National Institute for Health and Care Excellence

Guideline version (Consultation)

Weight management suite

[A] Evidence review for accuracy of anthropometric measures in assessing health risks associated with overweight and obesity in adults

Clinical Guideline <…>NICE guideline CG189

Methods, evidence and recommendationsEvidence reviews underpinning recommendations 1.1.2 to 1.1.14 and research recommendations in the NICE guideline

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Draft for Consultation

These evidence reviews were developed by Guideline Development Team

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ISBN:

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1 Accuracy of anthropometric measures in assessing health risks associated with overweight and obesity in adults

1.1 Review question

What are the most accurate and suitable anthropometric methods and associated boundary values for different ethnicities, to assess the health risk associated with overweight and obesity in adults, particularly those in black, Asian and minority ethnic groups?

1.1.1 Introduction

Overweight and obesity, as well as a person's central adiposity, is a risk factor for the development of health problems such as cardiovascular disease, type 2 diabetes, hypertension, dyslipidaemia, and some types of cancers.

The 2014 NICE guideline on obesity identification, assessment and management advise using body mass index (BMI) as a practical estimate of adiposity in adults but to interpret BMI with caution because it is not a measure of adiposity. The recommendations also state that BMI should be interpreted with caution especially in populations such as people of Asian family origin as they have comorbidity risk factors that are of concern at different BMIs (lower for adults of an Asian origin). The 2013 NICE guideline on BMI: preventing ill health and premature death in black, Asian and other minority ethnic groups, advise the use of lower thresholds (23 kg/m^2 to indicate increased risk and 27.5 kg/m^2 to indicate high risk) for BMI to trigger action to prevent type 2 diabetes among Asian (South Asian and Chinese) populations. The guideline also recommends extending the use of lower BMI thresholds to trigger action to prevent type 2 diabetes among black African and African-Caribbean populations.

This topic was reviewed by NICE's surveillance team and evidence, and expert feedback indicated the discriminatory value of waist-to-height ratio (WHtR) as an alternative measure for adiposity. The aim of this review is to identify the most accurate anthropometric measures, or combination of measures in measuring health risk associated with overweight and obesity, particularly those in black, Asian and minority ethnic groups. Additionally, the aim of the review is to identify optimal boundary values for different anthropometric measures that are associated with overweight, obesity, and central adiposity in adults, particularly those in black, Asian and minority ethnic groups.

1.1.2 Summary of the protocol

Table 1: PICO table for accuracy of anthropometric methods in assessing health risks in adults

PICO Table	

Population	Inclusion: Adults aged 18 years and above.
	
	Population will be stratified by ethnicity:
	• Black African/ Caribbean
	• Asian
	  ○ South Asian
	  ○ Chinese
	  ○ other Asian background
	• White

PICO Table	

	• Other ethnic groups
	  ○ Arab
	  ○ Any other ethnic background
	• Multiple or mixed ethnic group
	Further stratification within these groups will be informed by the evidence identified.

Test	Method of measurement: • BMI • Waist-to-height ratio (WHtR) • Waist-to-hip ratio (WHR) • Waist circumference (WC) Combinations of methods of measurement.
Reference standard	Development of a condition of interest: • Type 2 diabetes (T2DM) • Cardiovascular disease (including coronary heart disease (CVD)) • Cancer • Dyslipidaemia • Hypertension • All-cause Mortality
Outcomes	Prediction of people later developing: • Type 2 diabetes (T2DM) • Cardiovascular disease (including coronary heart disease (CVD)) • Cancer • Dyslipidaemia • Hypertension • All-cause mortality Prognostic/ diagnostic accuracy: • Sensitivity • Specificity • Likelihood ratios • Predictive values Optimal boundary values will be explored using the following methods: • Area under the curve (c-statistic) • Youden's index

1.1.3 Methods and process

This evidence review was developed using the methods and process described in Developing NICE guidelines: the manual. Methods specific to this review question are described in the review protocol in appendix A and the methods are described in appendix B.

Declarations of interest were recorded according to NICE's conflicts of interest policy.

1.1.4 Prognostic and Diagnostic evidence

1.1.4.1 Included studies

A combined search was conducted for the adults and children and young people review. A total of 14,299 studies were identified in the search. Following title and abstract screening, 76 studies were identified as being potentially relevant prognostic accuracy studies in the adult population. These studies were reviewed against the inclusion criteria as described in the review protocol (Appendix A). Overall, 29 studies were included. These studies covered the following populations and health risks:

- Black African/ Caribbean population (1 study)
  - Type 2 diabetes (1 study)
- Chinese population (7 studies)
  - Type 2 diabetes (2 study)
  - Cardiovascular disease (1 study)
  - Hypertension (4 studies)
- Other Asian population (Thai, South Korean, Japanese) (6 studies)
  - Type 2 diabetes (2 studies)
  - Cardiovascular disease (2 studies)
  - Hypertension (2 studies)
- Arab population (1 study)
  - Type 2 diabetes (1 study)
- Other ethnicities (Iranian, Peruvian, Brazilian, Hispanic) (8 studies)
  - Type 2 diabetes (5 studies)
  - Cardiovascular disease (2 studies)
  - Hypertension (1 study)
- White population (4 studies)
  - Type 2 diabetes (1 study)
  - Hypertension (1 study)
  - All-cause mortality (2 studies)
- Studies reporting multiple ethnicities (White, African/Caribbean population and Hispanic population):
  - Type 2 diabetes (2 studies)

Prognostic accuracy studies were not identified for South Asian population. Additionally, 3 studies were identified which included black African/ Caribbean population but only explored type 2 diabetes. For these populations, diagnostic accuracy studies were explored to further provide evidence on accuracy of anthropometric measures. From the 14,299 records, an additional 72 diagnostic accuracy studies were included based on title and abstract. These studies were reviewed against the inclusion criteria as described in the review protocol (Appendix A). Overall, 21 studies were included. These studies covered the following populations and health risks:

- Black African/ Caribbean and South Asian population (1 study)
  - Type 2 diabetes (1 study)
- Black African/ Caribbean population (9 studies)
  - Type 2 diabetes (3 studies)
  - Hypertension (5 studies)
  - Dyslipidaemia (3 studies)
- South Asian population (11 studies)
  - Type 2 diabetes (9 studies)
  - Hypertension (6 studies)
  - Dyslipidaemia (1 study)

See appendix E for evidence tables and the reference list in section 1.1.14.

1.1.4.2 Excluded studies

See appendix L for the list of excluded studies with reasons for their exclusion.

1.1.5 Summary of studies included in the prognostic and diagnostic evidence

Prognostic accuracy evidence

Table 2: Black African/ Caribbean population

Study	Study type	Country	Population	Anthropometric measure	Condition of interest	Accuracy outcomes	Other information
Sargeant 2002 (n=728)	Prospective cohort study	Jamaica	People 25-74 years old without diabetes Mean age (SD): Men: 45.9 (13.1) Women: 49.2 (14.9)	• BMI • WC • WHtR • WHR	Type 2 diabetes	• Sensitivity • Specificity • C-statistic	Cut-off points were calculated using ROC curves. The “optimal” cut-off point was where sensitivity and specificity are maximized. Risk of bias: high Applicability: direct

Table 3: Chinese population

Study	Study type	Country	Population	Anthropometric measure	Condition of interest	Accuracy outcomes	Other information
Chen 2018 (n= 20194)	Prospective Cohort Study	China	Adults without hypertension	• BMI • WC • WHtR • WHR	Hypertension	• Sensitivity • Specificity • LRs (Calculated) • C-Statistic	Calculated optimal cut-off values by using the maximum Youden’s Index. Risk of bias: high Applicability: direct

Study	Study type	Country	Population	Anthropometric measure	Condition of interest	Accuracy outcomes	Other information
Nguyen 2008 (n= 4492)	Prospective cohort study	China	People 18-65 years old without hypertension Mean age (95% CI) Men: 41.5 (41 to 41.9) Women: 42.5 (42.1 to 42.9)	• BMI	Hypertension	• Sensitivity • Specificity • C-statistic	Cut-off values selected utilising ROC analysis. Risk of bias: high Applicability: direct
Wang 2018 n= 719	Prospective Cohort Study	China	Women 40-70 years old without hypertension Age mean (SD): Prehypertensive group: 57.22 (6.52) Normal BP group: 54.83 (6.3)	• BMI • WC • WHtR • WHR	Hypertension	• Sensitivity • Specificity • LRs(Calculated) • C-Statistic	The optimal cut-off values were selected via Youden's Index Risk of bias: high Applicability: direct
Xia 2018 (n= 2558)	Prospective Cohort Study	China	People 45 and older with normal basal plasma glucose levels Median Age (IQR): 62 (56 to 70)	• BMI • WC	Type 2 diabetes	• Sensitivity • Specificity • LRs (Calculated) • C-Statistic	The optimal cut-off values were selected via Youden's Index. Risk of bias: high Applicability: direct
Xu 2014 (n=1034)	Prospective Cohort Study	China	People 20 and older without CVD	• BMI • WC • WHtR • WHR	CVD via ischemic stroke	• Sensitivity • Specificity • C-Statistic	Cut-off values selected utilising ROC in comparison to the Z-Statistic Risk of bias: low

Study	Study type	Country	Population	Anthropometric measure	Condition of interest	Accuracy outcomes	Other information
							Applicability: direct
Yang 2018 (n= 9962)	Prospective Cohort Study	China	People 60 and older without diabetes Mean age (SD) 66.81 (5.55)	• BMI • WC • WHtR	Type 2 diabetes	• Sensitivity • Specificity • LRs (Calculated) • C-Statistic	The optimal cut-off values were selected via Youden's Index Risk of bias: moderate Applicability: direct
Yu 2020 (n= 3406)	Prospective Cohort Study	China.	Adults without hypertension Median Age (IQR) 45 (37 To 54)	• BMI • WC • WHtR	Hypertension	• Sensitivity • Specificity • LRs (Calculated) • C-Statistic	The optimal cut-off values were selected via Youden's Index. Risk of bias: moderate Applicability: direct

1 *Table 4: Other Asian populations*

Study	Study type	Country	Population	Anthropometric measure	Condition of interest	Accuracy outcomes	Other information
Aekplakorn 2007 (n=3499)	Prospective cohort study	Thailand	Adults 35 to 59 years of age Mean age (SD) 43 (5)	• BMI • WC • WHR • WHtR	Coronary heart disease	• Sensitivity • Specificity • C-statistic	Cut-off values selected utilising ROC analysis Risk of bias: moderate Applicability: direct
Choi 2018 (n=5178)	Prospective cohort study	South Korea	Adults aged 40 to 70 years old without hypertension	• BMI • WC • WHR • WHtR	Hypertension	• Sensitivity • Specificity • C-statistic	Risk of bias: high Applicability: partially

Study	Study type	Country	Population	Anthropometric measure	Condition of interest	Accuracy outcomes	Other information
			Mean age: 53 in those who did not develop hypertension and 57 in those who did				
Lee 2015 (n= 4454)	Prospective cohort study	South Korea	People aged 40-69 years of age	• BMI • WC • WHR • WHtR	Hypertension	• Sensitivity • Specificity • LRs (calculated) • C-statistic	The optimal cut-off values were selected via Youden's Index. The AUC of each obesity marker was compared those of BMI using the DeLong method Risk of bias: moderate Applicability: direct
Moon 2018 (n=10038)	Prospective cohort study	South Korea	People aged 40-69 years of age without CVD Mean age (SD) 52.1 (empty data)	• BMI • WC • WHR • WHtR	CVD	• Sensitivity • Specificity • C-statistic	Risk of bias: high Applicability: direct
Oda 2013 (n=2,034)	Prospective cohort study	Japan	Adults who visited Medical Check-up Centre in both 2008 and 2011 and were free from diabetes Mean age (SD): 52 (9.2)	• BMI	Type 2 diabetes	• Sensitivity • Specificity • LRs (calculated) • C-statistic	Cut-off values selected utilising ROC analysis Risk of bias: high Applicability: direct
Son 2016 (n= 2,900)	Prospective cohort study	South Korea	Non-diabetic participants) in a health screening program, who repeated the medical check-up in 2005 and 2009, Mean age (SD) 44.3 (6.5)	• BMI • WC • WHR • WHtR	Type 2 diabetes	• Sensitivity • Specificity • LRs (calculated) • C-statistic	Risk of bias: high Applicability: direct

Table 5: Arab population

Study	Study type	Country	Population	Anthropometric measure	Condition of interest	Accuracy outcomes	Other information
Mansour 2007 (n=13730)	Prospective cohort study	Iraq	Adults over 18 years old without diabetes Mean age (SD) 44.9 (15.8)	• BMI • WC • WHtR • WHR	Type 2 diabetes	• Sen • Spec • LRs (calculated) • C-statistic	Cut-off values selected utilising ROC analysis. Risk of bias: high Applicability: direct

Table 6: Other ethnicities

Study	Study type	Country	Population	Anthropometric measure	Condition of interest	Accuracy outcomes	Other information
Bozorgmanesh 2010 (n= 3242)	Prospective cohort study	Iran	Adults without diabetes Mean age (SD): Men: 43.4 (14) Women: 39.5 (12)	• BMI • WC • WHtR • WHR	Type 2 diabetes	• Sensitivity • Specificity • C-statistic	Cut off values are derived according to last medical nutrition therapy manual texts Risk of bias: high Applicability: direct
Hadaegh 2006 (n= 1852)	Prospective cohort study	Iran	Men without diabetes Age mean (SD): 45.1 (14.5)	• BMI • WHtR	Type 2 diabetes	• Sensitivity • Specificity • C-statistic	Risk of bias: high Applicability: direct
Hadaegh 2009 (1) (n= 2801)	Prospective cohort study	Iran	Adults without diabetes Mean age (SD): Men: 55 (10) Women: 53 (9)	• BMI • WC • WHtR • WHR	Type 2 diabetes	• Sensitivity • Specificity • C-statistic	Cut-off values selected utilising ROC analysis. Risk of bias: moderate Applicability: direct

Study	Study type	Country	Population	Anthropometric measure	Condition of interest	Accuracy outcomes	Other information
Hadaegh 2009 (2) (n=3620)	Prospective cohort study	Iran	Women, 20 years and older, without CVD Mean age (SD) 54 (12.9)	• BMI • WHtR •	Cardiovascular disease (including coronary heart disease)	• Sensitivity • Specificity • LRs (calculated) • C-statistic	Risk of bias: high Applicability: direct
Rezende 2018 (n= 471)	Prospective Cohort Study	Brazil	Adults without hypertension Mean (SD) age: 38.9 (12.3)	• BMI • WC • WHtR	Hypertension	• Sensitivity • Specificity • LRs (Calculated) • C-Statistic	Cut-off values selected utilising ROC analysis Risk of bias: high Applicability: direct
Talaei 2012 (n=6323)	Prospective cohort study	Iran	Adults without CVD Women Mean Age (SD) 50.3 (11.3) Men Mean Age (SD) 51.1 (11.9)	• WC	Cardiovascular disease (including coronary heart disease)	• Sensitivity • Specificity • LRs (calculated) • C-statistic	The optimal cut-off values were selected via Youden's Index Risk of bias: high Applicability: direct
Zafari 2018 (n=7017)	Prospective cohort study	Iran	Iranian adults, aged 20–60 years, free of T2D at baseline Mean age (SD) 37.3 (10.4)	• BMI • WC • WHtR • WHR	Type 2 diabetes	• Sensitivity • Specificity • LRs (calculated) • C-statistic	Risk of bias: high Applicability: direct
Zafra-Tanaka 2020 (n= 2510)	Prospective Cohort Study	Peru	People 35 and older Age: median (IQR) 54.1 (44.6 to 63.6)	• BMI • WC • WHtR • WHR	Type 2 diabetes	• Sensitivity • Specificity • LRS (Calculated) • C-Statistic	The optimal cut-off values were selected via Youden's Index Risk of bias: moderate Applicability: direct.

1 *Table 7: White population*

Study	Study type	Country	Population	Anthropometric measure	Condition of interest	Accuracy outcomes	Other information
Gus 2009 (n=530)	Cross-sectional study	Brazil	Adults :90% white ethnicity population Mean age (SD): 38.6 (17.7)	• WC	hypertension	• Sensitivity • Specificity • LRs (Calculated) • C-Statistic	Cut-off values selected utilising ROC analysis Risk of bias: high Applicability: direct
Schneider 2010 (n= 10652)	Prospective Cohort Study	Germany	Caucasian adults Mean age (SD): 54.8 (15.6)	• BMI • WC • WHtR • WHR	All-cause mortality	• Sensitivity • Specificity • LRs (Calculated) • C-Statistic	Cut-off values selected utilising ROC analysis Risk of bias: high Applicability: direct
Wannamethee 2010 (n=3404)	Prospective Cohort Study	UK	Adults without diabetes	• BMI • WC	Type 2 diabetes	• Sensitivity • Specificity • LRs (Calculated) • C-Statistic •	Cut-off values selected utilising ROC analysis Risk of bias: high Applicability: direct
Welborn 2007 (n= 9206)	Prospective Cohort Study	Australia	People aged 20–69 years old. Europid (93%), with a small proportion of Asians and Africans (5%), as determined by stated place of birth Mean age (SD) 43 (13)	• BMI • WC • WHtR • WHR	All-cause mortality	• Sensitivity • Specificity • LRs (Calculated) • C-Statistic	Optimal cut-off values for predicting mortality were determined using Youden's Index Risk of bias: high Applicability: direct

1 *Table 8: Studies reporting multiple ethnicities*

Study	Study type	Country	Population	Anthropometric measure	Condition of interest	Accuracy outcomes	Other information
MacKay 2009 (n= 1073)	Prospective cohort study	USA	People aged 40-69 years of age. Results were reported for 3 ethnicities: non-Hispanic white (40%), African American (26%), and Hispanic (34%).	• BMI • WHR • WHtR • WC	Type 2 diabetes	• Sensitivity • Specificity • C-Statistic	Risk of bias: high Applicability: direct
Stevens 2001 (n=15792)	Prospective cohort study	USA	Adults of black and white ethnicity Mean (SD) age: ~53 years old.	• BMI • WC • WHR	Type 2 diabetes	• Sensitivity • Specificity • C-Statistic	Cut-off values selected utilising ROC analysis Risk of bias: high Applicability: direct

2 ***Diagnostic accuracy evidence***

3 *Table 9: Black African/ Caribbean and South Asian populations*

Study	Study type	Setting	Population	Anthropometric measure	Condition of interest	Accuracy outcomes	Other information
Multiple ethnicities: Black African / Caribbean & South Asian							
Diaz 2007 (n=2262)	Cross-sectional study	USA and UK 2003–04 National Health and Nutrition Examination Survey (NHANES) & 2003-04 Health Survey for England (HSE)	People 20 years and older • Men • Women	• BMI • WC • WHtR	• Type 2 diabetes	• C-statistic	Cut-off values assigned at maximum sensitivity and specificity. Risk of bias: moderate Applicability: direct
Black African / Caribbean							
Foucan 2002 (n=5441)	Cross-sectional study	Consecutive women attending the Health Center of Guadeloupe (FWI)	Women 18-74 years old. • Women: 18-39 • Women: 40-74	• BMI • WC	• Type 2 diabetes • Hypertension • Dyslipidaemia	• Sensitivity • Specificity • C-statistic • LRs (calculated)	Cut-offs derived utilising ROC analysis Risk of bias: high Applicability: direct

Study	Study type	Setting	Population	Anthropometric measure	Condition of interest	Accuracy outcomes	Other information
Gutema 2020 (n=3345)	Cross-sectional study	Random sample of participants from the Arba Minch Health and Demographic Surveillance System (HDSS) database	Adults 24-64 years old • Men Women	• BMI • WC • WHR • WHtR	• Hypertension	• Sensitivity • Specificity • C-statistic • LRs (calculated)	Cut-offs derived utilising Youden's Index. Risk of bias: moderate Applicability: direct
Kenate 2020 (n=915)	Cross-sectional study	Ethiopia: residents of Jimma Town in 2019	Adults • Men • Women	• BMI • WC • WHR	• Dyslipidaemia	• Sensitivity • Specificity • PPV • NPV • C-statistic	Cut-offs thought to be assessed vis ROC analysis Risk of bias: moderate Applicability: direct
Okoro 2021 (n=240)	Cross-sectional study	Bayelsa state, Nigeria. Cluster sampling method used	Physicians recruited from all the medical doctors registered to practice medicine in Bayelsa state	• BMI • WC • WHR • WHtR	• Hypertension	• Sensitivity • Specificity • PPV • NPV • C-statistic • LRs (calculated)	Standard cut-offs evaluated Risk of bias: high Applicability: partial
Ononamadu 2017 (n=912)	Cross-sectional study	Nigeria: random sample of people recruited in church in 3 cities	People aged 17-79 years old • Men • Women	• BMI • WC • WHtR	• Hypertension	• Sensitivity • Specificity • LRs (calculated)	Cut-offs derived utilising Youden's Index. Risk of bias: high Applicability: direct
Paccaud 2000 (n=806)	Cross-sectional study	Seychelles Heart Study from 1994	People recruited were 25-64 years old. • Men • Women	• BMI • WC • WHR	• Dyslipidaemia	• Sensitivity • Specificity • LRs (calculated)	Published cut-offs were assessed Risk of bias: low Applicability: direct

Study	Study type	Setting	Population	Anthropometric measure	Condition of interest	Accuracy outcomes	Other information
Sinaga 2018 (n=704)	Cross-sectional study	Ethiopia: staff at Jimma University	Adults • Men • Women	• BMI • WC • WHR • WHtR	• Hypertension	• Sensitivity • Specificity • C-statistic	Cut-offs derived utilising Youden's Index. Risk of bias: moderate Applicability: partial
Skogberg 2018 (n=225)	Cross-sectional study	Finland: Migrant Health and Wellbeing Survey (Maamu) - 2010 and 2012	Adults from Somalia	• BMI • WC • WHtR • WHR	• Type 2 diabetes	• C-statistic	Risk of bias: low Applicability: direct
Yoon 2016 (n=854)	Cross-sectional study	USA: National Health and Nutrition Examination Survey (NHANES) 2007—2010	People 20 years and older	• BMI • WC	• Type 2 diabetes	• C-statistic	Risk of bias: high Applicability: direct
South Asian							
Alperet 2016 (n=2673)	Cross-sectional study	Participants in the Singapore National Health Survey	People of Indian ethnicity who are 18-69 years old. • Men • Women	• BMI • WC • WHR • WHtR	• Type 2 diabetes	• Sensitivity • Specificity • PPV • LRs (calculated)	Cut-offs derived utilising Youden's Index Risk of bias: high Applicability: direct
Awasthi 2017 (n=102)	Case-control study	Recruitment of cases in a single hospital and controls from local community	South Indian people over 20. Cases diagnosed for at least 2 years.	• BMI • WC • WHR • WHtR	• Type 2 diabetes	• Sensitivity • Specificity • LRs (calculated)	Unclear how cut-offs were derived Risk of bias: high Applicability: direct
Bhowmik 2013 (n=2376)	Cross-sectional study	Rural Bangladesh: randomly selected in a population-based survey	People 20 years and older: • Men • Women	• BMI • WC • WHtR • WHR	• Type 2 diabetes • Hypertension • Dyslipidaemia	• Sensitivity • Specificity • C-statistic	Cut-offs derived utilising ROC analysis Risk of bias: moderate Applicability: direct

Study	Study type	Setting	Population	Anthropometric measure	Condition of interest	Accuracy outcomes	Other information
Gupta 2012 (n=578)	Cross-sectional study	North India: multistage, stratified sampling	Adults 30 years and over • Men • Women	• BMI • WC • WHtR • WHR	• Hypertension	• Sensitivity • Specificity • C-statistic • PPV • NPV	Optimal cut-offs developed by calculating the accuracy at various points. Risk of bias: moderate Applicability: direct
Jayawardana 2013 (n=4485)	Cross-sectional study	Sri Lanka Diabetes and cardiovascular Study – SLDCS	Adults • Men • Women	• BMI • WC • WHtR • WHR	• Type 2 diabetes • Hypertension	• C-statistic	Cut-offs derived utilising Youden's Index. Risk of bias: low Applicability: direct
Kapoor 2020 (n=1709)	Cross-sectional study	India: Kerala Diabetes Prevention Program (K-DPP)	Adults 30-60 years old • Men • Women	• BMI • WC • WHtR • WHR	• Type 2 diabetes	• Sensitivity • Specificity • C-statistic	Cut-offs derived utilising Youden's Index. Risk of bias: moderate Applicability: direct
Katulanda 2011 (n=4474)	Cross-sectional study	Sri Lanka Diabetes and Cardiovascular Study: 2005-06	Adults • Men • Women	• BMI • WC • WHR	• Hypertension	• C-statistic	Cut-offs derived utilising Youden's Index. Risk of bias: moderate Applicability: direct
Mohan 2007 (n=2350)	Cross-sectional study	India: Chennai Urban Rural Epidemiology Study (CURES)	People 20 years and older • Men • Women	• BMI • WC	• Type 2 diabetes • Hypertension	• Sensitivity • Specificity • C-statistic	Cut-offs derived utilising ROC analysis Risk of bias: high Applicability: direct
Patel 2017 (n=8892)	Cross-sectional study	India & Pakistan: Center for Cardio-metabolic Risk Reduction in South Asia (CARRS) Surveillance Study	People 20 years and older • Men • Women	• BMI • WC • WHtR • WHR	• Type 2 diabetes • Hypertension	• C-statistic	Risk of bias: low Applicability: direct

Study	Study type	Setting	Population	Anthropometric measure	Condition of interest	Accuracy outcomes	Other information
Siddiquee 2015 (n=2293)	Cross-sectional study	Bangladesh: random selection of people from rural community in Chandra	People 20 years and older	• BMI • WC • WHR	• Type 2 diabetes	• C-statistic	Risk of bias: low Applicability: direct
Snehalatha 2003	Cross-sectional study	6 cities in India: multiple stratified sampling procedure.	People 20 years and older	• BMI • WC • WHR	• Type 2 diabetes	• Sensitivity • Specificity • C-statistic	Cut-offs derived utilising ROC analysis Risk of bias: moderate Applicability: direct

1 See appendix E for full evidence tables.

1.1.6 Summary of the prognostic and diagnostic evidence

Prognostic accuracy evidence

C-Statistic / area under the curve

The following table was used to aid judgments of classification accuracy.

Table 10: Interpretation of c-statistics

Value of c-statistic	Interpretation
c-statistic <0.6	**Poor classification accuracy**
0.6 ≤ c-statistic <0.7	**Adequate classification accuracy**
0.7 ≤ c-statistic <0.8	**Good classification accuracy**
0.8 ≤ c-statistic <0.9	**Excellent classification accuracy**
0.9 ≤ c-statistic < 1.0	**Outstanding classification accuracy**

Black African/ Caribbean population

Summary of studies providing head-to-head comparisons of measures

The majority of included studies compared the accuracy of measures within the same group of participants. The studies often reported the accuracy in gender or age specific subgroups. The table below indicates which measure offered the best discriminatory power as determined by its C-statistic / AUC – ROC curve in each study or, where reported, relevant subgroup within the study.

Table 11: C-statistic/AUC comparisons in the Black African/ Caribbean ethnicity

Type 2 diabetes		Highest C-statistic
BMI vs WC vs WHR vs BMI + WC vs BMI + WHR	Stevens 2001[1] (men / women) Stevens 2001 (women) Stevens 2001 (men / women)	BMI + waist circumference in 2 study subgroups BMI + waist-to-hip ratio in 1 study subgroup Waist circumference in 2 study subgroups
BMI vs WC vs WHR vs WHtR	Sargeant 2002[1] (men) Sargeant 2002 (men) MacKay 2009 (men and women) Sargeant 2002 (women)	Waist circumference in 1 study subgroup Waist-to-height ratio in 1 study subgroup Waist-to-hip ratio in 1 study subgroup BMI in 1 study subgroup

[1]Identical C-statistics reported for multiple subgroups

Table 12: Type 2 diabetes

No. of studies	Study design	Sample size	Effect size (95%CI)	Quality	Interpretation of effect
BMI					
Men and women					
MacKay 2009	Prospective	282	0.616 (95% CI not reported)	Very low	Adequate classification accuracy
Men					
Sargeant 2002	Prospective	290	0.74 (0.59 - 0.88)	Very low	Good classification accuracy
Stevens 2001	Prospective	1102	0.69 (95% CI not reported)	Low	Adequate classification accuracy
Women					
Sargeant 2002	Prospective	438	0.62 (0.51 -0.72)	Very low	Adequate classification accuracy
Stevens 2001	Prospective	1817	0.66 (95% CI not reported)	Low	Adequate classification accuracy
Waist circumference					
Men and women					
MacKay 2009	Prospective	282	0.63 (95% CI not reported)	Very low	Adequate classification accuracy
Men					
Sargeant 2002	Prospective	290	0.78 (0.65 -0.91)	Very low	Good classification accuracy
Stevens 2001	Prospective	1102	0.7 (95% CI not reported)	Low	Good classification accuracy
Women					
Sargeant 2002	Prospective	438	0.61 (0.50 -0.71)	Very low	Adequate classification accuracy

Stevens 2001	Prospective	1817	0.69 (95% CI not reported)	Low	Adequate classification accuracy
Waist-to-hip ratio (WHR)					
Men and women					
MacKay 2009	Prospective	282	0.691 (95% CI not reported)	Very low	Adequate classification accuracy
Men					
Sargeant 2002	Prospective	290	0.76 (0.63 - 0.89)	Very low	Good classification accuracy
Stevens 2001	Prospective	1102	0.66 (95% CI not reported)	Low	Adequate classification accuracy
Women					
Sargeant 2002	Prospective	438	0.60 (0.50- 0.70)	Very low	Adequate classification accuracy
Stevens 2001	Prospective	1817	0.67 (95% CI not reported)	Low	Adequate classification accuracy
Waist-to-height ratio (WHtR)					
Men and women					
MacKay 2009	Prospective	282	0.645 (95% CI not reported)	Very low	Adequate classification accuracy
Men					
Sargeant 2002	Prospective	290	0.78 (0.66 - 0.90)	Very low	Good classification accuracy
Women					
Sargeant 2002	Prospective	438	0.61 (0.51 to 0.72)	Very low	Adequate classification accuracy
BMI + Waist circumference					
Men					
Stevens 2001	Prospective	1102	0.7 (95% CI not reported)	Low	Good classification accuracy
Women					
Stevens 2001	Prospective	1817	0.69 (95% CI not reported)	Low	Adequate classification accuracy
BMI + Waist-to-hip					
Men					
Stevens 2001	Prospective	1102	0.69 (95% CI not reported)	Low	Adequate classification accuracy
Women					
Stevens 2001	Prospective	1817	0.69 (95% CI not reported)	Low	Adequate classification accuracy

Chinese population

Summary of studies providing head-to-head comparisons of measures

The majority of included studies compared the accuracy of measures within the same group of participants. The studies often reported the accuracy in gender or age specific subgroups. The table below indicates which measure offered the best discriminatory power as determined by its C-statistic / AUC – ROC curve in each study or, where reported, relevant subgroup within the study.

Table 13: C-statistic/AUC comparisons in the Chinese ethnicity

Type 2 diabetes		**Highest C-statistic**
BMI vs WC vs WHtR	Yang 2018 (men / women)	BMI in 2 study subgroups
BMI vs WC	Xia 2018 (men and women)	Waist circumference in 1 study
Hypertension		**Highest C-statistic**
BMI vs WC vs WHR vs WHtR	Wang 2018 (prehypertensive people / people with normal blood pressure)	Waist circumference 2 study subgroups
BMI vs WC vs WHtR	Yu 2020 (men / women)	Waist-to-height ratio in 2 study subgroups
Cardiovascular disease		**Highest C-statistic**
BMI vs WC vs WHtR	Xu 2014 (men)	Waist-to-height ratio in 1 study

Table 14: Type 2 diabetes

No. of studies	Study design	Sample size	Effect size (95%CI)	Quality	Interpretation of effect
BMI					
Men and women					
Xia 2018	Prospective	2558	0.631 (0.607-0.655	Low	Adequate classification accuracy
Men					
Yang 2018	Prospective	5998	0.655 (0.626- 0.684)	Moderate	Adequate classification accuracy
Women					
Yang 2018	Prospective	3964	0.635 (0.602-0.667)	Moderate	Adequate classification accuracy
Waist circumference					
Men and women					
Xia 2018	Prospective	2558	0.646 (0.622-0.670)	Low	Adequate classification accuracy
Men					

Yang 2018	Prospective	5998	0.629 (0.600-0.659)	Moderate	Adequate classification accuracy
Women					
Yang 2018	Prospective	3964	0.616 (0.581-0.651)	Low	Adequate classification accuracy
Waist-to-height ratio					
Men					
Yang 2018	Prospective	5998	0.629 (0.600,0.658)	Moderate	Adequate classification accuracy
Women					
Yang 2018	Prospective	3964	0.609 (0.574,0.644)	Low	Adequate classification accuracy

1 *Table 15: Hypertension*

No. of studies	Study design	Sample size	Effect size (95%CI)	Quality	**Interpretation of effect**
BMI					
Men (overall)					
Yu 2020	Prospective	1557	0.593 (0.568 - 0.618	Low	Poor classification accuracy
Nguyen 2008	Prospective	2077	0.62 (95% CI not reported)	Low	Adequate classification accuracy
Men (aged 18-40)					
Nguyen 2008	Prospective	946	0.64 (95% CI not reported)	Low	Adequate classification accuracy
Men (aged 41-65)					
Nguyen 2008	Prospective	1131	0.61(95% CI not reported)	Low	Adequate classification accuracy
Women (overall)					
Yu 2020	Prospective	1849	0.615 (0.592- 0.637)	Low	Adequate classification accuracy
Nguyen 2008	Prospective	2415	0.62 (95% CI not reported)	Low	Adequate classification accuracy
Women (aged 18-40)					
Nguyen 2008	Prospective	1053	0.64 (95% CI not reported)	Low	Adequate classification accuracy
Women (aged 41-65)					
Nguyen 2008	Prospective	1362	0.59 (95% CI not reported)	Low	Poor classification accuracy
In people with ideal blood pressure					
Wang 2018	Prospective	344	0.593 (0.484–0.702)	Very low	Poor classification accuracy
In people with pre-hypertension					

Wang 2018	Prospective	375	0.587 (0.525–0.650)	Very low	Poor classification accuracy
Waist circumference					
Men					
Yu 2020	Prospective	1557	0.583 (0.558 - 0.608)	Low	Poor classification accuracy
Women					
Yu 2020	Prospective	1849	0.644 (0.622 - 0.666)	Moderate	Adequate classification accuracy
In people with ideal blood pressure					
Wang 2018	Prospective	344	0.692 (0.598–0.787)	Very low	Adequate classification accuracy
In people with pre-hypertension					
Wang 2018	Prospective	375	0.615 (0.553–0.677)	Very low	Adequate classification accuracy
Waist-to-height ratio					
Men					
Yu 2020	Prospective	1557	0.597 (0.572 - 0.621)	Low	Poor classification accuracy
Women					
Yu 2020	Prospective	1849	0.647 (0.625 -0.669)	Moderate	Adequate classification accuracy
In people with ideal blood pressure					
Wang 2018	Prospective	344	0.682 (0.591-0.772)	Very low	Adequate classification accuracy
In people with pre-hypertension					
Wang 2018	Prospective	375	0.604 (0.542-0.667)	Very low	Adequate classification accuracy
Waist-to-hip ratio					
In people with ideal blood pressure					
Wang 2018	Prospective	344	0.671 (0.568-0.775)	Very low	Adequate classification accuracy
In people with pre-hypertension					
Wang 2018	Prospective	375	0.597 (0.534-0.660)	Very low	Poor classification accuracy

Table 16: Cardiovascular disease (CVD)

No. of studies	Study design	Sample size	Effect size (95%CI)	Quality	Interpretation of effect
BMI					
Men and women					

Xu 2014	Prospective	1034	0.566 (95% CI not reported)	High	Poor classification accuracy
Waist circumference					
Men and women					
Xu 2014	Prospective	1034	0.543 (95% CI not reported)	High	Poor classification accuracy
Waist-to-height ratio					
Men and women					
Xu 2014	Prospective	1034	0.586 (95% CI not reported)	High	Poor classification accuracy

Other Asian populations

Summary of studies providing head-to-head comparisons of measures

The majority of included studies compared the accuracy of measures within the same group of participants. The studies often reported the accuracy in gender or age specific subgroups. The table below indicates which measure offered the best discriminatory power as determined by its C-statistic / AUC – ROC curve in each study or, where reported, relevant subgroup within the study.

Table 17: C-statistic/AUC comparisons in the Other Asian ethnicity

Type 2 diabetes		**Highest C-statistic**
BMI vs WC vs WHtR	Son 2016 (men) Son 2016 (women)	Waist-to-height ratio in 1 study subgroup BMI in 1 study subgroup
Hypertension		**Highest C-statistic**
BMI vs WC vs WHR vs WHtR	Lee 2015[1] (men / women) Lee 2015[1] (men / women) Lee 2015[1] (men), Choi 2018 (men and women)	Waist-to-hip ratio in 2 study subgroups Waist-to-height ratio in 2 study subgroups Waist circumference in 2 study subgroups
Cardiovascular disease		**Highest C-statistic**
BMI vs WC vs WHR vs WHtR	Aekplakorn 2007 (men and women)	Waist-to-height ratio in 1 study subgroup
BMI vs WC	Moon 2018 (men and women)	Waist circumference in 2 study subgroups

[1]Lee 2015 reported the same C-statistic in men for 3 subgroups

Table 18: Type 2 diabetes

No. of studies	**Study design**	**Sample size**	**Effect size (95%CI)**	**Quality**	**Interpretation of effect**
BMI					

Men and women (Japanese population)					
Oda 2013	Prospective	2034	0.685 (0.580-0.790)	Very low	Adequate classification accuracy
Men (South Korean population)					
Son 2016	Prospective	2078	0.66 (0.602–0.718)	Very low	Adequate classification accuracy
Women (South Korean population)					
Son 2016	Prospective	822	0.66 (0.602–0.718)	Very low	Adequate classification accuracy
Waist circumference (WC)					
Men (South Korean population)					
Son 2016	Prospective	2078	0.668 (0.615–0.722)	Very low	Adequate classification accuracy
Women (South Korean population)					
Son 2016	Prospective	822	0.691 (0.571–0.812)	Very low	Adequate classification accuracy
Waist-to-height (WHtR)					
Men (South Korean population)					
Son 2016	Prospective	2078	0.697 (0.644–0.749)	Very low	Adequate classification accuracy
Women (South Korean population)					
Son 2016	Prospective	822	0.679 (0.554–0.803)	Very low	Adequate classification accuracy

Table 19: Hypertension

No. of studies	Study design	Sample size	Effect size (95%CI)	Quality	**Interpretation of effect**
BMI					
Men and women (South Korean population)					
Choi 2018	Prospective	1718	0.58 (0.56-0.6)	Very low	Poor classification accuracy
Men (South Korean population)					
Lee 2015	Prospective	2128	0.551 (0.483–0.619)	Low	Poor classification accuracy
Women (South Korean population)					
Lee 2015	Prospective	2326	0.57 (0.55 - 0.59)	Moderate	Poor classification accuracy
Waist circumference (WC)					
Men and women (South Korean population)					
Choi 2018	Prospective	1718	0.672 (0.634 - 0.711)	Very low	Adequate classification accuracy
Men (South Korean population)					
Lee 2015	Prospective	2128	0.62 (0.6 - 0.64)	Moderate	Adequate classification accuracy
Women (South Korean population)					
Lee 2015	Prospective	2326	0.66 (0.64 - 0.68)	Moderate	Adequate classification accuracy

Waist-to-hip ratio (WHR)					
Men and women (South Korean population)					
Choi 2018	Prospective	1718	0.648 (0.608 - 0.688)	Very low	Adequate classification accuracy
Men (South Korean population)					
Lee 2015	Prospective	2128	0.62 (0.6 - 0.64)	Moderate	Adequate classification accuracy
Women (South Korean population)					
Lee 2015	Prospective	2326	0.68 (0.66 - 0.7)	Low	Adequate classification accuracy
Waist-to-height ratio (WHtR)					
Men and women (South Korean population)					
Choi 2018	Prospective	1718	0.662 (0.625 - 0.7)	Very low	Adequate classification accuracy
Men (South Korean population)					
Lee 2015	Prospective	2128	0.62 (0.6 - 0.64)	Moderate	Adequate classification accuracy
Women (South Korean population)					
Lee 2015	Prospective	2326	0.68 (0.66 - 0.7)	Low	Adequate classification accuracy

Table 20: Cardiovascular disease (CVD)

No. of studies	Study design	Sample size	Effect size (95%CI)	Quality	**Interpretation of effect**
BMI					
Men and women (South Korean population)					
Moon 2018	Prospective	8485	0.538 (0.514 - 0.562)	Low	Poor classification accuracy
Men and women (Thai population)					
Aekplakorn 2007	Prospective	2536	0.606 (0.0535 -0.677)	Low	Adequate classification accuracy
Waist circumference (WC)					
Men and women (South Korean population)					
Moon 2018	Prospective	8485	0.604 (0.58 - 0.627)	Very low	Adequate classification accuracy
Men and women (Thai population)					
Aekplakorn 2007	Prospective	2536	0.627 (0.556 - 0.697)	Low	Adequate classification accuracy
Waist-to-hip ratio (WHR)					
Men and women (Thai population)					
Aekplakorn 2007	Prospective	2536	0.592 (0.521 - 0.664)	Low	Poor classification accuracy
Waist-to-height ratio (WHtR)					
Men and women (Thai population)					
Aekplakorn 2007	Prospective	2536	0.651 (0.584 - 0.719)	Very low	Adequate classification accuracy

Arab population

Summary of studies providing head-to-head comparisons of measures

The majority of included studies compared the accuracy of measures within the same group of participants. The studies often reported the accuracy in gender or age specific subgroups. The table below indicates which measure offered the best discriminatory power as determined by its C-statistic / AUC – ROC curve in each study or, where reported, relevant subgroup within the study.

Table 21: C-statistic/AUC comparisons in the Arab ethnicity

Type 2 diabetes		**Highest C-statistic**
BMI vs WC vs WHR vs WHtR	Mansour 2007 (men / women)	Waist-to-hip ratio in 2 study subgroups

Table 22: Type 2 diabetes

No. of studies	**Study design**	**Sample size**	**Effect size (95%CI)**	**Quality**	**Interpretation of effect**
BMI					
Men					
Mansour 2007	Prospective	7101	0.66 (0.64- 0.68)	Low	Adequate classification accuracy
Women					
Mansour 2007	Prospective	6629	0.61 (0.59- 0.64)	Very low	Adequate classification accuracy
Waist circumference (WC)					
Men					
Mansour 2007	Prospective	7101	0.71 (0.69- 0.73)	Very low	Good classification accuracy
Women					
Mansour 2007	Prospective	6629	0.69 (0.66- 0.71)	Very low	Adequate classification accuracy
Waist-to-hip ratio (WHR)					
Men					
Mansour 2007	Prospective	7101	0.74 (0.72- 0.76)	Low	Good classification accuracy
Women					
Mansour 2007	Prospective	6629	0.72 (0.7- 0.74)	Low	Good classification accuracy
Waist-to-height ratio (WHtR)					
Men					
Mansour 2007	Prospective	7101	0.71 (0.69- 0.73)	Very low	Good classification accuracy
Women (overall)					
Mansour 2007	Prospective	6629	0.69 (0.67- 0.72)	Very low	Adequate classification accuracy

Other ethnicities

Summary of studies providing head-to-head comparisons of measures

The majority of included studies compared the accuracy of measures within the same group of participants. The studies often reported the accuracy in gender or age specific subgroups. The table below indicates which measure offered the best discriminatory power as determined by its C-statistic / AUC – ROC curve in each study or, where reported, relevant subgroup within the study.

Table 23: C-statistic/AUC comparisons in other ethnicities

Type 2 diabetes		**Highest C-statistic**
BMI vs WC vs WHR vs WHtR	Zafra-Tanaka 2020 (Peruvian women), Zafari 2018 (Iranian men / women) MacKay 2009 (Hispanic men and women), Zafra-Tanaka 2020 (Peruvian men) Zafra-Tanaka 2020[1] (Peruvian women)	Waist-to-height ratio in 3 study subgroups B MI in 2 study / study subgroups Waist circumference in 1 study subgroup
BMI vs WHR vs WHtR	Bozorgmanesh 2010 (Iranian women 20-49 / 50+) Bozorgmanesh 2010 (Iranian men 20-49 / 50+)	Waist-to-height ratio in 2 study subgroups Waist-to-hip ratio in 2 study subgroups
BMI vs WHtR	Hadaegh 2009-1 (Iranian men), Hadaegh 2006 (Iranian women)	Waist-to-height ratio in 2 study subgroups
Cardiovascular disease		**Highest C-statistic**
BMI vs WC vs WHR vs WHtR	Hadaegh 2009-2 (Iranian men >60 / women >60) Hadaegh 2009-2 (Iranian men <60 / women <60)	Waist-to-height ratio in 2 study subgroups Waist-to-hip ratio in 2 study subgroups
Hypertension		**Highest C-statistic**
BMI vs WC vs WHtR	Rezende 2018 (men <40 / women <40) Rezende 2018 (women ≥40) Rezende 2018 (men ≥40)	Waist circumference in 2 study subgroups Waist-to-height ratio in 1 study subgroup BMI in 1 study subgroup

[1]Two measures in Peruvian women had the same C-statistic

Type 2 diabetes

Table 24: Iranian population

No. of studies	Study design	Sample size	Effect size (95%CI)	Quality	Interpretation of effect
BMI					

Men					
Zafari 2018	Prospective	2419	0.68 (0.65 – 0.71)	Very low	Adequate classification accuracy
Hadeaegh 2006	Prospective	1852	0.693 (95% CI not reported)	Low	Adequate classification accuracy
Men aged 20-49					
Bozorgmanesh 2010	Prospective	Unclear: 1368 men in the study	0.66 (95% CI not reported)	Very low	Adequate classification accuracy
Men aged 50+					
Bozorgmanesh 2010	Prospective	Unclear: 1368 men in the study	0.69 (95% CI not reported)	Very low	Adequate classification accuracy
Women					
Zafari 2018	Prospective	3319	0.72 (0.70- 0.74)	Low	Good classification accuracy
Hadeaegh 2009	Prospective	2801	0.69 (95% CI not reported)	Low	Adequate classification accuracy
Women aged 20-49					
Bozorgmanesh 2010	Prospective	Unclear: 1874 women in the study	0.76 (95% CI not reported)	Very low	Good classification accuracy
Women aged 50+					
Bozorgmanesh 2010	Prospective	Unclear: 1874 women in the study	0.63 (95% CI not reported)	Very low	Adequate classification accuracy
Waist circumference (WC)					
Men					
Zafari 2018	Prospective	1415	0.68 (0.65- 0.71)	Very low	Adequate classification accuracy
Women					
Zafari 2018	Prospective	1166	0.74 (0.72-0.77)	Low	Good classification accuracy
Waist-to-hip ratio (WHR)					
Men					
Zafari 2018	Prospective	2419	0.68 (0.65- 0.71)	Very low	Adequate classification accuracy
Men aged 20-49					
Bozorgmanesh 2010	Prospective	Unclear: 1368 men in the study	0.67 (95% CI not reported)	Very low	Adequate classification accuracy
Men aged 50+					
Bozorgmanesh 2010	Prospective	Unclear: 1368 men in the study	0.7 (95% CI not reported)	Very low	Good classification accuracy
Women					
Zafari 2018	Prospective	3319	0.71 (0.69- 0.74)	Very low	Good classification accuracy
Women aged 20-49					
Bozorgmanesh 2010	Prospective	Unclear: 1874 women in the study	0.77 (95% CI not reported)	Very low	Good classification accuracy
Women aged 50+					
Bozorgmanesh 2010	Prospective	Unclear: 1874 women in the study	0.64 ((95% CI not reported)	Very low	Adequate classification accuracy
Waist-to-height ratio (WHtR)					

Men					
Zafari 2018	Prospective	2419	0.69 (0.67 – 0.72)	Very low	Adequate classification accuracy
Hadeaegh 2006	Prospective	1852	0.716 (95% CI not reported)	Low	Good classification accuracy
Men aged 20-49					
Bozorgmanesh 2010	Prospective	Unclear: 1368 men in the study	0.66 (95% CI not reported)	Very low	Adequate classification accuracy
Men aged 50+					
Bozorgmanesh 2010	Prospective	Unclear: 1368 men in the study	0.69 (95% CI not reported)	Very low	Adequate classification accuracy
Women					
Zafari 2018	Prospective	3319	0.75 (0.73- 0.78)	Low	Good classification accuracy
Hadeaegh 2009	Prospective	2801	0.72 (95% CI not reported)	Low	Good classification accuracy
Women aged 20-49					
Bozorgmanesh 2010	Prospective	Unclear: 1874 women in the study	0.79 (95% CI not reported)	Very low	Good classification accuracy
Women aged 50+					
Bozorgmanesh 2010	Prospective	Unclear: 1874 women in the study	0.65 ((95% CI not reported)	Very low	Adequate classification accuracy

1 Table 25: Hispanic population

No. of studies	Study design	Sample size	Effect size (95%CI)	Quality	**Interpretation of effect**
BMI					
Men and women					
Mackay 2009	Prospective	361	0.658 (95% CI not reported)	Very low	Adequate classification accuracy
Waist circumference					
Men and women					
Mackay 2009	Prospective	361	0.647 (95% CI not reported)	Very low	Adequate classification accuracy
Waist-to-height ratio					
Men and women					
Mackay 2009	Prospective	361	0.65 (95% CI not reported)	Very low	Adequate classification accuracy
Waist-to-hip ratio					
Men and women					
Mackay 2009	Prospective	361	0.582 (95% CI not reported)	Very low	Poor classification accuracy

2 Table 26: Peruvian population

No. of studies	**Study design**	**Sample size**	**Effect size (95%CI)**	**Quality**	**Interpretation of effect**
BMI					

Men					
Zafra-Tanaka 2020	Prospective	1230	0.67 (0.60–0.74)	Low	Adequate classification accuracy
Women					
Zafra-Tanaka 2020	Prospective	1292	0.69 (0.63–0.76)	Low	Adequate classification accuracy
Waist circumference					
Men					
Zafra-Tanaka 2020	Prospective	1230	0.66 (0.59–0.72)	Very low	Adequate classification accuracy
Women					
Zafra-Tanaka 2020	Prospective	1292	0.71 (0.65–0.77)	Low	Good classification accuracy
Waist-to-height ratio					
Men					
Zafra-Tanaka 2020	Prospective	1230	0.65 (0.59–0.72)	Very low	Adequate classification accuracy
Women					
Zafra-Tanaka 2020	Prospective	1292	0.71 (0.65–0.77)	Low	Good classification accuracy
Waist-to-hip ratio					
Men					
Zafra-Tanaka 2020	Prospective	1230	0.62 (0.54–0.69)	Very low	Adequate classification accuracy
Women					
Zafra-Tanaka 2020	Prospective	1292	0.59 (0.52–0.66)	Low	Poor classification accuracy

Cardiovascular disease

Table 27: Iranian population

No. of studies	Study design	Sample size	Effect size (95%CI)	Quality	Interpretation of effect
BMI					
Men aged ≤ 60 years					
Hadeaegh 2009	Prospective	1614	0.588 (0.534–0.643)	Low	Poor classification accuracy
Men aged > 60 years					
Hadeaegh 2009	Prospective	1614	0.563 (0.500–0.625)	Low	Poor classification accuracy
Women aged ≤ 60 years					
Hadeaegh 2009	Prospective	2006	0.551 (0.483–0.619)	Low	Poor classification accuracy
Women aged > 60 years					
Hadeaegh 2009	Prospective	2006	0.541 (0.465–0.617)	Low	Poor classification accuracy
Waist circumference (WC)					

Men					
Taliaei 2012	Prospective	3068	0.59 (0.55-0.63)	Very low	Poor classification accuracy
Men aged ≤ 60 years					
Hadeaegh 2009	Prospective	1614	0.623 (0.57 - 0.675)	Low	Adequate classification accuracy
Men aged > 60 years					
Hadeaegh 2009	Prospective	1614	0.576 (0.513 - 0.64)	Low	Poor classification accuracy
Women					
Taliaei 2012	Prospective	3255	0.59 (0.55-0.63)	Very low	Poor classification accuracy
Women aged ≤ 60 years					
Hadeaegh 2009	Prospective	2006	0.599 (0.5324 - 0.664)	Low	Poor classification accuracy
Women aged > 60 years					
Hadeaegh 2009	Prospective	2006	0.567 (0.493 - 0.642)	Low	Poor classification accuracy
Waist-to-hip ratio (WHR)					
Men aged ≤ 60 years					
Hadeaegh 2009	Prospective	1614	0.649 (0.597 - 0.702)	Very low	Adequate classification accuracy
Men aged > 60 years					
Hadeaegh 2009	Prospective	1614	0.57 (0.504 - 0.637)	Low	Poor classification accuracy
Women aged ≤ 60 years					
Hadeaegh 2009	Prospective	2006	0.643 (0.581 - 0.704)	Very low	Adequate classification accuracy
Women aged > 60 years					
Hadeaegh 2009	Prospective	2006	0.578 (0.503 - 0.652)	Low	Poor classification accuracy
Waist-to-height ratio (WHtR)					
Men aged ≤ 60 years					
Hadeaegh 2009	Prospective	1614	0.627 (0.572 - 0.681)	Low	Adequate classification accuracy
Men aged > 60 years					
Hadeaegh 2009	Prospective	1614	0.588 (0.524 - 0.652)	Low	Poor classification accuracy
Women aged ≤ 60 years					
Hadeaegh 2009	Prospective	2006	0.608 (0.547 - 0.67)	Low	Adequate classification accuracy
Women aged > 60 years					
Hadeaegh 2009	Prospective	2006	0.58 (0.505 - 0.655)	Low	Poor classification accuracy

1 ***Hypertension***

2 Table 28: Brazilian population

No. of studies	Study design	Sample size	Effect size (95%CI)	Quality	**Interpretation of effect**
BMI					
Men aged <40					
Rezende 2018	Prospective	86	0.56 (0.43–0.69)	Very low	Poor classification accuracy
Men aged ≥40					
Rezende 2018	Prospective	66	0.57 (0.42–0.73)	Very low	Poor classification accuracy
Women aged <40					
Rezende 2018	Prospective	197	0.63 (0.54–0.73)	Very low	Adequate classification accuracy
Women aged ≥40					
Rezende 2018	Prospective	122	0.61 (0.50–0.71)	Very low	Adequate classification accuracy
Waist circumference					
Men aged <40					
Rezende 2018	Prospective	86	0.62 (0.49–0.74)	Very low	Adequate classification accuracy
Men aged ≥40					
Rezende 2018	Prospective	66	0.54 (0.39–0.68)	Very low	Poor classification accuracy
Women aged <40					
Rezende 2018	Prospective	197	0.65 (0.56–0.73)	Very low	Adequate classification accuracy
Women aged ≥40					
Rezende 2018	Prospective	122	0.64 (0.53–0.75)	Very low	Adequate classification accuracy
Waist-to-height ratio					
Men aged <40					
Rezende 2018	Prospective	86	0.59 (0.46–0.72)	Very low	Poor classification accuracy
Men aged ≥40					
Rezende 2018	Prospective	66	0.50 (0.34–0.64)	Very low	Poor classification accuracy

Women aged <40					
Rezende 2018	Prospective	197	0.62 (0.53–0.71)	Very low	Adequate classification accuracy
Women aged ≥40					
Rezende 2018	Prospective	122	0.65 (0.55–0.75)	Very low	Adequate classification accuracy

White population

Summary of studies providing head-to-head comparisons of measures

The majority of included studies compared the accuracy of measures within the same group of participants. The studies often reported the accuracy in gender or age specific subgroups. The table below indicates which measure offered the best discriminatory power as determined by its C-statistic / AUC – ROC curve in each study or, where reported, relevant subgroup within the study.

Table 29: C-statistic/AUC comparisons in the White ethnicity

Type 2 diabetes		**Highest C-statistic**
BMI vs WC vs WHR vs WHtR	MacKay 2009 (men and women)	BMI in 1 study subgroup
BMI vs WC vs WHR vs BMI+WC vs BMI+WHR	Stevens 2001 (men / women)	BMI + waist-to-hip ratio in 2 study subgroups
BMI vs WC	Wannamethee 2010 (women) Wannamethee 2010 (men)	Waist circumference in 1 study subgroup BMI in 1 study subgroup
Cardiovascular disease		**Highest C-statistic**
BMI vs WC vs WHR vs WHtR	Welborn 2007 (men) Welborn 2007 (women)	Waist-to-hip ratio in 1 study subgroup Waist-to-height ratio in 1 study subgroup
All cause mortality		**Highest C-statistic**
BMI vs WC vs WHR vs WHtR	Welborn 2007 (men) Welborn 2007 (women)	Waist-to-hip ratio in 1 study subgroup Waist-to-height ratio in 1 study subgroup

Table 30: Type 2 diabetes

No. of studies	Study design	Sample size	Effect size (95%CI)	Quality	Interpretation of effect
BMI					
Men and women					
MacKay 2009	Prospective	430	0.734 (95% CI not reported)	Very low	Good classification accuracy
Men					
Wannamethee 2010	Prospective	3519	0.726 (95% CI not reported)	Low	Good classification accuracy

Stevens 2001	Prospective	4602	0.70 (95% CI not reported)	Low	Good classification accuracy
Women					
Wannamethee 2010	Prospective	3404	0.733 (95% CI not reported)	Low	Good classification accuracy
Stevens 2001	Prospective	5293	0.72 (95% CI not reported)	Low	Good classification accuracy
Waist circumference					
Men and women					
MacKay 2009	Prospective	430	0.716 (95% CI not reported)	Very low	Good classification accuracy
Men					
Wannamethee 2010	Prospective	3519	0.713 (95% CI not reported)	Low	Good classification accuracy
Stevens 2001	Prospective	4602	0.7 (95% CI not reported)	Low	Good classification accuracy
Women					
Wannamethee 2010	Prospective	3404	0.78 (95% CI not reported)	Low	Good classification accuracy
Stevens 2001	Prospective	5293	0.73 (95% CI not reported)	Low	Good classification accuracy
Waist-to-hip ratio					
Men and women					
MacKay 2009	Prospective	430	0.670 (95% CI not reported)	Very low	Adequate classification accuracy
Men					
Stevens 2001	Prospective	4602	0.67 (95% CI not reported)	Low	Adequate classification accuracy
Women					
Stevens 2001	Prospective	5293	0.72 (95% CI not reported)	Low	Good classification accuracy
Waist-to-height ratio					
Men and women					
MacKay 2009	Prospective	430	0.730 (95% CI not reported)	Very low	Good classification accuracy
BMI + Waist circumference					
Men					
Stevens 2001	Prospective	1102	0.7 (95% CI not reported)	Low	Good classification accuracy
Women					
Stevens 2001	Prospective	1817	0.73 (95% CI not reported)	Low	Good classification accuracy
BMI + Waist-to-hip ratio					
Men					
Stevens 2001	Prospective	1102	0.71 (95% CI not reported)	Low	Good classification accuracy
Women					
Stevens 2001	Prospective	1817	0.75 (95% CI not reported)	Low	Good classification accuracy

1 *Table 31: Hypertension*

No. of studies	Study design	Sample size	Effect size (95%CI)	Quality	Interpretation of effect
Waist circumference					
Men					
Gus 2009	Prospective	255	0.56 (0.47 0.64)	Very low	Poor classification accuracy
Women					
Gus 2009	Prospective	334	0.70 (0.63-0.77)	Low	Good classification accuracy

2 *Table 32: All-cause mortality*

No. of studies	Study design	Sample size	Effect size (95%CI)	Quality	Interpretation of effect
BMI					
Men and women					
Schneider 2010	Prospective	10652	0.528 (0.50-0.55)	Low	Poor classification accuracy
Men					
Welborn 2007	Prospective	4508	0.53 (0.50–0.57)	Low	Poor classification accuracy
Women					
Welborn 2007	Prospective	4668	0.62 (0.57–0.66)	Very low	Poor classification accuracy
Waist circumference					
Men and women					
Schneider 2010	Prospective	10652	0.508 (0.48-0.53)	Low	Poor classification accuracy
Men					
Welborn 2007	Prospective	4508	0.62 (0.59–0.64)	Very low	Adequate classification accuracy
Women					
Welborn 2007	Prospective	4668	0.66 (0.62–0.70)	Very low	Adequate classification accuracy
Waist-to-height ratio					
Men and women					
Schneider 2010	Prospective	10652	0.531 (0.51-0.56)	Low	Poor classification accuracy
Men					
Welborn 2007	Prospective	4508	0.64 (0.61–0.68)	Low	Adequate classification accuracy
Women					
Welborn 2007	Prospective	4668	0.68 (0.64–0.72)	Very low	Adequate classification accuracy
Waist-to-hip ratio					
Men and women					

Schneider 2010	Prospective	10652	0.512 (0.49 -0.53)	Low	Poor classification accuracy
Men					
Welborn 2007	Prospective	4508	0.66 (0.63–0.69)	Low	Adequate classification accuracy
Women					
Welborn 2007	Prospective	4668	0.67 (0.63–0.71)	Very low	Adequate classification accuracy

Sensitivity, specificity, likelihood ratios

The following table was used to aid judgments of accuracy.

Table 33: Interpretation of LRS

Value of likelihood ratio	Interpretation
LR ≤ 0.1	**Very large** decrease in probability of disease or outcome
0.1 < LR ≤ 0.2	**Large** decrease in probability of disease or outcome
0.2 < LR ≤ 0.5	**Moderate** decrease in probability of disease or outcome
0.5 < LR ≤ 1.0	**Slight** decrease in probability of disease or outcome
1.0 < LR < 2.0	**Slight** increase in probability of disease or outcome
2.0 ≤ LR < 5.0	**Moderate** increase in probability of disease or outcome
5.0 ≤ LR < 10.0	**Large** increase in probability of disease or outcome
LR ≥ 10.0	**Very large** increase in probability of disease or outcome

Chinese population

Type 2 diabetes

Table 34: BMI

No. studies (sample size)	Cut-off	Diagnostic accuracy			Quality	Interpretation of effect
		Sensitivity	Specificity	Likelihood ratios		
Men and Women						
1 (n=2558) Xia 2018	**24.4 kg/m^2**	0.571 (0.532,0.608)	0.610 (0.588,0.632)	LR+ 1.463 (1.341,1.597)	Low	Slight increase in probability of type 2 diabetes
				LR- 0.704 (0.640,0.775)	Low	Slight decrease in probability of type 2 diabetes

No. studies (sample size)	Cut-off	Diagnostic accuracy			Quality	Interpretation of effect
		Sensitivity	Specificity	Likelihood ratios		
Men						
1 (n=5998) Yang 2018	**25.78kg/m^2**	0.542 (0.491,0.593)	0.713 (0.701,0.725)	LR+ 1.890 (1.704,2.096)	Low	Slight increase in probability of type 2 diabetes
				LR- 0.642 (0.573,0.718)	Low	Slight decrease in probability of type 2 diabetes
Women						
1 (n=3964) Yang 2018	**24.86 kg/m^2**	0.655 (0.593,0.711)	0.582 (0.565,0.598)	LR+ 1.566 (1.419,1.728)	Low	Slight increase in probability of type 2 diabetes
				LR- 0.594 (0.499,0.706)	Low	Slight decrease in probability of type 2 diabetes

Table 35: Waist circumference

No. studies (sample size)	Cut-off	Diagnostic accuracy			Quality	Interpretation of effect
		Sensitivity	Specificity	Likelihood ratios		
Men and Women						
1 (n=2558) Xia 2018	**82.8 cm**	0.620 (0.582, 0.657)	0.600 (0.578, 0.622)	LR+ 1.551(1.429,1.683)	Low	Slight increase in probability of type 2 diabetes
				LR- 0.633 (0.570, 0.703)	Low	Slight decrease in probability of type 2 diabetes
Men						
1 (n=5998) Yang 2018	**84.9 cm**	0.671 (0.621,0.7180	0.532 (0.519,0.546)	LR+ 1.435 (1.328,1.550)	Moderate	Slight increase in probability of type 2 diabetes
				LR- 0.618 (0.532, 0.717)	Moderate	Slight decrease in probability of type 2 diabetes
Women						
1 (n=3964) Yang 2018	**81.1 cm**	0.659 (0.598, 0.715)	0.521 (0.504,0.538)	LR+1.375 (1.24,1.514)	Moderate	Slight increase in probability of type 2 diabetes
				LR- 0.655 (0.550, 0.781)	Moderate	Slight decrease in probability of type 2 diabetes

Table 36: Waist-to-height ratio

No. studies (sample size)	Cut-off	Diagnostic accuracy			Quality	Interpretation of effect
		Sensitivity	Specificity	Likelihood ratios		
Men						
1 (n=5998) Yang 2018	**0.512**	0.644 (0.593, 0.691)	0.555 (0.542,0.568)	LR+ 1.447 (1.333, 1.571)	Moderate	Slight increase in probability of type 2 diabetes
				LR- 0.642 (0.558, 0.738)	Moderate	Slight decrease in probability of type 2 diabetes
Women						
1 (n=3964) Yang 2018	**0.514**	0.727 (0.668, 0.779)	0.456 (0.439, 0.472)	LR+1.336 (1.231, 1.450)	Moderate	Slight increase in probability of type 2 diabetes
				LR- 0.599 (0.488,0.736)	Low	Slight decrease in probability of type 2 diabetes

1 *Hypertension*

2 Table 37: BMI

No. studies (sample size)	Cut-off	Diagnostic accuracy			Quality	Interpretation of effect
		Sensitivity	Specificity	Likelihood ratios		
Men						
1 (n=3866) Chen 2018	**22.655 kg/m^2**	0.692 (0.658,0.723)	0.481 (0.464,0.499)	LR+1.333 (1.258,1.413)	Low	Slight increase in probability of Hypertension
				LR-0.641 (0.573,0.717)	Low	Slight decrease in probability of Hypertension
Men						
1 (n=1557) Yu 2020	**23.74 kg/m^2**	0.479 (0.432,0.528)	0.670 (0.642,0.696)	LR+ 1.451 (1.274,1.652)	Moderate	Slight increase in probability of Hypertension
				LR- 0.777 (0.703,0.860)	Moderate	Slight decrease in probability of Hypertension
Women						
1 (n=3866) Chen 2018	**23.8 kg/m^2**	0.650 (0.622,0.677)	0.513 (0.499,0.527)	LR+ 1.334 (1.267,1.404)	Low	Slight increase in probability of Hypertension
				LR- 0.683 (0.628,0.743)	Low	Slight decrease in probability of Hypertension

No. studies (sample size)	Cut-off	Diagnostic accuracy			Quality	Interpretation of effect
		Sensitivity	Specificity	Likelihood ratios		
1 (n=344) Wang 2018	**25.4kg/m^2**	0.387 (0.235,0.565)	0.185 (0.146,0.232)	LR+ 3.308 (2.299,4.758)	Low	Moderate increase in probability of Hypertension
				LR- 0.475 (0.304,0.742)	Very low	Moderate decrease in probability Hypertension
1 (n=375) Wang 2018	**26.2 kg/m^2**	0.446 (0.360,0.536)	0.272 (0.221,0.330)	LR+ 2.038 (1.576,2.636)	Very low	Moderate increase in probability Hypertension
				LR- 0.613 (0.496,0.758)	Very low	Slight decrease in probability of Hypertension
1 (n=1849) Yu 2020	**23.83 kg/m^2**	0.530 (0.482,0.577)	0.670 (0.645,0.694)	LR+ 1.606 (1.429,1.804)	Moderate	Slight increase in probability of Hypertension
				LR- 0.702 (0.630,0.782)	Moderate	Slight decrease in probability of Hypertension

1 Table 38: Waist circumference (WC)

No. studies (sample size)	Cut-off	Diagnostic accuracy			Quality	Interpretation of effect
		Sensitivity	Specificity	Likelihood ratios		
Men						
1 (n=3866) Chen 2018	**82.7 cm**	0.564 (0.529,0.599)	0.589 (0.572,0.606)	LR+ 1.374 (1.275,1.481)	Low	Slight increase in probability of Hypertension
				LR- 0.739 (0.679,0.805)	Low	Slight decrease in probability of Hypertension
1 (n=1557) Yu 2020	**82.95 cm**	0.581 (0.533,0.628)	0.560 (0.531,0.589)	LR+ 1.322 (1.190,1.468)	Moderate	Slight increase in probability of Hypertension
				LR- 0.748 (0.660,0.847)	Moderate	Slight decrease in probability of Hypertension
Women						
1 (n=3866) Chen 2018	**82.17 cm**	0.551 (0.521,0.579)	0.629 (0.615,0.642)	LR+ 1.484 (1.392,1.582)	Moderate	Slight increase in probability of Hypertension
				LR- 0.715 (0.668,0.765)	Moderate	Slight decrease in probability of Hypertension

No. studies (sample size)	Cut-off	Diagnostic accuracy			Quality	Interpretation of effect
		Sensitivity	Specificity	Likelihood ratios		
1 (n=344) Wang 2018 – Normal group 1	**84.5 cm**	0.581 (0.404,0.739)	0.272 (0.225,0.324)	LR+ 1.544 (0.982,2.427)	Very low	Slight increase in probability Hypertension
				LR- 0.797 (0.587,1.083)	Very low	Slight decrease in probability of Hypertension
1 (n=375) Wang 2018 – Prehypertensive group 2	**91.5 cm**	0.405 (0.321,0.495)	0.193 (0.149,0.246)	LR+ 3.084 (2.305,4.128)	Low	Moderate increase in probability Hypertension
				LR- 0.502 (0.401,0.628)	Very low	Slight decrease in probability of Hypertension
1 (n=1849) Yu 2020	**81.1 cm**	0.760 (0.717,0.798)	0.460 (0.434,0.486)	LR+ 1.408 (1.310,1.513)	Moderate	Slight increase in probability of Hypertension
				LR- 0.521 (0.436,0.624)	Low	Slight decrease in probability of Hypertension

1 Table 39: Waist-to-hip ratio

No. studies (sample size)	Cut-off	Diagnostic accuracy			Quality	Interpretation of effect
		Sensitivity	Specificity	Likelihood ratios		
Women						
1 (n=344) Wang 2018	**0.859**	0.548 (0.374,0.711)	0.230 (0.187,0.280)	LR+ 1.963 (1.267,3.041)	Very low	Slight increase in probability Hypertension
				LR- 0.712 (0.515,0.986)	Low	Slight decrease in probability of Hypertension
1 (n=375) Wang 2018	**0.862**	0.479 (0.392,0.568)	0.291 (0.239,0.350)	LR+1.787 (1.382,2.311)	Very low	Slight increase in probability Hypertension
				LR - 0.676(0.553,0.828)	Low	Slight decrease in probability of Hypertension

2 Table 40: Waist-to-height ratio

No. studies (sample size)	Cut-off	Diagnostic accuracy			Quality	Interpretation of effect
		Sensitivity	Specificity	Likelihood ratios		
Men						
1 (n=3866)	**0.49**	0.640 (0.605,0.673)	0.542 (0.525,0.560)	LR+ 1.398 (1.310,1.493)	Low	Slight increase in probability of Hypertension

No. studies (sample size)	Cut-off	Diagnostic accuracy			Quality	Interpretation of effect
		Sensitivity	Specificity	Likelihood ratios		
Chen 2018				LR- 0.664 (0.601,0.734)	Low	Slight decrease in probability of Hypertension
1 (n=1557) Yu 2020	**0.51**	0.511 (0.463,0.559)	0.650 (0.622,0.677)	LR+ 1.461 (1.292,1.653)	Moderate	Slight increase in probability of Hypertension
				LR- 0.752 (0.676,0.837)	Moderate	Slight decrease in probability of Hypertension
Women						
1 (n=3866) Chen 2018	**0.52**	0.669 (0.64,0.696)	0.521 (0.507,0.535)	LR+ 1.399 (1.330,1.471)	Low	Slight increase in probability of Hypertension
				LR- 0.634 (0.581,0.692)	Low	Slight decrease in probability of Hypertension
1 (n=344) Wang 2018 – Normal group 1	**0.516**	0.710 (0.530,0.841)	0.319 (0.270,0.373)	LR+ 1.043 (0.822,1.323)	Very low	Slight increase in probability of Hypertension
				LR- 0.909 (0.512,1.613)	Very low	Slight decrease in probability of Hypertension
1 (n=375) Wang 2018 – Prehypertensive group 2	**0.55**	0.587 (0.497,0.671)	0.386 (0.328,0.447)	LR+ 0.955 (0.799,1.142)	Very low	Slight increase in probability Hypertension
				LR- 1.071 (0.823,1.393)	Very low	Slight decrease in probability of Hypertension
1 (n=1849) Yu 2020	**0.5**	0.751 (0.707,0.790)	0.470 (0.444,0.496)	LR+ 1.416 (1.315,1.524)	Moderate	Slight increase in probability of Hypertension
				LR- 0.531 (0.446,0.632)	Low	Slight decrease in probability of Hypertension

1 *Other Asian population*

2 *Type 2 diabetes*

3 Table 41: BMI

No. studies (sample size)	Cut-off	Diagnostic accuracy			Quality	Interpretation of effect
		Sensitivity	Specificity	Likelihood ratios		
Men and women						
1 (n=2034)	**24 kg/m^2**	0.625 (0.449,0.773)	0.734 (0.714,0.753)	LR+1.605 (1.489,1.730)	Low	Slight increase in probability of type 2 diabetes

No. studies (sample size)	Cut-off	Diagnostic accuracy			Quality	Interpretation of effect
		Sensitivity	Specificity	Likelihood ratios		
Oda 2013				LR- 0.468 (0.390,0.560)	Very low	Moderate decrease in probability of type 2 diabetes
Men						
1 (n=2034) Son 2016	**26.1 kg/m^2**	0.506 (0.403,0.608)	0.759 (0.740,0.777)	LR+ 2.100 (1.685,2.616)	Very low	Moderate increase in probability of T2D
				LR- 0.651 (0.527,0.805)	Low	Slight decrease in probability of T2D
Women						
1 (n=822) Son 2016	**23 kg/m^2**	0.667 (0.376,0.869)	0.698 (0.665,0.728)	LR+ 2.204 (1.458,3.333)	Very low	Moderate increase in probability of type 2 diabetes
				LR- 0.478 (0.214,1.065)	Very low	Moderate decrease in probability of type 2 diabetes

1 Table 42: Waist circumference

No. studies (sample size)	Cut-off	Diagnostic accuracy			Quality	Interpretation of effect
		Sensitivity	Specificity	Likelihood ratios		
Men						
1 (n=2034) Son 2016	**86.5 cm**	0.674 (0.570,0.763)	0.631 (0.610,0.652)	LR+ 1.827 (1.564,2.134)	Very low	Slight increase in probability of type 2 diabetes
				LR- 0.516 (0.382,0.698)	Very low	Slight decrease in probability of type 2 diabetes
Women						
1 (n=822) Son 2016	**71.8 cm**	0.833 (0.523,0.958)	0.510 (0.475,0.544)	LR+ 1.700 (1.308.2.211)	Very low	Slight increase in probability of type 2 diabetes
				LR-0.327 (0.092,1.160)	Very low	Moderate decrease in probability of type 2 diabetes

2

3

Table 43: Waist-to-height ratio

No. studies (sample size)	Cut-off	Diagnostic accuracy			Quality	Interpretation of effect
		Sensitivity	Specificity	Likelihood ratios		
Men						
1 (n=2034) Son 2016	**0.51**	0.506 (0.403,0.608)	0.759 (0.740,0.777)	LR+ 2.100 (1.685,2.616)	Very low	Moderate increase in probability of type 2 diabetes
				LR- 0.651 (0.527,0.805)	Low	Slight decrease in probability of type 2 diabetes
Women						
1 (n=822) Son 2016	**0.43**	0.962 (0.597,0.998)	0.380 (0.348,0.414)	LR+ 1.552 (1.375,1.752)	Low	Slight increase in probability of type 2 diabetes
				LR- 0.101 (0.007,1.534)	Very low	Large decrease in probability of type 2 diabetes

Hypertension

Table 44: BMI

No. studies (sample size)	Cut-off	Diagnostic accuracy			Quality	Interpretation of effect
		Sensitivity	Specificity	Likelihood ratios		
Men						
1 (n=2128) Lee 2015	**23.59 kg/m^2**	0.661 (0.613,0.707)	0.474 (0.451,0.498)	LR+ 1.258 (1.156,1.369)	Moderate	Slight increase in probability of Hypertension
				LR- 0.714 (0.616,0.828)	Moderate	Slight decrease in probability of Hypertension
Women						
1 (n=2326) Lee 2015	**25.63 kg/m^2**	0.506 (0.403,0.608)	0.759 (0.740,0.777)	LR+ 2.100 (1.685,2.616)	Moderate	Moderate increase in probability of Hypertension
				LR- 0.651 (0.527,0.805)	Moderate	Slight decrease in probability of Hypertension

Table 45: Waist circumference

No. studies (sample size)	Cut-off	Diagnostic accuracy			Quality	Interpretation of effect
		Sensitivity	Specificity	Likelihood ratios		
Men						
1 (n=2128) Lee 2015	**83.88 cm**	0.599 (0.549,0.647)	0.579 (0.556,0.602)	LR+ 1.423 (1.289,1.571)	Moderate	Slight increase in probability of Hypertension
				LR- 0.692 (0.609,0.788)	Moderate	Slight decrease in probability of Hypertension
Women						
1 (n=2326) Lee 2015	**80.37 cm**	0.660 (0.611,0.707)	0.605 (0.583,0.626)	LR+ 1.670 (1.525,1.829)	Moderate	Slight increase in probability of Hypertension
				LR- 0.651 (0.527,0.805)	Low	Slight decrease in probability of Hypertension

Table 46: Waist-to-hip ratio

No. studies (sample size)	Cut-off	Diagnostic accuracy			Quality	Interpretation of effect
		Sensitivity	Specificity	Likelihood ratios		
Men						
1 (n=2128) Lee 2015	**0.88**	0.697 (0.675,0.718)	0.678 (0.653,0.703)	LR+ 1.735 (1.561,1.929)	Moderate	Slight increase in probability of Hypertension
				LR- 0.651 (0.590,0.718)	Moderate	Slight decrease in probability of Hypertension
Women						
1 (n=2326) Lee 2015	**0.86**	0.711 (0.663,0.755)	0.577 (0.555,0.599)	LR+ 1.682 (1.549,1.828)	Moderate	Slight increase in probability of Hypertension
				LR- 0.500 (0.425,0.589)	Low	Moderate decrease in probability of Hypertension

Table 47: Waist-to-height ratio

No. studies (sample size)	Cut-off	Diagnostic accuracy			Quality	Interpretation of effect
		Sensitivity	Specificity	Likelihood ratios		
Men						

No. studies (sample size)	Cut-off	Diagnostic accuracy			Quality	Interpretation of effect
		Sensitivity	Specificity	Likelihood ratios		
1 (n=2128) Lee 2015	**0.49**	0.692 (0.644,0.736)	0.489 (0.466,0.513)	LR+1.354 (1.249,1.469)	Moderate	Slight increase in probability of Hypertension
				LR- 0.630 (0.538,0.737)	Moderate	Slight decrease in probability of Hypertension
Women						
1 (n=2326) Lee 2015	**0.51**	0.751 (0.705,0.793)	0.532 (0.510,0.554)	LR+ 1.605 (1.489,1.730)	Moderate	Slight increase in probability of Hypertension
				LR- 0.468 (0.390,0.560)	Low	Moderate decrease in probability of Hypertension

1 *White population*

2 *Type 2 diabetes*

3 Table 48: BMI

No. studies (sample size)	Cut-off	Diagnostic accuracy			Quality	Interpretation of effect
		Sensitivity	Specificity	Likelihood ratios		
Men						
1 (n=3519) Wannamethee 2010	**25 kg/m²**	0.891 (0.830,0.932)	0.334 (0.315,0.354)	LR+1.338 (1.255,1.426)	Low	Slight increase in probability of type 2 diabetes
				LR-0.326 (0.205,0.520)	Very low	Moderate decrease in probability of type 2 diabetes
1 (n=3519) Wannamethee 2010	**26 kg/m²**	0.842 (0.771,0.893)	0.445 (0.422,0.468)	LR+1.517 (1.396,1.648)	Low	Slight increase in probability of type 2 diabetes
				LR-0.356 (0.242,0.524)	Very low	Moderate decrease in probability of type 2 diabetes
1 (n=3519) Wannamethee 2010	**27 kg/m²**	0.748 (0.664,0.817)	0.588 (0.562,0.614)	LR+1.815 (1.609,2.047)	Very low	Slight increase in probability of type 2 diabetes
				LR-0.429 (0.315,0.583)	Very low	Moderate decrease in probability of type 2 diabetes
1 (n=3519)	**28 kg/m²**	0.596 (0.497,0.688)	0.699 (0.670,0.727)	LR+1.983 (1.644,2.392)	Very low	Slight increase in probability of type 2 diabetes

No. studies (sample size)	Cut-off	Diagnostic accuracy			Quality	Interpretation of effect
		Sensitivity	Specificity	Likelihood ratios		
Wannamethee 2010				LR-0.578 (0.453,0.736)	Very low	Slight decrease in probability of type 2 diabetes
1 (n=3519) Wannamethee 2010	**29 kg/m²**	0.539 (0.436,0.640)	0.787 (0.756, 0.816)	LR+2.536 (1.998,3.219)	Very low	Moderate increase in probability of type 2 diabetes
				LR-0.585 (0.466,0.735)	Very low	Slight decrease in probability of type 2 diabetes
1 (n=3519) Wannamethee 2010	**30 kg/m²**	0.437 (0.327,0.553)	0.866 (0.831,0.895)	LR+3.260 (2.288,4.644)	Low	Moderate increase in probability of type 2 diabetes
				LR-0.651 (0.528,0.801)	Low	Slight decrease in probability of type 2 diabetes
Women						
1 (n=3404) Wannamethee 2010	**25 kg/m²**	0.895 (0.824,0.939)	0.342 (0.322,0.362)	LR+1.359 (1.268,1.458)	Low	Slight increase in probability of type 2 diabetes
				LR-0.308 (0.180,0.528)	Very low	Moderate decrease in probability of type 2 diabetes
1 (n=3404) Wannamethee 2010	**26 kg/m²**	0.832 (0.749,0.891)	0.448 (0.425,0.471)	LR+1.506 (1.370,1.656)	Low	Slight increase in probability of type 2 diabetes
				LR- 0.376 (0.246,0.574)	Very low	Moderate decrease in probability of type 2 diabetes
1 (n=3404) Wannamethee 2010	**27kg/m²**	0.778 (0.685,0.849)	0.547 (0.522,0.572)	LR+1.718 (1.525,1.935)	Low	Slight increase in probability of type 2 diabetes
				LR-0.406 (0.280,0.589)	Very low	Moderate decrease in probability of type 2 diabetes
1 (n=3404) Wannamethee 2010	**28kg/m²**	0.717 (0.617,0.800)	0.634 (0.607,0.661)	LR+1.962 (1.692,2.276)	Very low	Slight increase in probability of type 2 diabetes
				LR-0.445 (0.321,0.619)	Very low	Moderate decrease in probability of type 2 diabetes
1 (n=3404) Wannamethee 2010	**29kg/m²**	0.655 (0.547,0.748)	0.713 (0.683,0.741)	LR+2.280 (1.894,2.743)	Very low	Moderate increase in probability of type 2 diabetes
				LR-0.484 (0.360,0.652)	Very low	Moderate decrease in probability of type 2 diabetes

No. studies (sample size)	Cut-off	Diagnostic accuracy			Quality	Interpretation of effect
		Sensitivity	Specificity	Likelihood ratios		
1 (n=3404) Wannamethee 2010	**30kg/m^2**	0.615 (0.503,0.716)	0.777 (0.745,0.805)	LR+2.754 (2.207,3.436)	Low	Moderate increase in probability of type 2 diabetes
				LR-0.495 (0.373,0.658)	Very low	Moderate decrease in probability of type 2 diabetes

Table 49: Waist circumference

No. studies (sample size)	Cut-off	Diagnostic accuracy			Quality	Interpretation of effect
		Sensitivity	Specificity	Likelihood ratios		
Men						
1 (n=3519) Wannamethee 2010	**100 cm**	0.642 (0.546,0.727)	0.673 (0.645,0.700)	LR+1.964 (1.664,2.318)	Very low	Slight increase in probability of type 2 diabetes
				LR- 0.532 (0.411,0.689)	Very low	Slight decrease in probability of type 2 diabetes
Women						
1 (n=3404) Wannamethee 2010	**92 cm**	0.697 (0.594,0.783)	0.755 (0.724,0.784)	LR+ 2.847 (2.370,3.420)	Low	Moderate increase in probability of type 2 diabetes
				LR- 0.402 (0.292,0.552)	Very low	Moderate decrease in probability of type 2 diabetes

Hypertension

Table 50: Waist circumference

No. studies (sample size)	Cut-off	Diagnostic accuracy			Quality	Interpretation of effect
		Sensitivity	Specificity	Likelihood ratios		
Men						
1 (n=255) Gus 2009	**87 cm**	0.542 (0.415,0.664)	0.561 (0.491,0.629)	LR+ 1.236 (0.932,1.640)	Very low	Slight increase in probability of Hypertension
				LR- 0.815 (0.602,1.105)	Very low	Slight decrease in probability of Hypertension
Women						
1 (n=334) Gus 2009	**80 cm**	0.691 (0.572,0.789)	0.670 (0.613,0.723)	LR+ 2.096 (1.663,2.642)	Very low	Moderate increase in probability of Hypertension

No. studies (sample size)	Cut-off	Diagnostic accuracy			Quality	Interpretation of effect
		Sensitivity	Specificity	Likelihood ratios		
				LR- 0.461 (0.320,0.664)	Very low	Moderate decrease in probability of Hypertension

All cause- mortality

Table 51: BMI

No. studies (sample size)	Cut-off	Diagnostic accuracy			Quality	Interpretation of effect
		Sensitivity	Specificity	Likelihood ratios		
Men and women						
1 (n=10652) Schneider 2010	**25th cut-off percentile**	0.521 (0.482,0.560)	0.551 (0.541,0.561)	LR+ 1.160 (1.073,1.255)	Low	Slight increase in probability of All-Cause Mortality
				LR- 0.869 (0.799,0.945)	Low	Slight decrease in probability of All-Cause Mortality
Men						
1 (n=4508) Welborn 2007	**27.4 kg/m^2**	0.439 (0.383,0.497)	0.630 (0.615,0.644)	LR+1.188 (1.037,1.361)	Low	Slight increase in probability of All-Cause Mortality
				LR-0.890 (0.801,0.988)	Low	Slight decrease in probability of All-Cause Mortality
Women						
1 (n=4698) Welborn 2007	**27.14 kg/m^2**	0.619 (0.545,0.688)	0.580 (0.565,0.594)	LR+1.474 (1.307,1.664)	Low	Slight increase in probability of All-Cause Mortality
				LR-0.656 (0.543,0.794)	Low	Slight decrease in probability of All-Cause Mortality

Table 52: Waist circumference

No. studies (sample size)	Cut-off	Diagnostic accuracy			Quality	Interpretation of effect
		Sensitivity	Specificity	Likelihood ratios		
Men and women						
1 (n=10652) Schneider 2010	**53rd cut-off percentile**	0.498 (0.459,0.538)	0.531 (0.521,0.541)	LR+ 1.063 (0.979,1.153)	Very low	Slight increase in probability of All-Cause Mortality
				LR- 0.945 (0.872,1.024)	Very low	Slight decrease in probability of All-Cause Mortality
Men						

No. studies (sample size)	Cut-off	Diagnostic accuracy			Quality	Interpretation of effect
		Sensitivity	Specificity	Likelihood ratios		
1 (n=4508) Welborn 2007	**92 cm**	0.592 (0.534,0.647)	0.610 (0.595,0.625)	LR+ 1.518 (1.369,1.682)	Low	Slight increase in probability of All-Cause Mortality
				LR- 0.669 (0.581,0.770)	Low	Slight decrease in probability of All-Cause Mortality
Women						
1 (n=4698) Welborn 2007	**80 cm**	0.589 (0.514,0.659)	0.690 (0.676,0.703)	LR+ 1.899 (1.665,2.165)	Very low	Slight increase in probability of All-Cause Mortality
				LR- 0.596 (0.499,0.713)	Very low	Slight decrease in probability of All-Cause Mortality

Table 53: Waist-to-hip ratio

No. studies (sample size)	Cut-off	Diagnostic accuracy			Quality	Interpretation of effect
		Sensitivity	Specificity	Likelihood ratios		
Men and women						
1 (n=10652) Schneider 2010	**28th cut-off percentile**	0.768 (0.733,0.799)	0.276 (0.267,0.285)	LR+ 1.060 (1.014,1.109)	Low	Slight increase in probability of All-Cause Mortality
				LR- 0.841 (0.727,0.974)	Low	Slight decrease in probability of All-Cause Mortality
Men						
1 (n=4508) Welborn 2007	**0.93**	0.519 (0.461,0.576)	0.710 (0.696,0.723)	LR+ 1.789 (1.586,2.018)	Very low	Slight increase in probability of All-Cause Mortality
				LR- 0.678 (0.600,0.765)	Low	Slight decrease in probability of All-Cause Mortality
Women						
1 (n=4698) Welborn 2007	**0.79**	0.549 (0.474,0.621)	0.710 (0.697,0.723)	LR+ 1.891 (1.641,2.180)	Very low	Slight increase in probability of All-Cause Mortality
				LR- 0.636 (0.539,0.749)	Low	Slight decrease in probability of All-Cause Mortality

1 Table 54: Waist-to-height ratio

No. studies (sample size)	Cut-off	Diagnostic accuracy			Quality	Interpretation of effect
		Sensitivity	Specificity	Likelihood ratios		
Men and women						
1 (n=10652) Schneider 2010	**74th cut-off percentile**	0.335 (0.299,0.374)	0.738 (0.729,0.747)	LR+ 1.281 (1.141,1.438)	Low	Slight increase in probability of All-Cause Mortality
				LR- 0.900 (0.850,0.953)	Low	Slight decrease in probability of All-Cause Mortality
Men						
1 (n=4508) Welborn 2007	**0.53**	0.630 (0.573,0.684)	0.610 (0.595,0.625)	LR+ 1.615 (1.467,1.778)	Low	Slight increase in probability of All-Cause Mortality
				LR- 0.607 (0.521,0.707)	Low	Slight decrease in probability of All-Cause Mortality
Women						
1 (n=4698) Welborn 2007	**0.48**	0.680 (0.607,0.745)	0.630 (0.616,0.644)	LR+1.837 (1.648,2.048)	Very low	Slight increase in probability of All-Cause Mortality
				LR-0.508 (0.409,0.631)	Very low	Slight decrease in probability of All-Cause Mortality

2 *Other ethnicities*

3 *Iranian population*

4 Type 2 diabetes

5 Table 55: BMI

	Cut-off	Diagnostic accuracy			Quality	Interpretation of effect
		Sensitivity	Specificity	Likelihood ratios		
Men						
1 (n=2419) Zafari 2018	**26.49 kg/m^2**	0.679 (0.618,0.735)	0.614 (0.593,0.634)	LR+ 1.759 (1.589,1.947)	Low	Moderate increase in probability of type 2 diabetes
				LR- 0.523 (0.434,0.630)	Very low	Slight decrease in probability of type 2 diabetes
Women						
1 (n=3319) Zafari 2018	**29.27 kg/m^2**	0.603 (0.547,0.657)	0.724 (0.708,0.740)	LR+ 2.187 (1.962,2.437)	Very low	Moderate increase in probability of type 2 diabetes

	Cut-off	Diagnostic accuracy			Quality	Interpretation of effect
		Sensitivity	Specificity	Likelihood ratios		
				LR- 0.548 (0.476,0.631)	Very low	Slight decrease in probability of type 2 diabetes

Table 56: Waist circumference

	Cut-off	Diagnostic accuracy			Quality	Interpretation of effect
		Sensitivity	Specificity	Likelihood ratios		
Men						
1 (n=1415) Zafari 2018	**87cm**	0.812 (0.763,0.852)	0.455 (0.434,0.476)	LR+ 1.490 (1.392,1.594)	Low	Slight increase in probability of type 2 diabetes
				LR- 0.414 (0.325,0.528)	Very low	Moderate decrease in probability of type 2 diabetes
Women						
1 (n=1166) Zafari 2018	**91cm**	0.665 (0.612,0.713)	0.704 (0.688,0.720)	LR+ 2.247 (2.044,2.469)	Low	Moderate increase in probability of type 2 diabetes
				LR- 0.476 (0.409,0.555)	Very low	Moderate decrease in probability of type 2 diabetes

Table 57: Waist-to-hip ratio

	Cut-off	Diagnostic accuracy			Quality	Interpretation of effect
		Sensitivity	Specificity	Likelihood ratios		
Men						
1 (n=1415) Zafari 2018	**0.92**	0.720 (0.660,0.772)	0.555 (0.534,0.576)	LR+ 1.617 (1.476,1.771)	Low	Slight increase in probability of type 2 diabetes
				LR- 0.505(0.412,0.620)	Very low	Slight decrease in probability of type 2 diabetes
Women						
1 (n=1166) Zafari 2018	**0.83**	0.729 (0.68, 0.773)	0.591 (0.573,0.609)	LR+ 1.783 (1.651,1.924)	Low	Slight increase in probability of type 2 diabetes
				LR- 0.458 (0.386,0.545)	Very low	Moderate decrease in probability of type 2 diabetes

Table 58: Waist-to-height ratio

	Cut-off	Diagnostic accuracy			Quality	Interpretation of effect
		Sensitivity	Specificity	Likelihood ratios		
Men						
1 (n=2419) Zafari 2018	**0.56**	0.625 (0.560,0.686)	0.650 (0.630,0.670)	LR+ 1.786 (1.590, 2.007)	Very low	Slight increase in probability of type 2 diabetes
				LR- 0.577 (0486,0685)	Very low	Slight decrease in probability of type 2 diabetes
Women						
1 (n=3319) Zafari 2018	**0.56**	0.735 (0.687,0.778)	0.648 (0.631,0.665)	LR+ 2.089 (1.931,2.260)	Very low	Moderate increase in probability of type 2 diabetes
				LR- 0.409 (0.344,0.486)	Low	Moderate decrease in probability of type 2 diabetes

Peruvian population

Type 2 diabetes

Table 59: BMI

No. studies (sample size)	Cut-off	Diagnostic accuracy			Quality	Interpretation of effect
		Sensitivity	Specificity	Likelihood ratios		
Men						
1 (n=1230) Zafra-Tanaka 2020	**27.8 kg/m^2**	0.762 (0.642,0.851)	0.590 (0.562,0.617)	LR+ 1.858 (1.594,2.166)	Low	Slight increase in probability of type 2 diabetes
				LR- 0.404 (0.259,0.629)	Low	Moderate decrease in probability of type 2 diabetes
Women						
1 (n=1292) Zafra-Tanaka 2020	**28.9 kg/m^2**	0.638 (0.508,0.751)	0.640 (0.612,0.667)	LR+ 1.772 (1.438,2.182)	Low	Slight increase in probability of type 2 diabetes
				LR- 0.566 (0.401,0.798)	Low	Slight decrease in probability of type 2 diabetes

1 Table 60: Waist circumference

No. studies (sample size)	Cut-off	Diagnostic accuracy			Quality	Interpretation of effect
		Sensitivity	Specificity	Likelihood ratios		
Men						
1 (n=1230) Zafra-Tanaka 2020	**93.2 cm**	0.714 (0.591,0.812)	0.610 (0.583,0.637)	LR+ 1.833 (1.544,2.175)	Low	Slight increase in probability of type 2 diabetes
				LR- 0.468 (0.316,0.694)	Low	Moderate decrease in probability of type 2 diabetes
Women						
1 (n=1292) Zafra-Tanaka 2020	**93.5 cm**	0.746 (0.620,0.841)	0.540 (0.511,0.568)	LR+ 1.622 (1.380,1.906)	Moderate	Slight increase in probability of type 2 diabetes
				LR- 0.471 (0.303,0.731)	Low	Moderate decrease in probability of type 2 diabetes

2 Table 61: Waist-to-hip ratio

No. studies (sample size)	Cut-off	Diagnostic accuracy			Quality	Interpretation of effect
		Sensitivity	Specificity	Likelihood ratios		
Men						
1 (n=1230) Zafra-Tanaka 2020	**0.97**	0.476 (0.357,0.598)	0.700 (0.674,0.725)	LR+ 1.586 (1.207,2.083)	Low	Slight increase in probability of type 2 diabetes
				LR- 0.749 (0.590,0.950)	Moderate	Moderate decrease in probability of type 2 diabetes
Women						
1 (n=1292) Zafra-Tanaka 2020	**0.94**	0.741 (0.614,0.838)	0.470 (0.442,0.499)	LR+ 1.399 (1.191,1.644)	Moderate	Slight increase in probability of type 2 diabetes
				LR- 0.550 (0.354,0.854)	Low	Slight decrease in probability of type 2 diabetes

3 Table 62: Waist-to-height ratio

No. studies (sample size)	Cut-off	Diagnostic accuracy			Quality	Interpretation of effect
		Sensitivity	Specificity	Likelihood ratios		
Men						
1 (n=1230)	**0.61**	0.825 (0.712,0.901)	0.645 (0.616,0.674)	LR+ 2.327 (2.022,2.677)	Moderate	Moderate increase in probability of type 2 diabetes

No. studies (sample size)	Cut-off	Diagnostic accuracy			Quality	Interpretation of effect
		Sensitivity	Specificity	Likelihood ratios		
Zafra-Tanaka 2020				LR- 0.271 (0.158,0.464)	Moderate	Moderate decrease in probability of type 2 diabetes
Women						
1 (n=1292) Zafra-Tanaka 2020	**0.57**	0.776 (0.651,0.865)	0.550 (0.522,0.579)	LR+ 1.725 (1.482,2.009)	Low	Slight increase in probability of type 2 diabetes
				LR- 0.407 (0.252,0.659)	Low	Moderate decrease in probability of type 2 diabetes

Brazilian population

Hypertension

Table 63: BMI

No. studies (sample size)	Cut-off	Diagnostic accuracy			Quality	Interpretation of effect
		Sensitivity	Specificity	Likelihood ratios		
Men						
1 (n=152) Rezende 2018	**24.80 kg/m^2**	0.514 (0.401,0.625)	0.500 (0.391,0.609)	LR+ 1.027 (0.750,1.406)	Very low	Slight increase in probability of Hypertension
				LR- 0.973 (0.705,1.343)	Very low	Slight decrease in probability of Hypertension
Women						
1 (n=319) Rezende 2018	**23.82 kg/m^2**	0.639 (0.554,0.716)	0.629 (0.557,0.695)	LR+ 1.723 (1.374,2.161)	Very low	Slight increase in probability of Hypertension
				LR- 0.574 (0.446,0.738)	Very low	Slight decrease in probability of Hypertension

Table 64: Waist circumference

No. studies (sample size)	Cut-off	Diagnostic accuracy			Quality	Interpretation of effect
		Sensitivity	Specificity	Likelihood ratios		
Men						
1 (n=152)	**81.50 cm**	0.635 (0.520,0.736)	0.564 (0.453,0.669)	LR+ 1.457 (1.073,1.978)	Low	Slight increase in probability of Hypertension

No. studies (sample size)	Cut-off	Diagnostic accuracy			Quality	Interpretation of effect
		Sensitivity	Specificity	Likelihood ratios		
Rezende 2018				LR- 0.647 (0.452,0.926)	Very low	Slight decrease in probability of Hypertension
Women						
1 (n=319) Rezende 2018	**85.30 cm**	0.632 (0.547,0.709)	0.667 (0.596,0.731)	LR+ 1.895 (1.489,2.411)	Very low	Slight increase in probability of Hypertension
				LR- 0.553 (0.433,0.706)	Very low	Slight decrease in probability of Hypertension

Table 65: Waist-to-height ratio

No. studies (sample size)	Cut-off	Diagnostic accuracy			Quality	Interpretation of effect
		Sensitivity	Specificity	Likelihood ratios		
Men						
1 (n=152) Rezende 2018	**0.61**	0.595 (0.480,0.700)	0.564 (0.453,0.669)	LR+ 1.364 (0.996,1.869)	Very low	Slight increase in probability of Hypertension
				LR- 0.719 (0.513,1.008)	Very low	Slight decrease in probability of Hypertension
Women						
1 (n=319) Rezende 2018	**0.57**	0.662 (0.577,0.737)	0.645 (0.574,0.711)	LR+ 1.865 (1.483,2.344)	Very low	Slight increase in probability of Hypertension
				LR- 0.524 (0.404,0.680)	Very low	Slight decrease in probability of Hypertension

Accuracy data where GRADE analysis is not be possible

Iranian

Table 66: Type 2 diabetes

Population and index test	Sample size	Likelihood ratio +/-	Sens	Spec	PPV/NPV	Risk of bias
Hadaegh, F (2009-2) **Reference standard: Type 2 Diabetes**						
Men ≤60: BMI	1614	NR	0.56	0.57	NR	Moderate
Men ≤60: WC	1614	NR	0.56	0.64	NR	

Population and index test	Sample size	Likelihood ratio +/-	Sens	Spec	PPV/NPV	Risk of bias
Men ≤60: WHP	1614	NR	0.62	0.62	NR	
Men ≤60: WHtR	1614	NR	0.58	0.62	NR	
Women ≤60: BMI	2006	NR	0.51	0.58	NR	
Women ≤60: WC	2006	NR	0.7	0.44	NR	
Women ≤60: WHR	2006	NR	0.63	0.6	NR	
Women ≤60: WHtR	2006	NR	0.59	0.55	NR	
Men >60: BMI	1614	NR	0.52	0.63	NR	
Men >60: WC	1614	NR	0.63	0.5	NR	
Men >60: WHR	1614	NR	0.44	0.66	NR	
Men >60: WHtR	1614	NR	0.6	0.6	NR	
Women >60 BMI	2006	NR	0.56	0.56	NR	
Women >60 WC	2006	NR	0.61	0.61	NR	
Women >60: WHR	2006	NR	0.71	0.71	NR	
Women >60: WHtR	2006	NR	0.61	0.61	NR	

1 *Table 67: Cardiovascular disease*

Population and index test	Sample size	Likelihood ratio +/-	Sens	Spec	PPV/NPV	Risk of bias
Talaei 2012 **Reference standard: Cardiovascular disease (including coronary heart disease)**						
Men WC	3068	1.5, 0.77	45.90%	69.40%	NR	High
Men WC	3068	1.28,0.69	66.30%	48.30%	NR	
Women WC	3255	1.48,0.79	44.70%	69.80%	NR	
Women WC	3255	1.27,0.69	66.80%	47.60%	NR	

1 *Other Asian populations*

2 *Table 68: Cardiovascular disease*

Population and index test	Sample size	Likelihood ratio +/-	Sens	Spec	PPV/NPV	Risk of bias
Aekplakorn 2007 **Reference standard: cardiovascular disease (including coronary heart disease)**						
BMI (23 kg/m^2)	2536	NR	0.591	0.511	NR	Moderate
WC (85 cm)	2536	NR	0.515	0.642	NR	
WHR (0.98)	2536	NR	0.53	0.54	NR	
WHtR (0.51)	2536	NR	0.545	0.609	NR	

3 *Chinese*

4 *Table 69: Hypertension*

Population and index test	Sample size	Likelihood ratio +/-	Sens	Spec	PPV/NPV	Risk of bias
Nguyen 2008 **Reference standard: Hypertension**						
Women (All ages) BMI	2415	NR	0.56	0.65	NR	High
Women (18–40) BMI	1053	NR	0.59	0.66	NR	
Women (41–65) BMI	1362	NR	0.57	0.58	NR	
Men (All ages) BMI	2077	NR	0.61	0.59	NR	
Men (18–40) BMI	946	NR	0.62	0.62	NR	
Men (41–65) BMI	1131	NR	0.6	0.57	NR	

5 **Diagnostic accuracy evidence**

6 ***C-statistic / Area under the curve***

7 The following table was used to aid judgments of classification accuracy.

Table 70: Interpretation of c-statistics

Value of c-statistic	Interpretation
c-statistic <0.6	**Poor classification accuracy**
0.6 ≤ c-statistic <0.7	**Adequate classification accuracy**
0.7 ≤ c-statistic <0.8	**Good classification accuracy**
0.8 ≤ c-statistic <0.9	**Excellent classification accuracy**
0.9 ≤ c-statistic < 1.0	**Outstanding classification accuracy**

Black African / Caribbean population

Summary of studies providing head-to-head comparisons of measures

The majority of included studies compared the accuracy of measures within the same group of participants. The studies often reported the accuracy in gender or age specific subgroups. The table below indicates which measure offered the best discriminatory power as determined by its C-statistic / AUC – ROC curve in each study or, where reported, relevant subgroup within the study.

1 **Table 71: C-statistic/AUC comparisons in the Black African / Caribbean ethnicity**

Type 2 diabetes		Highest C-statistic
BMI vs WC vs WHR vs WHtR	Skogberg 2018 (men and women),	Waist-to-height ratio in 1 study subgroup
BMI vs WC vs WHtR	Diaz 2007 (men USA / women UK / women USA) Diaz 2007 (men UK)	Waist-to-height ratio in 4 studies/subgroups Waist circumference in 1 study/subgroup
BMI vs WC	Foucan 2002 (women 18-39 / 40-74), Yoon 2016 (men and women)	Waist circumference in 3 studies/subgroups
Hypertension		
BMI vs WC vs WHR vs WHtR	Gutema 2020 (men), Sinaga 2018 (men) Gutema 2020 (women), Sinaga 2018 (women) Okoro 2021 (men and women)	Waist circumference in 2 studies/subgroups Waist-to-height ratio in 2 studies/subgroups BMI in 1 study/subgroup
BMI vs WC	Foucan 2002 (women 18-39 / 40-74)	Waist circumference in 2 studies/subgroups
Dyslipidaemia		
BMI vs WC	Foucan 2002 (women 18-39 / 40-74)	Waist circumference in 2 studies/subgroups

2 *Table 72: Type 2 diabetes*

No. of studies	Study design	Sample size	Effect size (95%CI)	Quality	Interpretation of effect
BMI					
Woman (18-39 years old)					
Foucan 2002	Cross-sectional	2762	0.84 (0.78 -0.9)	Very low	Excellent classification accuracy
Women (40-74 years old)					
Foucan 2002	Cross-sectional	2387	0.68 (0.66 - 0.7)	Very low	Adequate classification accuracy
Women (US black) ≥40 years old					
Diaz 2007	Cross-sectional	491	0.61 (95% CI not reported)	Low	Adequate classification accuracy
Women (English black) ≥40 years old					
Diaz 2007	Cross-sectional	279	0.59 (95% CI not reported)	Low	Poor classification accuracy
Men (US black) ≥40 years old					
Diaz 2007	Cross-sectional	491	0.60 (95% CI not reported)	Low	Adequate classification accuracy
Men (English black) ≥40 years old					
Diaz 2007	Cross-sectional	279	0.59 (95% CI not reported)	Low	Poor classification accuracy
Men and women (30-64 years old)					
Skogberg 2018	Cross-sectional	225	0.68 (0.58 - 0.79)	Low	Adequate classification accuracy

Men and women (≥20 years old)					
Yoon 2016	Cross-sectional	854	0.62 (0.62 - 0.62)	Moderate	Adequate classification accuracy
Waist circumference					
Women (18-39 years old)					
Foucan 2002	Cross-sectional	2762	0.88 (0.84 - 0.92)	Very low	Excellent classification accuracy
Women (40-74 years old)					
Foucan 2002	Cross-sectional	2387	0.68 (0.65 - 0.71)	Very low	Adequate classification accuracy
Women (US black) ≥40 years old					
Diaz 2007	Cross-sectional	491	0.69 (95% CI not reported)	Low	Adequate classification accuracy
Women (English black) ≥40 years old					
Diaz 2007	Cross-sectional	279	0.68 (95% CI not reported)	Low	Adequate classification accuracy
Men (US black) ≥40 years old					
Diaz 2007	Cross-sectional	491	0.65(95% CI not reported)	Low	Adequate classification accuracy
Men (English black) ≥40 years old					
Diaz 2007	Cross-sectional	279	0.67(95% CI not reported)	Low	Adequate classification accuracy
Men and women (30-64 years old)					
Skogberg 2018	Cross-sectional	225	0.74 (0.64 - 0.84)	Low	Good classification accuracy
Men and women (≥20 years old)					
Yoon 2016	Cross-sectional	854	0.65 (0.594 - 0.70)	Very low	Adequate classification accuracy
Waist-to-hip ratio					
Men and Women					
Skogberg 2018	Cross-sectional	225	0.66 (0.55 - 0.77)	Low	Adequate classification accuracy
Waist-to-height ratio					
Women (US black) ≥40 years old					
Diaz 2007	Cross-sectional	491	0.70 (95% CI not reported)	Low	Good classification accuracy
Women (English black) ≥40 years old					
Diaz 2007	Cross-sectional	279	0.70 (95% CI not reported)	Low	Good classification accuracy
Men (US black) ≥40 years old					
Diaz 2007	Cross-sectional	491	0.62 (95% CI not reported)	Low	Adequate classification accuracy
Men (English black) ≥40 years old					
Diaz 2007	Cross-sectional	279	0.71 (95% CI not reported)	Low	Good classification accuracy
Men and women (30-64 years old)					
Skogberg 2018	Cross-sectional	225	0.75 (0.65 - 0.85)	Low	Good classification accuracy

1 *Table 73: Hypertension*

No. of studies	Study design	Sample size	Effect size (95%CI)	Quality	Interpretation of effect
BMI					
Woman (18-39 years old)					
Foucan 2002	Cross-sectional	2762	0.74 (0.72 - 0.76)	Low	Good classification accuracy
Women (40-74 years old)					
Foucan 2002	Cross-sectional	2387	0.64 (0.63 - 0.67)	Very low	Adequate classification accuracy
Women (20-64 years old)					
Gutema 2020 Sinaga 2018	Cross-sectional	2069	0.57 (0.50 - 0.63)	Very low	Poor classification accuracy
Men (20-64 years old)					
Gutema 2020 Sinaga 2018	Cross-sectional	1980	0.63 (0.52 - 0.74)	Very low	Adequate classification accuracy
Men and women (mean age 37.4 years [SD 11.3])					
Okoro 2021	Cross-sectional	241	0.68 (95% CI not reported)	Very low	Adequate classification accuracy
Waist circumference					
Woman (18-39 years old)					
Foucan 2002	Cross-sectional	2762	0.75 (0.73 - 0.77)	Low	Good classification accuracy
Women (40-74 years old)					
Foucan 2002	Cross-sectional	2387	0.68 (0.66 - 0.7)	Very low	Adequate classification accuracy
Women (20-64 years old)					
Gutema 2020 Sinaga 2018	Cross-sectional	2069	0.59 (0.54 - 0.63)	Very low	Poor classification accuracy
Men (20-64 years old)					
Gutema 2020 Sinaga 2018	Cross-sectional	1980	0.66 (0.54 - 0.79)	Very low	Adequate classification accuracy
Men and women (mean age 37.4 years [SD 11.3])					
Okoro 2021	Cross-sectional	241	0.56 (95% CI not reported)	Very low	Poor classification accuracy
Waist-hip ratio					
Women (20-64 years old)					
Gutema 2020 Sinaga 2018	Cross-sectional	2069	0.56 (0.53 - 0.59)	Low	Poor classification accuracy
Men (20-64 years old)					

Gutema 2020 Sinaga 2018	Cross-sectional	1980	0.64 (0.52 - 0.75)	Very low	Adequate classification accuracy
Men and women (mean age 37.4 years [SD 11.3])					
Okoro 2021	Cross-sectional	241	0.52 (95% CI not reported)	Very low	Poor classification accuracy
Waist-to-height ratio					
Women (20-64 years old)					
Gutema 2020 Sinaga 2018	Cross-sectional	2069	0.60 (0.56 - 0.65)	Very low	Adequate classification accuracy
Men (20-64 years old)					
Gutema 2020 Sinaga 2018	Cross-sectional	1980	0.64 (0.53 - 0.76)	Very low	Adequate classification accuracy
Men and women (mean age 37.4 years [SD 11.3])					
Okoro 2021	Cross-sectional	241	0.53 (95% CI not reported)	Very low	Poor classification accuracy

1 *Table 74: Dyslipidaemia*

No. of studies	Study design	Sample size	Effect size (95%CI)	Quality	Interpretation of effect
BMI					
Woman (18-39 years old)					
Foucan 2002	Cross-sectional	2762	0.61 (0.57 - 0.65)	Very low	Adequate classification accuracy
Women (40-74 years old)					
Foucan 2002	Cross-sectional	2387	0.52 (0.49 - 0.55)	Low	Poor classification accuracy
Waist circumference					
Woman (18-39 years old)					
Foucan 2002	Cross-sectional	2762	0.63 (0.59 - 0.69)	Very low	Adequate classification accuracy
Women (40-74 years old)					
Foucan 2002	Cross-sectional	2387	0.55 (0.53 - 0.58)	Low	Poor classification accuracy

South Asian Population

Type 2 diabetes		**Highest C-statistic**
BMI vs WC vs WHR vs WHtR	Bhowmik 2013 (men / women), Kapoor 2020 (men / women) Jayawardana 2013 (men / women), Patel 2017 (men / women)	Waist-to-hip ratio in 4 studies/subgroups Waist-to-height ratio in 2 studies/subgroups Waist circumference in 2 studies/subgroups
BMI vs WC vs WHtR	Diaz 2007[1] (men / women – UK Indian, men / women – UK Bangladeshi) Diaz 2007 (men – UK Pakistani) Diaz 2007 (women – UK Pakistani, women – UK Bangladeshi)	Waist-to-height ratio in 4 studies/subgroups BMI in 1 study/subgroup Waist circumference in 2 studies/subgroups
BMI vs WC vs WHR	Siddiquee 2015 (men and women)	Waist-to-hip ratio in 1 study/subgroup
BMI vs WC	Mohan 2007 (men / women)	Waist circumference in 2 studies/subgroups
Hypertension		
BMI vs WC vs WHR vs WHtR	Bhowmik 2013[2] (men / women), Jayawardana 2013 (men / women) Bhowmik 2013 (men), Gupta 2012 (men / women), Patel 2017 (men) Bhowmik 2013 (women), Patel 2017 (women)	Waist-to-height ratio in 4 studies/subgroups BMI in 4 studies/subgroups Waist circumference in 2 studies/subgroups
BMI vs WC vs WHR	Katulanda 2011[2] (men / women) Katulanda 2011 (men)	Waist circumference in 2 studies/subgroups Waist-to-hip ratio in 1 study/subgroup
BMI vs WC	Mohan 2007 (men / women)	Waist circumference in 2 studies/subgroups
Dyslipidaemia		
BMI vs WC vs WHR vs WHtR	Bhowmik 2013 (men) Bhowmik 2013 (women)	Waist-to-height in 1 study/subgroup Waist-to-hip ratio in 1 study/subgroup

Summary of studies providing head-to-head comparisons of measures

The majority of included studies compared the accuracy of measures within the same group of participants. The studies often reported the accuracy in gender or age specific subgroups. The table below indicates which measure offered the best discriminatory power as determined by its C-statistic / AUC – ROC curve in each study or, where reported, relevant subgroup within the study.

Table75: C-statistic/AUC comparisons in the South Asian ethnicity

[1] UK Bangladeshi subgroup in women had the same C-statistic for WC and WHtR.

[2] Multiple measures had the same C-statistic for predicting hypertension in these studies

Table 76: Type 2 diabetes

No. of studies	Study design	Sample size	Effect size (95%CI)	Quality	Interpretation of effect
BMI					
Women (≥18 years old)					
Bhowmik 2013 Jayawardana 2013 Kapoor 2020 Mohan 2007	Cross-sectional	7163	0.64 (0.63 - 0.66)	Moderate	Adequate classification accuracy
Women (UK Indian) ≥40 years old					
Diaz 2007	Cross-sectional	271	0.63 (95% CI not reported)	Low	Adequate classification accuracy
Women (UK Pakistani) ≥40 years old					
Diaz 2007	Cross-sectional	160	0.73 (95% CI not reported)	Very low	Good classification accuracy
Women (UK Bangladeshi) ≥40 years old					
Diaz 2007	Cross-sectional	75	0.60 (95% CI not reported)	Low	Adequate classification accuracy
Women (≥20 years old)					
Patel 2017	Cross-sectional	5120	0.78 (95% CI not reported)	High	Good classification accuracy
Men (≥18 years old)					
Bhowmik 2013 Jayawardana 2013 Kapoor 2020 Mohan 2007	Cross-sectional	6024	0.64 (0.57 - 0.70)	Very low	Adequate classification accuracy
Men (UK Indian) ≥40 years old					
Diaz 2007	Cross-sectional	264	0.61 (95% CI not reported)	Low	Good classification accuracy
Men (UK Pakistani) ≥40 years old					
Diaz 2007	Cross-sectional	136	0.57 (95% CI not reported)	Very low	Poor classification accuracy
Men (UK Bangladeshi) ≥40 years old					
Diaz 2007	Cross-sectional	77	0.67 (95% CI not reported)	Very low	Adequate classification accuracy
Men (≥20 years old)					
Patel 2017	Cross-sectional	3772	0.76 (95% CI not reported)	High	Good classification accuracy
Men and women (≥20 years old)					
Siddiquee 2015	Cross-sectional	2293	0.63 (95% CI not reported)	Moderate	Adequate classification accuracy

Waist circumference					
Women (≥18 years old)					
Bhowmik 2013 Jayawardana 2013 Kapoor 2020 Mohan 2007	Cross-sectional	7163	0.68 (0.66 - 0.69)	Moderate	Adequate classification accuracy
Women (UK Indian) ≥40 years old					
Diaz 2007	Cross-sectional	271	0.66 (95% CI not reported)	Low	Adequate classification accuracy
Women (UK Pakistani) ≥40 years old					
Diaz 2007	Cross-sectional	160	0.83 (95% CI not reported)	Very low	Excellent classification accuracy
Women (UK Bangladeshi) ≥40 years old					
Diaz 2007	Cross-sectional	75	0.65 (95% CI not reported)	Very low	Adequate classification accuracy
Women (≥20 years old)					
Patel 2017	Cross-sectional	5120	0.80 (95% CI not reported)	High	Excellent classification accuracy
Men (≥18 years old)					
Bhowmik 2013 Jayawardana 2013 Kapoor 2020 Mohan 2007	Cross-sectional	6024	0.68 (0.61 - 0.74)	Very low	Adequate classification accuracy
Men (UK Indian) ≥40 years old					
Diaz 2007	Cross-sectional	264	0.65 (95% CI not reported)	Low	Adequate classification accuracy
Men (UK Pakistani) ≥40 years old					
Diaz 2007	Cross-sectional	136	0.51 (95% CI not reported)	Very low	Poor classification accuracy
Men (UK Bangladeshi) ≥40 years old					
Diaz 2007	Cross-sectional	77	0.73 (95% CI not reported)	Low	Good classification accuracy
Men (≥20 years old)					
Patel 2017	Cross-sectional	3772	0.77 (95% CI not reported)	High	Good classification accuracy
Men and women (≥20 years old)					
Siddiquee 2015	Cross-sectional	2293	0.68 (0.65 - 0.72)	Moderate	Adequate classification accuracy
Waist-to-hip ratio					
Women (≥18 years old)					
Bhowmik 2013 Jayawardana 2013 Kapoor 2020	Cross-sectional	4813	0.69 (0.66 - 0.73)	Very low	Adequate classification accuracy

Women (≥20 years old)					
Patel 2017	Cross-sectional	5120	0.78 (95% CI not reported)	High	Good classification accuracy
Men (≥18 years old)					
Bhowmik 2013 Jayawardana 2013 Kapoor 2020	Cross-sectional	3674	0.67 (0.65 - 0.69)	Moderate	Adequate classification accuracy
Men (≥20 years old)					
Patel 2017	Cross-sectional	3772	0.75 (95% CI not reported)	High	Good classification accuracy
Men and women (≥20 years old)					
Siddiquee 2015	Cross-sectional	2293	0.68 (0.65 - 0.72)	Moderate	Adequate classification accuracy
Waist-to-height ratio					
Women (≥18 years old)					
Bhowmik 2013 Jayawardana 2013 Kapoor 2020	Cross-sectional	4813	0.69 (0.67 - 0.71)	Low	Adequate classification accuracy
Women (UK Indian) ≥40 years old					
Diaz 2007	Cross-sectional	271	0.69 (95% CI not reported)	Low	Adequate classification accuracy
Women (UK Pakistani) ≥40 years old					
Diaz 2007	Cross-sectional	160	0.80 (95% CI not reported)	Very low	Excellent classification accuracy
Women (UK Bangladeshi) ≥40 years old					
Diaz 2007	Cross-sectional	75	0.65 (95% CI not reported)	Very low	Adequate classification accuracy
Women (≥20 years old)					
Patel 2017	Cross-sectional	5120	0.79 (95% CI not reported)	High	Good classification accuracy
Men (≥18 years old)					
Bhowmik 2013 Jayawardana 2013 Kapoor 2020	Cross-sectional	3674	0.67 (0.55- 0.80)	Very low	Adequate classification accuracy
Men (UK Indian) ≥40 years old					
Diaz 2007	Cross-sectional	264	0.68 (95% CI not reported)	Low	Adequate classification accuracy
Men (UK Pakistani) ≥40 years old					
Diaz 2007	Cross-sectional	136	0.54 (95% CI not reported)	Very low	Poor classification accuracy
Men (UK Bangladeshi) ≥40 years old					
Diaz 2007	Cross-sectional	77	0.75 (95% CI not reported)	Very low	Good classification accuracy

Men (≥20 years old)					
Patel 2017	Cross-sectional	3772	0.76 (95% CI not reported)	High	Good classification accuracy

1 *Table 77: Hypertension*

No. of studies	Study design	Sample size	Effect size (95%CI)	Quality	Interpretation of effect
BMI					
Women (≥18 years old)					
Bhowmik 2013 Gupta 2012 Jayawardana 2013 Katulanda 2011 Mohan 2007	Cross-sectional	11295	0.62 (0.60 - 0.65)	Low	Adequate classification accuracy
Women (≥20 years old)					
Patel 2017	Cross-sectional	5120	0.78 (95% CI not reported)	High	Good classification accuracy
Men (≥18 years old)					
Bhowmik 2013 Gupta 2012 Jayawardana 2013 Katulanda 2011 Mohan 2007	Cross-sectional	9709	0.65 (0.63 - 0.67)	Low	Adequate classification accuracy
Men (≥20 years old)					
Patel 2017	Cross-sectional	3772	0.70 (95% CI not reported)	High	Good classification accuracy
Waist circumference					
Women (≥18 years old)					
Bhowmik 2013 Gupta 2012 Jayawardana 2013 Katulanda 2011 Mohan 2007	Cross-sectional	11295	0.63 (0.60 - 0.67)	Very low	Adequate classification accuracy
Women (≥20 years old)					
Patel 2017	Cross-sectional	5120	0.78 (95% CI not reported)	High	Good classification accuracy
Men (≥18 years old)					
Bhowmik 2013 Gupta 2012	Cross-sectional	9709	0.66 (0.64 - 0.68)	Low	Adequate classification accuracy

Jayawardana 2013 Katulanda 2011 Mohan 2007					
Men (≥20 years old)					
Patel 2017	Cross-sectional	3772	0.70 (95% CI not reported)	High	Good classification accuracy
Waist-to-hip ratio (WHR)					
Women (≥18 years old)					
Bhowmik 2013 Gupta 2012 Jayawardana 2013 Katulanda 2011	Cross-sectional	8945	0.60 (0.56 - 0.65)	Very low	Adequate classification accuracy
Women (≥20 years old)					
Patel 2017	Cross-sectional	5120	0.76 (95% CI not reported)	High	Good classification accuracy
Men (≥18 years old)					
Bhowmik 2013 Gupta 2012 Jayawardana 2013 Katulanda 2011	Cross-sectional	7359	0.65 (0.61 - 0.69)	Very low	Adequate classification accuracy
Men (≥20 years old)					
Patel 2017	Cross-sectional	3772	0.68 (95% CI not reported)	High	Adequate classification accuracy
Waist-to-height ratio					
Women (≥18 years old)					
Bhowmik 2013 Gupta 2012 Jayawardana 2013	Cross-sectional	4471	0.65 (0.62 - 0.68)	Low	Adequate classification accuracy
Women (≥20 years old)					
Patel 2017	Cross-sectional	5120	0.78 (95% CI not reported)	High	Good classification accuracy
Men (≥18 years old)					
Bhowmik 2013 Gupta 2012 Jayawardana 2013	Cross-sectional	2885	0.67 (0.65 - 0.70)	Low	Adequate classification accuracy
Men (≥20 years old)					
Patel 2017	Cross-sectional	3772	0.70 (95% CI not reported)	High	Good classification accuracy

Table 78: Dyslipidaemia

No. of studies	Study design	Sample size	Effect size (95%CI)	Quality	
BMI					
Women (≥20 years old)					
Bhowmik 2013	Cross-sectional	1451	0.62 (0.59 - 0.66)	Low	Good classification accuracy
Men (≥20 years old)					
Bhowmik 2013	Cross-sectional	842	0.70 (0.67 - 0.74)	Low	Good classification accuracy
Waist circumference (WC)					
Women (≥20 years old)					
Bhowmik 2013	Cross-sectional	1451	0.66 (0.63 - 0.70)	Low	Adequate classification accuracy
Men (≥20 years old)					
Bhowmik 2013	Cross-sectional	842	0.7 (0.67 - 0.74)	Low	Good classification accuracy
Waist-to-hip ratio (WHR)					
Women (≥20 years old)					
Bhowmik 2013	Cross-sectional	1451	0.68 (0.65 - 0.71)	Low	Adequate classification accuracy
Men (≥20 years old)					
Bhowmik 2013	Cross-sectional	842	0.68 (0.64 - 0.72)	Low	Adequate classification accuracy
Waist-to-height ratio (WHR)					
Women (≥20 years old)					
Bhowmik 2013	Cross-sectional	1451	0.66 (0.63 - 0.69)	Moderate	Adequate classification accuracy
Men (≥20 years old)					
Bhowmik 2013	Cross-sectional	842	0.71 (0.67 - 0.74)	Low	Adequate classification accuracy

Sensitivity, specificity, likelihood ratios

The following table was used to aid judgments of accuracy.

Table 79: Interpretation of LRS

Value of likelihood ratio	Interpretation
LR ≤ 0.1	**Very large** decrease in probability of disease or outcome
0.1 < LR ≤ 0.2	**Large** decrease in probability of disease or outcome
0.2 < LR ≤ 0.5	**Moderate** decrease in probability of disease or outcome
0.5 < LR ≤ 1.0	**Slight** decrease in probability of disease or outcome
1.0 < LR < 2.0	**Slight** increase in probability of disease or outcome
2.0 ≤ LR < 5.0	**Moderate** increase in probability of disease or outcome
5.0 ≤ LR < 10.0	**Large** increase in probability of disease or outcome
LR ≥ 10.0	**Very large** increase in probability of disease or outcome

Black African/ Caribbean population

Table 80: Type 2 Diabetes

	Cut-off	Diagnostic accuracy			Quality	Interpretation of effect
		Sensitivity	Specificity	Likelihood ratios		
Index test: BMI						
Women (18-39 years old)						
1 (n=2762) Foucan 2002	**26 kg/m^2**	0.830 (0.646,0.929)	0.690 (0.672,0.707)	LR+ 2.677 (2.244,3.195)	Low	Moderate increase in probability of type 2 diabetes
				LR- 0.246 (0.109,0.559)	Very low	Moderate decrease in probability of type 2 diabetes
Women (40-74 years old)						
1 (n=2387) Foucan 2002	**27 kg/m^2**	0.620 (0.563,0.674)	0.520 (0.499,0.541)	LR+ 1.292 (1.168,1.428)	Low	Slight increase in probability of type 2 diabetes
				LR- 0.731 (0.627,0.851)	Low	Slight decrease in probability of type 2 diabetes
Index test: waist circumference						
Women (18-39 years old)						
1 (n=2762) Foucan 2002	**85 cm**	0.840 (0.657,0.935)	0.780 (0.764,0.795)	LR+ 3.818 (3.201,4.555)	Low	Moderate increase in probability of type 2 diabetes
				LR- 0.205 (0.088,0.479)	Low	Moderate decrease in probability of type 2 diabetes

	Cut-off	Diagnostic accuracy			Quality	Interpretation of effect
		Sensitivity	Specificity	Likelihood ratios		
Women (40-74 years old)						
1 (n=2387) Foucan 2002	**88 cm**	0.700 (0.645,0.750)	0.600 (0.579,0.621)	LR+ 1.750 (1.597,1.918)	Low	Slight increase in probability of type 2 diabetes
				LR- 0.500 (0.418,0.598)	Very low	Moderate decrease in probability of type 2 diabetes

1 *Table 81: Hypertension*

	Cut-off	Diagnostic accuracy			Quality	Interpretation of effect
		Sensitivity	Specificity	Likelihood ratios		
Index test: BMI						
Men and women						
1 (n=240) Okoro 2020	**30 kg/m^2**	0.262 (0.169,0.381)	0.844 (0.783,0.890)	LR+ 1.672 (0.983,2.845)	Very low	Slight increase in probability of hypertension
				LR- 0.875 (0.748,1.025)	Very low	Slight decrease in probability of hypertension
Men						
1 (n=1673) Gutema 2020	**22.86 kg/m^2**	0.357 (0.313,0.403)	0.788 (0.764,0.810)	LR+ 1.684 (1.427,1.987)	Moderate	Slight increase in probability of hypertension
				LR- 0.816 (0.757,0.880)	Moderate	Slight decrease in probability of hypertension
1 (n=436) Ononamadu 2017	**24.49 kg/m^2**	0.729 (0.632,0.809)	0.600 (0.547,0.651)	LR+ 1.823 (1.525,2.179)	Very low	Slight increase in probability of hypertension
				LR- 0.451 (0.321,0.634)	Very low	Moderate decrease in probability of hypertension
Women (18-39)						
1 (n=2762) Foucan 2002	**24 kg/m^2**	0.740 (0.691,0.784)	0.600 (0.580,0.619)	LR+ 1.850 (1.708,2.003)	Very low	Slight increase in probability of hypertension
				LR- 0.433 (0.361,0.520)	Very low	Moderate decrease in probability of hypertension
Women (40-70)						
1 (n=2387) Foucan 2002	**26 kg/m^2**	0.700 (0.675,0.724)	0.510 (0.480,0.540)	LR+ 1.429 (1.331,1.533)	Low	Slight increase in probability of hypertension

	Cut-off	Diagnostic accuracy			Quality	Interpretation of effect
		Sensitivity	Specificity	Likelihood ratios		
				LR- 0.588 (0.532,0.651)	Low	Slight decrease in probability of hypertension
Women						
1 (n=1672) Gutema 2020	**24.02 kg/m^2**	0.264 (0.226,0.305)	0.854 (0.833,0.873)	LR+ 1.808 (1.476,2.215)	Low	Slight increase in probability of hypertension
				LR- 0.862 (0.813,0.914)	Moderate	Slight decrease in probability of hypertension
1 (n=476) Ononamadu 2017	**24.44 kg/m^2**	0.741 (0.652,0.814)	0.489 (0.438,0.540)	LR+ 1.450 (1.250,1.683)	Low	Slight increase in probability of hypertension
				LR- 0.529 (0.380,0.737)	Very low	Slight decrease in probability of hypertension
Index test: waist circumference						
Men and women						
1 (n=240) Okoro 2020	**94 cm and 80 cm**	0.508 (0.388,0.626)	0.581 (0.507,0.651)	LR+ 1.212 (0.902,1.628)	Very low	Slight increase in probability of HTN
				LR- 0.847 (0.643,1.117)	Very low	Slight decrease in probability of HTN
Men						
1 (n=1673) Gutema 2020	**84.05 cm**	0.325 (0.283,0.370)	0.854 (0.833,0.873)	LR+ 2.226 (1.839,2.694)	Low	Moderate increase in probability of hypertension
				LR- 0.790 (0.738,0.847)	Moderate	Slight decrease in probability of hypertension
1 (n=436) Ononamadu 2017	**91.44 cm**	0.531 (0.432,0.629)	0.842 (0.799,0.877)	LR+ 3.356 (2.465,4.571)	Low	Moderate increase in probability of hypertension
				LR- 0.557 (0.448,0.692)	Very low	Slight decrease in probability of hypertension
Women (18-39 years old)						
1 (n=2762) Foucan 2002	**76 cm**	0.531 (0.432,0.629)	0.842 (0.799,0.877)	LR+ 3.356 (2.465,4.571)	Very low	Moderate increase in probability of hypertension
				LR- 0.557 (0.448,0.692)	Very low	Slight decrease in probability of hypertension
Women (40-70 years old)						

	Cut-off	Diagnostic accuracy			Quality	Interpretation of effect
		Sensitivity	Specificity	Likelihood ratios		
1 (n=2387) Foucan 2002	**84.5 cm**	0.710 (0.685,0.734)	0.540 (0.510,0.570)	LR+ 1.543 (1.434,1.661)	Low	Slight increase in probability of hypertension
				LR- 0.537 (0.485,0.594)	Very low	Slight decrease in probability of hypertension
Women						
1 (n=1672) Gutema 2020	**79.5 cm**	0.520 (0.475,0.565)	0.615 (0.587,0.642)	LR+ 1.351 (1.207,1.511)	Moderate	Slight increase in probability of hypertension
				LR- 0.780 (0.704,0.866)	Moderate	Slight decrease in probability of hypertension
1 (n=476) Ononamadu 2017	**96.52 cm**	0.402 (0.315,0.495)	0.767 (0.720,0.807)	LR+ 1.721 (1.284,2.306)	Very low	Slight increase in probability of hypertension
				LR- 0.780 (0.664,0.918)	Low	Slight decrease in probability of hypertension
Index test: waist-to-hip ratio						
Men and women						
1 (n=240) Okoro 2020	**0.9 and 0.8**	0.785 (0.668,0.868)	0.425 (0.354,0.498)	LR+ 1.364 (1.140,1.631)	Very low	Slight increase in probability of hypertension
				LR- 0.507 (0.309,0.832)	Very low	Slight decrease in probability of hypertension
Men						
1 (n=1673) Gutema 2020	**0.91**	0.785 (0.668,0.868)	0.425 (0.354,0.498)	LR+ 1.364 (1.140,1.631)	Moderate	Slight increase in probability of hypertension
				LR- 0.507 (0.309,0.832)	Moderate	Slight decrease in probability of hypertension
Women						
1 (n=1672) Gutema 2020	**0.91**	0.417 (0.374,0.462)	0.682 (0.655,0.708)	LR+ 1.311 (1.146,1.500)	Moderate	Slight increase in probability of hypertension
				LR- 0.855 (0.785,0.931)	Moderate	Slight decrease in probability of hypertension
Index test: waist-to-height ratio						
Men and women						
1 (n=240) Okoro 2020	**0.5**	0.723 (0.603,0.818)	0.469 (0.397,0.543)	LR+ 1.362 (1.111,1.671)	Very low	Slight increase in probability of hypertension

	Cut-off	Diagnostic accuracy			Quality	Interpretation of effect
		Sensitivity	Specificity	Likelihood ratios		
				LR- 0.590 (0.387,0.900)	Very low	Slight decrease in probability of hypertension
Men						
1 (n=436) Ononamadu 2017	**0.55**	0.490 (0.391,0.589)	0.830 (0.786,0.866)	LR+ 2.880 (2.110,3.932)	Low	Moderate increase in probability of hypertension
				LR- 0.615 (0.503,0.752)	Low	Slight decrease in probability of hypertension
1 (n=1673) Gutema 2020	**0.5**	0.419 (0.374.0.466)	0.740 (0.715,0.764)	LR+ 1.612 (1.394,1.863)	Moderate	Slight increase in probability of hypertension
				LR- 0.785 (0.720,0.856)	Moderate	Slight decrease in probability of hypertension
Women						
1 (n=1672) Gutema 2020	**0.51**	0.564 (0.519,0.608)	0.587 (0.559,0.615)	LR+ 1.366 (1.231,1.515)	Moderate	Slight increase in probability of hypertension
				LR- 0.743 (0.664,0.831)	Moderate	Slight decrease in probability of hypertension
1 (n=476) Ononamadu 2017	**0.508**	0.813 (0.729,0.874)	0.404 (0.355,0.455)	LR+ 1.363 (1.205,1.541)	Low	Slight increase in probability of hypertension
				LR- 0.464 (0.310,0.696)	Very low	Moderate decrease in probability of hypertension

1 *Table 82: Dyslipidaemia*

	Cut-off	Diagnostic accuracy			Quality	Interpretation of effect
		Sensitivity	Specificity	Likelihood ratios		
Index test: BMI						
Men						
1 (n=476) Kenate 2020	**22.5 kg/m^2**	0.606 (0.523,0.683)	0.698 (0.646,0.744)	LR+ 2.003 (1.623,2.471)	Very low	Moderate increase in probability of dyslipidaemia
				LR- 0.565 (0.456,0.701)	Very low	Slight decrease in probability of dyslipidaemia
1 (n=385) Paccaud 2000	**27 kg/m^2**	0.480 (0.417,0.544)	0.830 (0.761,0.88	LR+ 2.824 (1.935,4.120)	Moderate	Moderate increase in probability of dyslipidaemia

	Cut-off	Diagnostic accuracy			Quality	Interpretation of effect
		Sensitivity	Specificity	Likelihood ratios		
				LR- 0.627 (0.543,0.723)	High	Slight decrease in probability of dyslipidaemia
Women (18-39 years old)						
1 (n=2762) Foucan 2002	**24 kg/m^2**	0.640 (0.576,0.700)	0.520 (0.501,0.539)	LR+ 1.333 (1.200,1.482)	Low	Slight increase in probability of dyslipidaemia
				LR- 0.692 (0.580,0.827)	Low	Slight decrease in probability of dyslipidaemia
Women (40-70 years old)						
1 (n=2387) Foucan 2002	**27 kg/m^2**	0.540 (0.501,0.579)	0.500 (0.477,0.523)	LR+ 1.080 (0.991,1.177)	Very low	Slight increase in probability of dyslipidaemia
				LR- 0.920 (0.835,1.014)	Very low	Slight decrease in probability of dyslipidaemia
Women						
1 (n=439) Kenate 2020	**24.5 kg/m^2**	0.469 (0.379,0.561)	0.650 (0.597,0.700)	LR+ 1.341 (1.049,1.715)	Low	Slight increase in probability of dyslipidaemia
				LR- 0.816 (0.675,0.988)	Low	Slight decrease in probability of dyslipidaemia
1 (n=421) Paccaud 2000	**27 kg/m^2**	0.690 (0.621,0.752)	0.530 (0.466,0.593)	LR+ 1.468 (1.243,1.734)	High	Slight increase in probability of dyslipidaemia
				LR- 0.585 (0.458,0.747)	Moderate	Slight decrease in probability of dyslipidaemia
Index test: waist circumference						
Men						
1 (n=476) Kenate 2020	**83.7 cm**	0.380 (0.304,0.463)	0.749 (0.699,0.792)	LR+ 1.512 (1.143,2.000)	Very low	Slight increase in probability of dyslipidaemia
				LR- 0.828 (0.718,0.955)	Low	Slight decrease in probability of dyslipidaemia
1 (n=385) Paccaud 2000	**94 cm**	0.480 (0.417,0.544)	0.860 (0.795,0.907)	LR+ 3.429 (2.256,5.210)	High	Moderate increase in probability of dyslipidaemia
				LR- 0.605 (0.526,0.695)	High	Slight decrease in probability of dyslipidaemia
Women (18-39 years old)						

	Cut-off	Diagnostic accuracy			Quality	Interpretation of effect
		Sensitivity	Specificity	Likelihood ratios		
1 (n=2762) Foucan 2002	**75 cm**	0.650 (0.586,0.709)	0.540 (0.521,0.559)	LR+ 1.413 (1.273,1.568)	Low	Slight increase in probability of dyslipidaemia
				LR- 0.648 (0.541,0.777)	Low	Slight decrease in probability of dyslipidaemia
Women (40-70 years old)						
1 (n=2387) Foucan 2002	**87.5 cm**	0.580 (0.541,0.618)	0.510 (0.487,0.533)	LR+ 1.184 (1.090,1.285)	Low	Slight increase in probability of dyslipidaemia
				LR- 0.824 (0.743,0.913)	Low	Slight decrease in probability of dyslipidaemia
Women						
1 (n=439) Kenate 2020	**78 cm**	0.726 (0.636,0.800)	0.267 (0.222,0.318)	LR+ 1.028 (0.725,1.458)	Very low	Slight decrease in probability of dyslipidaemia
				LR- 0.990 (0.868,1.128)	Very low	Slight increase in probability of dyslipidaemia
1 (n=421) Paccaud 2000	**80 cm**	0.890 (0.837,0.927)	0.470 (0.407,0.534)	LR+ 1.679 (1.473,1.915)	High	Slight increase in probability of dyslipidaemia
				LR- 0.234 (0.153,0.359)	High	Moderate decrease in probability of dyslipidaemia
Index test: waist-to-hip ratio						
Men						
1 (n=476) Kenate 2020	**0.88**	0.775 (0.699,0.836)	0.368 (0.318,0.421)	LR+ 1.226 (1.087,1.384)	Low	Slight increase in probability of dyslipidaemia
				LR- 0.612 (0.437,0.856)	Very low	Slight decrease in probability of dyslipidaemia
1 (n=385) Paccaud 2000	**0.9**	0.630 (0.566,0.689)	0.650 (0.570,0.722)	LR+ 1.800 (1.417,2.286)	Moderate	Slight increase in probability of dyslipidaemia
				LR- 0.569 (0.464,0.698)	Moderate	Slight decrease in probability of dyslipidaemia
Women						
1 (n=439) Kenate 2020	**0.82**	0.991 (0.940,0.999)	0.006 (0.002,0.024)	LR+ 1.442 (0.132,15.76)	Very low	Slight decrease in probability of dyslipidaemia
				LR- 0.997 (0.978,1.017)	Very low	Slight increase in probability of dyslipidaemia

	Cut-off	Diagnostic accuracy			Quality	Interpretation of effect
		Sensitivity	Specificity	Likelihood ratios		
1 (n=421) Paccaud 2000	**0.8**	0.820 (0.759,0.868)	0.430 (0.368,0.495)	LR+ 1.439 (1.263,1.639)	High	Slight increase in probability of dyslipidaemia
				LR- 0.419 (0.298,0.587)	Moderate	Moderate decrease in probability of dyslipidaemia

South Asian population

Table 83: Type 2 Diabetes

	Cut-off	Diagnostic accuracy			Quality	Interpretation of effect
		Sensitivity	Specificity	Likelihood ratios		
Index test: BMI						
Men						
1 (n=2673 M+F) Alperet 2016	**25.4 kg/m^2**	0.615 (0.571,0.657)	0.616 (0.604,0.628)	LR+ 1.602 (1.484,1.728)	Low	Slight increase in probability of type 2 diabetes
				LR- 0.548 (0.476,0.631)	Very low	Slight decrease in probability of type 2 diabetes
1 (n=51) Awasthi 2017	**22.07 kg/m^2**	0.760 (0.558,0.888)	0.660 (0.463,0.814)	LR+ 2.235 (1.253,3.989)	Very low	Moderate increase in probability of type 2 diabetes
				LR- 0.364 (0.172,0.770)	Very low	Moderate decrease in probability of type 2 diabetes
1 (n=842) Bhowmik 2013	**21.2 kg/m^2**	0.825 (0.724,0.895)	0.412 (0.378,0.447)	LR+ 1.403 (1.246,1.580)	Moderate	Slight increase in probability of type 2 diabetes
				LR- 0.425 (0.260,0.695)	Low	Moderate decrease in probability of type 2 diabetes
Women						
1 (n=2673 M+F) Alperet 2016	**26.3 kg/m^2**	0.606 (0.563,0.647)	0.600 (0.589,0.611)	LR+ 1.515 (1.406,1.632)	Low	Slight increase in probability of type 2 diabetes
				LR- 0.657 (0.590,0.731)	Low	Slight decrease in probability of type 2 diabetes
1 (n=51) Awasthi 2017	**22.28 kg/m^2**	0.800 (0.605,0.913)	0.680 (0.478,0.831)	LR+ 2.500 (1.368,4.568)	Very low	Moderate increase in probability of type 2 diabetes
				LR- 0.294 (0.130,0.664)	Very low	Moderate decrease in probability of type 2 diabetes

	Cut-off	Diagnostic accuracy			Quality	Interpretation of effect
		Sensitivity	Specificity	Likelihood ratios		
1 (n=1451) Bhowmik 2013	**22.28 kg/m^2**	0.772 (0.682,0.843)	0.465 (0.438,0.492)	LR+ 1.443 (1.285,1.620)	Moderate	Slight increase in probability of type 2 diabetes
				LR- 0.490 (0.343,0.702)	Low	Moderate decrease in probability of type 2 diabetes
Index test: waist circumference						
Men						
1 (n=2673 M+F) Alperet 2016	**91.3 cm**	0.646 (0.603,0.687)	0.661 (0.649,0.672)	LR+ 1.906 (1.770,2.051)	Very low	Slight increase in probability of type 2 diabetes
				LR- 0.536 (0.475,0.604)	Very low	Slight decrease in probability of type 2 diabetes
1 (n=51) Awasthi 2017	**91.25 cm**	0.760 (0.558,0.888)	0.740 (0.542,0.872)	LR+ 2.923 (1.474,5.798)	Very low	Moderate increase in probability of type 2 diabetes
				LR- 0.324 (0.156,0.676)	Very low	Moderate decrease in probability of type 2 diabetes
1 (n=842) Bhowmik 2013	**82 cm**	0.825 (0.724,0.895)	0.412 (0.378,0.447)	LR+ 1.646 (1.422,1.905)	Moderate	Slight increase in probability of type 2 diabetes
				LR- 0.443 (0.296,0.665)	Low	Moderate decrease in probability of type 2 diabetes
Women						
1 (n=2673 M+F) Alperet 2016	**85.2 cm**	0.642 (0.600,0.682)	0.651 (0.640,0.662)	LR+ 1.840 (1.713,1.975)	Low	Slight increase in probability of type 2 diabetes
				LR- 0.550 (0.490,0.617)	Very low	Slight decrease in probability of type 2 diabetes
1 (n=51) Awasthi 2017	**83.5 cm**	0.730 (0.532,0.865)	0.600 (0.403,0.770)	LR+ 1.825 (1.070,3.113)	Very low	Slight increase in probability of type 2 diabetes
				LR- 0.450 (0.222,0.914)	Very low	Moderate decrease in probability of type 2 diabetes
1 (n=1451) Bhowmik 2013	**82 cm**	0.673 (0.577,0.756)	0.625 (0.599,0.650)	LR+ 1.795 (1.544,2.086)	Very low	Slight increase in probability of type 2 diabetes
				LR- 0.523 (0.396,0.691)	Very low	Slight decrease in probability of type 2 diabetes
Index test: waist-to-hip ratio						
Men						

	Cut-off	Diagnostic accuracy			Quality	Interpretation of effect
		Sensitivity	Specificity	Likelihood ratios		
1 (n=2673 M+F) Alperet 2016	**0.93**	0.654 (0.611,0.695)	0.713 (0.702,0.724)	LR+ 2.279 (2.115,2.456)	Low	Moderate increase in probability of type 2 diabetes
				LR- 0.485 (0.429,0.548)	Very low	Moderate decrease in probability of type 2 diabetes
1 (n=51) Awasthi 2017	**0.95**	0.720 (0.518,0.860)	0.540 (0.352,0.717)	LR+ 1.565 (0.966,2.537)	Very low	Slight increase in probability of type 2 diabetes
				LR- 0.519 (0.252,1.067)	Very low	Slight decrease in probability of type 2 diabetes
1 (n=842) Bhowmik 2013	**0.93**	0.688 (0.577,0.781)	0.609 (0.574,0.643)	LR+ 1.760 (1.478,2.095)	Low	Slight increase in probability of type 2 diabetes
				LR- 0.512 (0.366,0.717)	Low	Slight decrease in probability of type 2 diabetes
Women						
1 (n=2673 M+F) Alperet 2016	**0.84**	0.642 (0.600,0.682)	0.654 (0.643,0.665)	LR+ 1.855 (1.728,1.993)	Low	Slight increase in probability of type 2 diabetes
				LR- 0.547 (0.488,0.615)	Very low	Slight decrease in probability of type 2 diabetes
1 (n=51) Awasthi 2017	**0.94**	0.460 (0.283,0.648)	0.480 (0.296,0.669)	LR+ 0.885 (0.505,1.551)	Very low	Slight decrease in probability of type 2 diabetes
				LR- 1.125 (0.655,1.932)	Very low	Slight increase in probability of type 2 diabetes
1 (n=1451) Bhowmik 2013	**0.87**	0.842 (0.759,0.900)	0.545 (0.518,0.571)	LR+ 1.851 (1.672,2.049)	Low	Slight increase in probability of type 2 diabetes
				LR- 0.290 (0.186,0.453)	Moderate	Moderate decrease in probability of type 2 diabetes
Index test: waist-to-height ratio						
Men						
1 (n=2673 M+F) Alperet 2016	**0.54**	0.685 (0.643,0.724)	0.640 (0.628,0.652)	LR+ 1.903 (1.778,2.037)	Very low	Slight increase in probability of type 2 diabetes
				LR- 0.492 (0.432,0.561)	Very low	Moderate decrease in probability of type 2 diabetes
1 (n=51) Awasthi 2017	**0.54**	0.760 (0.558,0.888)	0.620 (0.425,0.783)	LR+ 2.000 (1.168,3.426)	Very low	Moderate increase in probability of type 2 diabetes

	Cut-off	Diagnostic accuracy			Quality	Interpretation of effect
		Sensitivity	Specificity	Likelihood ratios		
				LR- 0.387 (0.181,0.827)	Very low	Moderate decrease in probability of type 2 diabetes
1 (n=842) Bhowmik 2013	**0.53**	0.638 (0.525,0.737)	0.664 (0.630,0.697)	LR+ 1.899 (1.562,2.309)	Low	Slight increase in probability of type 2 diabetes
				LR- 0.545 (0.404,0.736)	Low	Slight decrease in probability of type 2 diabetes
Women						
1 (n=2673 M+F) Alperet 2016	**0.5**	0.751 (0.712,0.786)	0.724 (0.714,0.734)	LR+ 2.721 (2.558,2.894)	Low	Moderate increase in probability of type 2 diabetes
				LR- 0.344 (0.296,0.399)	Low	Moderate decrease in probability of type 2 diabetes
1 (n=51) Awasthi 2017	**0.54**	0.730 (0.532,0.865)	0.560 (0.366,0.737)	LR+ 1.659 (1.006,2.736)	Very low	Slight increase in probability of type 2 diabetes
				LR- 0.482 (0.234,0.992)	Very low	Moderate decrease in probability of type 2 diabetes
1 (n=1451) Bhowmik 2013	**0.54**	0.723 (0.629,0.800)	0.559 (0.532,0.585)	LR+ 1.639 (1.435,1.873)	Moderate	Slight increase in probability of type 2 diabetes
				LR- 0.496 (0.362,0.678)	Low	Moderate decrease in probability of type 2 diabetes

1 *Table 84: Hypertension*

	Cut-off	Diagnostic accuracy			Quality	Interpretation of effect
		Sensitivity	Specificity	Likelihood ratios		
Index test: BMI						
Men						
1 (n=842) Bhowmik 2013	**22 kg/m^2**	0.717 (0.639,0.784)	0.520 (0.483,0.557)	LR+ 1.494 (1.315,1.697)	Moderate	Slight increase in probability of hypertension
				LR- 0.544 (0.417,0.711)	Low	Slight decrease in probability of hypertension
Women						
1 (n=1451) Bhowmik 2013	**22.8 kg/m^2**	0.645 (0.577,0.707)	0.578 (0.550,0.605)	LR+ 1.528 (1.355,1.724)	Moderate	Slight increase in probability of hypertension

	Cut-off	Diagnostic accuracy			Quality	Interpretation of effect
		Sensitivity	Specificity	Likelihood ratios		
				LR- 0.614 (0.508,0.742)	Moderate	Slight decrease in probability of hypertension
Index test: waist circumference						
Men						
1 (n=842) Bhowmik 2013	**79 cm**	0.786 (0.712,0.845)	0.449 (0.412,0.486)	LR+ 1.426 (1.281,1.589)	Moderate	Slight increase in probability of hypertension
				LR- 0.477 (0.346,0.657)	Low	Moderate decrease in probability of hypertension
Women						
1 (n=1451) Bhowmik 2013	**81 cm**	0.645 (0.577,0.707)	0.612 (0.585,0.639)	LR+ 1.662 (1.470,1.880)	Moderate	Slight increase in probability of hypertension
				LR- 0.580 (0.480,0.701)	Low	Slight decrease in probability of hypertension
Index test: waist-hip ratio						
Men						
1 (n=842) Bhowmik 2013	**0.93**	0.541 (0.460,0.620)	0.634 (0.598,0.669)	LR+ 1.478 (1.237,1.766)	Moderate	Slight increase in probability of hypertension
				LR- 0.724 (0.602,0.871)	Moderate	Slight decrease in probability of hypertension
Women						
1 (n=1451) Bhowmik 2013	**0.89**	0.558 (0.490,0.624)	0.645 (0.618,0.671)	LR+ 1.572 (1.363,1.813)	Moderate	Slight increase in probability of hypertension
				LR- 0.685 (0.585,0.803)	Moderate	Slight decrease in probability of hypertension
Index test: waist-to-height ratio						
Men						
1 (n=842) Bhowmik 2013	**0.52**	0.629 (0.548,0.703)	0.605 (0.568,0.641)	LR+ 1.592 (1.364,1.859)	Moderate	Slight increase in probability of hypertension
				LR- 0.613 (0.493,0.763)	Low	Slight decrease in probability of hypertension
Women						
1 (n=1451) Bhowmik 2013	**0.54**	0.659 (0.592,0.720)	0.604 (0.577,0.631)	LR+ 1.664 (1.476,1.876)	Moderate	Slight increase in probability of hypertension

	Cut-off	Diagnostic accuracy			Quality	Interpretation of effect
		Sensitivity	Specificity	Likelihood ratios		
				LR- 0.565 (0.465,0.686)	Low	Slight decrease in probability of hypertension

1 *Table 85: Dyslipidaemia*

	Cut-off	Diagnostic accuracy			Quality	Interpretation of effect
		Sensitivity	Specificity	Likelihood ratios		
Index test: BMI						
Men						
1 (n=842) Bhowmik 2013	**22 kg/m^2**	0.745 (0.692,0.791)	0.593 (0.551,0.634)	LR+ 1.830 (1.621,2.066)	Low	Slight increase in probability of dyslipidaemia
				LR- 0.430 (0.350,0.529)	Low	Moderate decrease in probability of dyslipidaemia
Women						
1 (n=1451) Bhowmik 2013	**21.9 kg/m^2**	0.691 (0.641,0.737)	0.501 (0.471,0.531)	LR+ 1.385 (1.264,1.517)	Moderate	Slight increase in probability of dyslipidaemia
				LR- 0.617 (0.523,0.728)	Moderate	Slight decrease in probability of dyslipidaemia
Index test: waist circumference						
Men						
1 (n=842) Bhowmik 2013	**82 cm**	0.765 (0.713,0.810)	0.563 (0.521,0.604)	LR+ 1.751 (1.562,1.962)	Moderate	Slight increase in probability of dyslipidaemia
				LR- 0.417 (0.336,0.519)	Low	Moderate decrease in probability of dyslipidaemia
Women						
1 (n=1451) Bhowmik 2013	**81 cm**	0.618 (0.567,0.667)	0.641 (0.612,0.669)	LR+ 1.721 (1.537,1.928)	Moderate	Slight increase in probability of dyslipidaemia
				LR- 0.596 (0.519,0.685)	Moderate	Slight decrease in probability of dyslipidaemia
Index test: waist-to-hip ratio						
Men						
1 (n=842) Bhowmik 2013	**0.93**	0.569 (0.512,0.624)	0.707 (0.667,0.744)	LR+ 1.942 (1.649,2.287)	Low	Slight increase in probability of dyslipidaemia

	Cut-off	Diagnostic accuracy			Quality	Interpretation of effect
		Sensitivity	Specificity	Likelihood ratios		
				LR- 0.610 (0.529,0.702)	Moderate	Slight decrease in probability of dyslipidaemia
Women						
1 (n=1451) Bhowmik 2013	**0.86**	0.725 (0.677,0.769)	0.580 (0.550,0.609)	LR+ 1.726 (1.571,1.897)	Moderate	Slight increase in probability of dyslipidaemia
				LR- 0.474 (0.398,0.565)	Low	Slight increase in probability of dyslipidaemia
Index test: waist-to-height ratio						
Men						
1 (n=842) Bhowmik 2013	**0.51**	0.729 (0.676,0.777)	0.609 (0.567,0.649)	LR+ 1.864 (1.644,2.114)	Low	Slight increase in probability of dyslipidaemia
				LR- 0.445 (0.365,0.543)	Low	Moderate decrease in probability of dyslipidaemia
Women						
1 (n=1451) Bhowmik 2013	**0.53**	0.691 (0.641,0.737)	0.552 (0.522,0.581)	LR+ 1.542 (1.402,1.697)	Moderate	Slight increase in probability of dyslipidaemia
				LR- 0.560 (0.475,0.659)	Low	Slight increase in probability of dyslipidaemia

Accuracy data where GRADE analysis is not be possible

Black African/ Caribbean population

Table 86: Hypertension

Index test	Sample size	Cut-off	Likelihood ratio +/-	Sens	Spec	PPV/ NPV	Risk of bias
Sinaga 2018: optimal cut-off values were defined as a point on the curve where Youden's index is maximum							
Men: BMI	307	23.5	NR	0.68	0.65	NR	Moderate risk of bias.
Men: WC	307	0.47	NR	0.87	0.5	NR	
Men: WHR	307	89.22	NR	0.909	0.58	NR	
Men: WHtR	307	0.86	NR	0.9	0.47	NR	

Index test	Sample size	Cut-off	Likelihood ratio +/-	Sens	Spec	PPV/ NPV	Risk of bias
Women: BMI	397	26.2	NR	0.59	0.6	NR	Partially applicable due to the sampling
Women: WC	397	0.51	NR	0.77	0.47	NR	
Women: WHR	397	93	NR	0.43	0.79	NR	
Women: WHtR	397	0.89	NR	0.43	0.76	NR	

South Asian Population

Table 87: Type 2 diabetes

Index test	Sample size	Cut-off	Likelihood ratio +/-	Sens	Spec	PPV/ NPV	Risk of bias
Kapoor 2020: Optimal cut-offs were assigned utilising Youden's index							
Men: WHR	1060	0.96	NR	0.83	0.4	NR	Moderate risk of bias Directly applicable
Men: WC	1060	86	NR	0.33	0.36	NR	
Men: WHtR	1060	0.56	NR	0.82	0.75	NR	
Women: WHR	649	0.88	NR	0.87	0.43	NR	
Women: WC	649	83	NR	0.3	0.32	NR	
Women: WHtR	649	0.54	NR	0.82	0.82	NR	
Mohan 2007: shortest distance on the ROC curve							
Men: BMI	Unclear but 2350 people in total	23.1	NR	0.59 (0.52 – 0.66)	0.58 (0.55 – 0.62)	NR	High risk of bias Directly applicable
Men: WC		23.8	NR	0.6 (0.52 – 0.68	0.6 (0.57 – 0.62)	NR	
Women: BMI		88.2	NR	0.62 (0.55 – 0.69)	0.62 (0.58 – 0.65)	NR	
Women: WC		83.8	NR	0.62 (0.54 – 0.69)	0.61 (0.58 – 0.64)	NR	
Snehalatha 2003: Optimal values were extrapolated from the ROC curves.							
Men: BMI	4711	23	NR	0.671	0.627	NR	Moderate risk of bis

Index test	Sample size	Cut-off	Likelihood ratio +/-	Sens	Spec	PPV/ NPV	Risk of bias
Men: WC	4711	85	NR	0.637	0.671	NR	Directly applicable
Men: WHR	4711	0.92	NR	0.613	0.663	NR	
Women: BMI	5314	23	NR	0.668	0.529	NR	
Women: WC	5314	80	NR	0.697	0.564	NR	
Women: WHR	5314	0.85	NR	0.655	0.54	NR	

Table 88: Hypertension

Index test	Sample size	Cut-off	Likelihood ratio +/-	Sens	Spec	PPV/NPV	Risk of bias
Gupta 2012: optimal cut-offs calculated by trialling possibilities							
Men: BMI	271	22.8	NR	0.825	0.778	96.8 / 35.6	Moderate risk of bias Directly applicable
Men: WC	271	92	NR	0.778	0.778	96.5 / 30	
Men: WHR	271	0.9	NR	0.945	0.481	91.6 / 9.1	
Men: WHtR	271	0.56	NR	0.756	0.778	93.8 / 28.1	
Women: BMI	307	28.8	NR	0.644	0.686	84.1 / 42.8	
Women: WC	307	91.3	NR	0.572	0.616	79.4 / 35.8	
Women: WHR	307	0.78	NR	0.95	0.151	73.5 / 47.6	
Women: WHtR	307	0.43	NR	0.986	0	72.1 / 0	

See appendix H for full GRADE.

1.1.7 Economic evidence

1.1.7.1 Included studies

A systematic literature search was undertaken to identify published health economic evidence for both topics included in the scope of this guideline. The search returned 174 records which were sifted against the review protocol, but no economic studies were identified which were applicable to this review question. See the literature search strategy in appendix B and economic study selection flow chart in appendix I.

1.1.7.2 Excluded studies

All papers identified were excluded in the initial review of titles and abstracts. Hence no studies were selected for screening on full text.

1.1.8 Summary of included economic evidence

No economic studies were identified which were applicable to this review question.

1.1.9 Economic model

No economic modelling was conducted for this review question.

1.1.10 Unit costs

Not applicable.

1.1.11 The committee's discussion and interpretation of the evidence

1.1.11.1. The outcomes that matter most

The main objectives of this review were to identify the most accurate anthropometric measure or combination of methods and optimal boundary values in assessing health risks associated with overweight and obesity, including central obesity, in adults particularly those in black, Asian and minority ethnic groups. The objectives were linked to implications of acquiring conditions such as type 2 diabetes or cardiovascular disease.

Based on these objectives, the outcomes that mattered most to the committee were likelihood ratios and other indications of accuracy such as C-statistic, sensitivity and specificity. Sensitivity and specificity were equally important for this review and optimised cut-offs were extracted.

For positive and negative likelihood ratio, the clinical decision threshold was set at 2 and 0.5. For c-statistics a formal decision threshold was not set, but committee were interested in identifying measures that demonstrated good classification. A table of interpretation C-statistics, from poor to outstanding, was presented to the committee. The committee concentrated on comparisons of measures in the same study to identify where the interpretation of the accuracy of measures varied.

1.1.11.2 The quality of the evidence

The committee were seeking accuracy data linking the simple measures of interest with a number of health conditions, including, type 2 diabetes, cardiovascular disease, cancer, dyslipidaemia, hypertension and all-cause mortality. The review population was stratified by ethnicity linked to the categories utilised in the UK census. These were Black African/Caribbean, South Asian, Chinese, Asian (other), White, Arab, Other ethnicity, and multiple/mixed ethnic group.

Based on the objectives of the review, prognostic accuracy studies were prioritised. However, the committee highlighted that for certain ethnic groups, there may be a lack of prognostic accuracy evidence. Diagnostic accuracy studies were identified as a useful alternative. While these studies focus on screening rather than identifying future health risks, the committee highlighted that diagnostic accuracy evidence could be useful in providing evidence on accuracy and optimal cut off points. Therefore, if insufficient prognostic accuracy studies were identified for a specific ethnic group, comparative diagnostic accuracy studies were utilised.

Overall, 29 prognostic accuracy studies and 21 diagnostic accuracy studies were included in the review. The following number of studies were identified for each ethnic group:

- 3 prognostic accuracy studies reported on the black African/ Caribbean population
- 7 prognostic accuracy studies reported on Chinese population
- 6 prognostic accuracy studies reported on Asian (other) population
- 1 prognostic accuracy study reported on an Arab population
- 8 prognostic accuracy studies reported on other ethnic populations which included Iranian, Peruvian, Brazilian, and Hispanic populations.
- 6 prognostic accuracy studies reported on a white population

3 prognostic accuracy studies were identified for black African/ Caribbean populations. However, evidence was only identified for the risk of type 2 diabetes. Due to the lack of evidence for other health risks in this population, decision was made to utilise diagnostic accuracy evidence. 10 diagnostic accuracy studies were also for this population.

No prognostic accuracy evidence was identified in the South Asian population, therefore diagnostic accuracy evidence was utilised. 12 diagnostic accuracy studies were included for the South Asian population. No prognostic accuracy or diagnostic evidence was identified in people of multiple/mixed ethnic backgrounds and diagnostic accuracy evidence was sought.

The committee understood that prognostic evidence was directly relevant to the clinical question as this review is concerned with how the effects of overweight, obesity and central adiposity) might affect a person’s health over a period of years. Diagnostic evidence does not allow longitudinal evidence to captured as it is a cross-sectional picture of how a person’s degree of overweight, obesity and central adiposity is affecting their health currently. The committee agreed that an assessment of how a person’s adiposity is linked to their currently having a condition of interest is too late to be directly applicable but offers indirectly applicable data on the usefulness of these measures. However, the committee were cautious about over-interpreting cutoff values from the diagnostic accuracy data in South Asian and black African/ Caribbean populations. Overall, the quality of the evidence ranged from very low to high. Studies were mainly downgraded for risk of bias due to study attrition with significant numbers of the baseline sample lost to follow-up. A number of studies were also downgraded for indirectness due to not being a population sample due to the recruitment criteria and/or method of recruitment utilised. For example, in Okoro 2021 only medical doctors were recruited into the study rather than a stratified population sample and Sinaga 2018 recruited only employees of a university. Furthermore, in 1 study [Choi 2018] the applicability of the outcome of interest was potentially indirect. While this study focused on the development of hypertension, it was unclear if the authors directly measured hypertension or the risk factors of hypertension.

Majority of the studies included in the review, reported area under the curve (c-statistics), however the reporting varied with a number of studies not reporting the 95% confidence intervals. These studies were downgraded as imprecision could not be determined. Meta-analysis was possible for studies which reported 95% confidence intervals. The decision to meta-analyse was based on the similarity of the sample populations and this was mainly influenced by the sex of the people in the sample. In 17 of the 32 meta-analyses, high or very high heterogeneity was identified through I^2 results of over 50% and the quality downgraded appropriately.

Reporting of sensitivity, specificity and likelihood ratios varied considerably. Some studies reported information which allowed 2x2 tables to be calculated thus allowing likelihood ratios to be calculated. However, a number of studies did not provide this level of evidence which meant 2x2 tables could not be generated which further meant that GRADE analysis was not possible. While this evidence was useful, we could not apply GRADE which meant that it could not be evaluated alongside other evidence. Additionally, sensitivity, specificity and likelihood ratios were identified for specific cut-off points for the different measures. As no two studies identified the same cut-off point, meta-analysis of this data was not possible.

It was also noted that studies included in the review identified a range of cut- off points for the different anthropometric measures. While the committee noted it was useful to obtain accuracy data on an array of cut-off points, little evidence was identified on the accuracy of published cut-off points. Most of the cut-offs identified were optimum cut-offs calculated via the ROC curve analysis often utilising Youden's index from the study's own accuracy data. These optimum cut-offs found the best trade-off between sensitivity and specificity and emphasized both. 20 of the 29 included prognostic studies included cut-offs and of those studies such as Aekplakorn 2007 and Wannamethee, 2010, evaluated ranges of commonly used published cut-off values for the measures they were evaluating. The others all identified optimal cut-offs.

While a large evidence base was identified, as previously highlighted, prognostic accuracy evidence was not identified for all ethnicities. While diagnostic evidence demonstrated a potential prognostic value of the different measures in different populations, the committee noted that further research was required. Additionally, as previously highlighted, there was limited data on accuracy of published cut-off points. Based on this understanding the committee drafted a research recommendation to facilitate further research in prognostic value of different measures in accurately assessing future health risks. The committee also noted that great majority of studies included in the review were not UK based and it would be more appropriate to judge the accuracy of the measures in people within a UK context.

1.1.11.3 Benefits and harms

Comparison of anthropometric measures

The 2014 guidance on obesity identification, assessment and management (CG189), recommended that BMI should be used as a practical estimate for adiposity. BMI became the standard index of assessing obesity in 1990s and as such is well integrated into the current health and social care system. It benefits from being a calculation based on 2 simple measures, a person's weight and a person's height. However, as the 2014 guidance highlights, BMI should be interpreted with caution because it is not a direct measure of adiposity. The committee further noted that BMI is not a direct measure of central obesity, which is the accumulation of excess fat in the abdominal area and is related to health risks such as type 2 diabetes and cardiovascular disease.

The committee were keen to state that it is not the intention of the update to alter the definition of obesity, it was to give practical evidence-based advice on when a person should consider or be offered weight management services. This is understood to vary based on a number of factors but one of those being their ethnicity. If a person living with overweight or obesity can attend a weight management service and this reduces their chance of acquiring on of these conditions then this could have a positive effect on their life expectancy and also their quality of life.

As previously highlighted, all 29 prognostic accuracy studies and 17 diagnostic accuracy included studies reported the area under the curve (c-statistic). This evidence helped identify the classification accuracy of different measures in predicting or identifying different health risks. A number of studies did not provide sufficient evidence to apply GRADE analysis. However, the committee were content that this evidence broadly agreed with the mainstay of the evidence that could be GRADED.

The committee gave more attention to studies that compared measures head-to-head in the same individuals. Through this head-to-head analysis the committee attempted to identify the measures that demonstrated good classification accuracy. Quality of the evidence was also assessed through the prism of the GRADE rating for each study with the committee prioritising studies of the highest quality.

In the black African/Caribbean population, Comparisons of all 4 measures to predict type 2 diabetes categorised them equally as either good or adequate in the sex-based subgroups. Diagnostic accuracy studies compared all 4 measures to find type 2 diabetes, WC and WHtR were ‘good’ while BMI and WHR were ‘adequate’. A diagnostic test accuracy (DTA) study determined BMI as an ‘adequate’ classifier and WC, WHR, and WHtR as ‘poor’ classifiers to identify hypertension.

In the Chinese population, there was very little to separate each measure’s accuracy to predict type 2 diabetes or CVD. Hypertension was similar though a single study indicated WC, WHR, and WHtR were ‘adequate’ while BMI was ‘poor’ in a subgroup of people with ‘ideal blood pressure’.

In the South Asian population, the diagnostic accuracy studies provided C-statistic outcomes. All of the measures were categorised as ‘adequate’ classifiers of type 2 diabetes in studies that were meta-analysed and ‘good’ in a single study (not meta-analysed). The same findings were identified from the meta-analysis of studies which focused on hypertension. The diagnostic accuracy study looking for dyslipidaemia indicated BMI and WC were ‘good’ measures in men but all 4 were ‘adequate’ in women.

In other Asian populations (South Korean, Thai and Japanese populations) all 4 measures were compared in predicting hypertension and they found WC, WHR, and WHtR to be ‘adequate’ classifiers and BMI to be a ‘poor’ classifier in the sex-defined subgroups. In a comparison of all 4 measures, BMI, WC, and WHtR were ‘adequate’ predictors of CVD while WHR was ‘poor’.

In the white population, 1 study compared 3 measures and found BMI and WC to be ‘good’ predictors of type 2 diabetes while WHR was ‘poor’. A study comparing BMI to WC found both to be ‘good’ in both sexes. The other C-statistic comparison looked at BMI, WHR, and WHtR to predict all-cause mortality. All three were poor in a study combining analysis of men and women. A second study found WHR and WHtR to be ‘adequate’ in each separate sex while BMI was ‘poor’.

Evidence in an Arab population showed that when all 4 measures were compared in predicting type 2 diabetes, WHR was categorised as a ‘good’ classifier in both male and female subgroups. WC and WHtR were superior than BMI which was adequate for both subgroups.

In other ethnic groups (Iranian, Peruvian, Brazilian and Hispanic population) there was little to separate the C-statistics in predicting type 2 diabetes. WHtR led in 3 study subgroups, BMI in 2 and WC in 1. A single study compared all 4 measures to predict cardiovascular disease in Iranian people and found either waist-to-height ratio or waist-to-hip ratio to be most accurate. Results for BMI vs WC vs WHtR to predict hypertension in Brazilian people found all measures to be ‘adequate’ or ‘poor’ across the age and sex subgroups. No single measure stood out as being more accurate than the others.

One study was also identified that combined different measures in the black African/Caribbean population and white population. The study compared BMI vs WC vs WHR vs BMI+WC vs BMI+WHR. In black African/Caribbean ethnicity men WC alone was ‘good’ and BMI+WC was ‘good’ and in fact had an identical C-statistic. The other single measures and measure combination were all categorised as ‘adequate’. In women all of the measures and combinations of measures were ‘adequate’. In white ethnicity men BMI, WC and WC+BMI were ‘good’ and BMI+WHR was ‘adequate’. In women all measures and combinations of measures were ‘good’.

This evidence demonstrated that classification accuracy of different anthropometric measures varied among different populations, and overall were similar in their accuracy to predict and identify important health risks across the different populations. While most measures were identified as being ‘good’ or ‘adequate’ measures the committee did note that the evidence demonstrated serious imprecision which had an impact on the overall quality of the evidence. The committee did take this into consideration when drafting recommendations but based on their expertise, they highlighted that waist-to-height ratio offers a truer measure of central obesity through the use of waist circumference in the calculation. BMI, as with the other measures, demonstrated mixed classification accuracy of health risks in some populations. BMI is considered, due to its practical and the non-invasive measures needed to calculate, still of value. Therefore, the committee retained the existing recommendation which states that BMI should be used as practical measure of overweight and obesity in adults.

The 2014 guidance also included recommendations which stated that healthcare professionals should think about using waist circumference, in addition to BMI, in people with a BMI less than 35 kg/m^2. This is because waist circumference measurements are inaccurate in people with a BMI greater than 35 kg/m^2. Based on the evidence and their clinical knowledge, the committee further amended this recommendation to state that waist-to-height ratio should be used, in addition to BMI, in adults as an estimate for central adiposity and to help to assess and predict future health risks (such as type 2 diabetes and cardiovascular disease). It was again limited to people with a BMI less than or equal to 35 kg/m^2. This is again because waist circumference measurements are inaccurate in people with a BMI greater than 35 kg/m^2 and waist circumference measurement is necessary to calculate waist-to-height ratio.

In drafting the recommendations, the committee agreed to use overweight and obesity when talking about BMI and central adiposity when talking about waist-to-height ratio. Overweight and obesity have long been defined via BMI but, unlike waist-to-height ratio, it is not a proxy for “central” adiposity which is the accumulation of fat in the lower torso around the abdominal area.

The committee noted that addition of waist-to-height ratio to NICE recommendations is likely to result in more people being identified as at risk of health risks. It was also noted that height is already measured as part of BMI measurements. One benefit of using WHtR compared to measures such as WHR is that it only requires one additional measurement of waist circumference to be recorded. However, recording of waist measurements is poor in practice as currently there is no space dedicated to recording a person’s waist circumference or waist-to-height ratio a person’s electronic patient record.

The committee also highlighted that compared to other measures, particularly waist circumference, which was previously recommended, waist-to-height ratio is easy to calculate, interpret and conveys an accessible public health message that your waist should be half your height. The calculation is a person’s waist circumference divided by their height, both measured in the same units. Linked to this public health understanding that your weight should be no more than half your height the committee spoke about the potential of self-measurement. The committee further highlighted countries, such as Thailand, who have adopted the use of waist-to-height ratio and it has worked well in terms of self-measurement and reporting. The committee also noted that there is evidence to show that there is good agreement between technician- and self-reported measurements for WC and WHtR. However, it should be noted that this evidence was not assessed as part of this review question.

It was remarked that there are a number of practical and personal benefits to self-measurement whether it be waist-to-height ratio or BMI. It can be done during virtual GP appointments, virtual weight management appointments, or indeed other virtual appointments, which have become and potentially will continue to be, more common. Also, a person measuring their waist-to-height ratio or BMI at home and keeping a record of it allows a person to have an ongoing record allowing people to spot changes at an early stage. A further benefit is that self-measurement may reduce the stigma associated with a health professional doing the WC measurement that is required for the waist-to-height ratio calculation.

The act of measuring your own waist still requires a person to know where their waist is. There are videos by organisations such as the British Heart Foundation and Diabetes UK that offer advice on finding your waist, how to measure it, and where to record it. A method of recording or reporting these measurements is an important consideration to support continuous monitoring. Based on their clinical understanding, the committee recommended that healthcare professionals should encourage adults to self-measure and to seek lifestyle advice if they are at increased risk. It was also recommended that when a person seeks advice because their self-measurement indicates an increased health risk, further clinical measurements, including a confirmation of the waist-to-height ratio, may be necessary..

BMI boundary values

The 2014 guidance on obesity identification, assessment and management (CG189), included recommendations on how to define the degree of overweight or obesity in adults based on BMI. It was further recommended that BMI should be interpreted with caution in some population groups, such as people of Asian family origin. 2013 guidance on BMI: preventing ill health and premature death in black, Asian and other minority ethnic groups (PH46) referenced guidance on preventing type 2 diabetes: risk identification and interventions for individuals at high risk to recommend that lower BMI thresholds (23 kg/m^2 to indicate increased risk and 27.5 kg/m^2 to indicate high risk) should be used among Asian (South Asian and Chinese population) to trigger action to prevent type 2 diabetes.

A number of studies reported enough evidence to create 2x2 tables and to generate likelihood ratios and these were attached to optimal cut-offs. The committee accepted that the most likelihood ratios indicated very minor predictive ability of the measures for the conditions of interest. The committee were aware that there are a host of factors that, in addition to a person's central adiposity, influence their future chance of acquiring a condition of interest. This includes, for example, a person's existing comorbidities. However, for this question the aim was to find a simple measure that gives an indication of a person's risk rather than a formal risk score taking into account a person's wider health and lifestyle factors. Therefore, in line with this, the group accepted that likelihood ratios sitting between 0.5 and 2, may show no meaningful change, but highlighted that while it is important to look at the overall quality of the evidence, it is also important to apply the findings to the wider clinical context.

In the black African/ Caribbean population, 15 different diagnostic BMI cut-offs were reported for type 2 diabetes, hypertension, or dyslipidaemia. They varied from 22.5 kg/m^2 to 30 kg/m^2 but most sat around 25 kg/m^2. The likelihood ratios associated with these cut off points varied but generally demonstrated a slight increase or slight decrease in the probability of disease. These were mainly from diagnostic accuracy studies and as such were linked to a condition a person already has rather than a condition they will acquire in the future. Therefore, the committee understood that the "at risk" prognostic accuracy cutoff may be lower.

In the Chinese population, 9 different optimal prognostic BMI cut-offs were reported for type 2 diabetes or hypertension. They ranged from 22.7 kg/m^2 to 26.2 kg/m^2 with half below 24.4 kg/m^2. The likelihood ratios associated with these cut off points generally demonstrated a slight increase orslight decrease in the probability of disease.

In the South Asian population, 10 different optimal diagnostic likelihood ratios were reported for type 2 diabetes, hypertension, and dyslipidaemia. Optimal cut-offs ranged from 21.2 kg/m2 to 26.3 kg/m^2. The strongest likelihood ratios utilised cut-offs clustered around 22 kg/m^2. These were taken from diagnostic accuracy studies and as such were linked to a condition a person already has rather than a condition they will acquire in the future. Therefore, the committee understood that the “at risk” prognostic accuracy cutoff may be lower.

In other Asian populations (South Korean, Thai and Japanese populations), 5 different prognostic optimal likelihood ratios were reported for type 2 diabetes and hypertension. The cut-offs ranged from 23 kg/m^2 to 26.1 kg/m^2. The likelihood ratios associated with these cut off points demonstrated either moderate increase or slight decrease in the probability of disease.

In the White population, 6 different optimal prognostic likelihood ratios for type 2 diabetes and all-cause mortality were reported. They ranged from 25 kg/m^2 to 29 kg/m^2. The likelihood ratios associated with these cut off points demonstrated either moderate increase or slight decrease in the probability of disease. Optimal cut-off of 29 kg/m^2 and 30 kg/m^2 demonstrated moderate increase and moderate decrease in the probability of type 2 diabetes.

In other ethnic populations (Iranian, Brazilian, Peruvian and Hispanic populations), 6 different optimal prognostic likelihood ratios for type 2 diabetes and hypertension were reported. They ranged from 23.8 kg/m^2 to 29.3 kg/m^2. The likelihood ratios associated with these cut off points demonstrated either slight or moderate increase / decreases in the probability of disease. However, the Iranian cut-offs were lower than those in the Brazilian, Peruvian and Hispanic populations.

Based on the evidence identified, the committee agreed that the recommendation from PH46 to utilise lower BMI thresholds for Asian (South Asian and Chinese populations) was supported by evidence found for this review. PH46 also recommended extending these lower thresholds to people of the black African / Caribbean ethnicity and the evidence in this review supported this too. The committee also supported the use of these lower thresholds and agreed the evidence supported the addition of Arab, Iranian and other Asian ethnicity populations to this recommendation. They agreed to make an inclusive recommendation for lower thresholds in people with a Middle Eastern family background and this includes people with Arab and Iranian family backgrounds.

However, the committee noted that these thresholds should be used as a practical measure for overweight and obesity, as we know lower BMI thresholds indicate increased health risk in this population. The PH46 guideline utilised reduced thresholds but defined them by risk (increased/high) rather than with overweight or obesity. The committee agreed that there was stigma attached to assigning a person as increased or high risk and also assessing people with overweight or obesity. However, the committee agreed that assigning a person as high risk was more worrying than the term ‘living with obesity’.

They also highlighted that these lower thresholds are equivalent to the definitions used to define overweight and obesity in the general population and that it would be appropriate to use the same terminology in recommendations for people of ethnic backgrounds. It was understood that this could mean that people from these ethnic backgrounds who were not previously identified as living with overweight or obesity utilising the standard BMI definition, now would be. However, the committee were comfortable with this as lower thresholds offer better assessment of their future health risk and are in line with guidance produced by health organisations across the world. For example, the National Health Portal of India, states that in Asians, lower cut- offs of ≥23.0kg/m^2 and ≥25.0kg/m^2 should be used to define overweight and obesity due to risk factors and morbidities present in this population.

Similarly, the Ministry of Health in Singapore, highlight that a BMI of 23 to 27.4 kg/m^2 puts the population at a moderate risk of health problems such as type 2 diabetes and heart disease, while a BMI of 27.5 kg/m^2 and above means there is a high risk of health problems. The committee also highlighted that in practice, lower BMI thresholds are being used to refer people from black, Asian and minority ethnic groups into weight management services. This was also supported by Caleyachetty 2021 a significant paper in this field that was excluded from this review as it was not a prognostic or diagnostic accuracy study. However, it concludes that revisions of ethnicity-specific BMI cutoffs are needed to ensure that minority ethnic populations are required to ensure appropriate clinical surveillance to optimise the prevention, early diagnosis, and timely management of type 2 diabetes.

Based on this understanding, an updated recommendation was made utilising lower thresholds as practical measure of overweight and obesity across people with South Asian, Chinese, other Asian, Middle Eastern, or black African and African-Caribbean family background. The committee recognised that PH46 did not assign people to obesity class 1, 2 or 3 based on their BMI. However, they agreed that it is important to have these defined to support correct access to weight management services. They noted that generally, BMI obesity classes are reduced by 2.5 kg/m^2 for people of ethnic backgrounds. Based on this understanding, the committee recommended that obesity class 2 and obesity class 3 can be defined in people with South Asian, Middle Eastern, Chinese, other Asian, Middle Eastern, Black African or African-Caribbean family background by reducing the BMI thresholds for the general population by 2.5 kg/m^2.

The committee further highlighted the impact of these new recommendations on practice. It was noted that extending the lower thresholds to further ethnic groups may see a rise in the number of people engaging on weight management services. This could add extra pressure on those services though it was highlighted that engagement with weight management at an earlier stage may mean reduced numbers of people acquiring conditions such as type 2 diabetes and cardiovascular disease.

As new boundary values were identified for people from different ethnic groups, the committee noted that recommendation in CG189 which defines the degree of overweight or obesity mainly applies to the general population. The committee further noted that due to the limitations of BMI in estimating central obesity, it was important that even in people identified as being in a healthy weight range (BMI 18.5 kg/m^2 to 24.9 kg/m^2), healthcare professionals used their clinical judgement when interpreting the ‘healthy weight’ category. Based on their clinical expertise, the committee amended the recommendation to highlight that the healthy weight category should be interpreted with caution.

Waist-to-height ratio boundary values

Next the committee assessed boundary values for WHtR as a more direct but simple measure of central adiposity to sit alongside BMI. These values will be used to assess a person’s health risk associated with central adiposity. They were aware that the published cut-off for waist-to-height is 0.5 and is reported to be valid for both sexes and all ethnicities.

In the black African/Caribbean population, 5 different diagnostic cut-offs were reported for hypertension and 4 of cut-off pointes were 0.5 or 0.51. In the Chinese population, 7 different optimal prognostic cut-offs were reported for type 2 diabetes or hypertension and ranged from 0.49 to 0.52

Furthermore, in the South Asian population, 10 different optimal diagnostic likelihood ratios were reported for type 2 diabetes, hypertension, and dyslipidaemia. Optimal cut-offs ranged from 0.50 to 0.54. In other Asian ethnicities, cut-off points were identified for type 2 diabetes and hypertension and generally were around the 0.5 with one outlier at 0.43.

In the White population, 2 optimal prognostic cut-offs were reported for all-cause mortality and they were 0.48 for women and 0.53 for men. In other ethnic groups, 2 optimal prognostic cut-offs were reported for type 2 diabetes. They were 0.61 in men and 0.57 in women.

The committee agreed that the cut-offs reported by the included studies tended to sit around 0.5 or slightly above 0.5 for all sexes and ethnicities. This was a clear benefit as other measures such as waist circumference, which was previously recommended, requires different cut-offs based on sex and ethnicity. Based on this evidence they agreed to recommend thresholds of 0.5-0.59 to indicate increased risk. They were aware of a linear relationship linking WHtR with health risks. Based on their clinical understanding and knowledge of the wider evidence base, the committee recommended that a boundary value of 0.4 to 0.49 indicates no increased risk and 0.6 and above indicates further increased risk. A committee member pointed out that research indicates the number of people with a BMI of 30 or more is roughly equal to the number of people with a WHtR of 0.6 or greater indicating a parity between BMI and WHtR. The committee were content that these universal thresholds made it an ideal assessment of risks associated with obesity and promotes equality and equal access to care among a multi-ethnic population.

Utilising BMI and waist-to-height ratio in practice

2014 guidance included recommendation on basing assessment of the health risks with BMI and waist circumference. This guidance was originally published in the 2006 guideline and continued in the 2014 guideline. It was based upon a WHO report published in 2000 titled Obesity: preventing and managing the global epidemic: report of a WHO consultation. It stated the limitations of BMI as a measure of central adiposity and indicated that more direct measures of intra-abdominal fat could complement it well. The 2006 guideline followed by the 2014 guideline formulated a matrix combining BMI categories with waist circumference categories (low, high, very high). The guideline group agreed risk levels in this matrix by consensus with an additive relationship between risks associated with elevated BMI and elevated WC.

The committee considered sustaining this recommendation and utilising WHtR instead of WC in the matrix. However, they were did not think it was appropriate to specify the degree of risk associated with combinations of BMI and WHtR measurements as this evidence was not examined for this guideline. Also, the group did not wish to label people as, for example, “high” risk based on BMI and WHtR alone. There are many other factors involved in a person’s health risk and the committee wished to offer a less alarmist and more informative assessment of their risk. They were also aware that BMI and WHtR are both attempting to assess body fat and their effect is unlikely to be additive. Also, the BMI and WHtR accuracy data were often very similar when both were assessed in the same people.

The committee agreed that this suggests the measures are well correlated. One study, Stevens 2001 assessed BMI, WC and WHR alone and also with WC and WHR in combination with BMI. The combination methods were incrementally more accurate than the single measures. Despite the close correlation between measures, one advantage of WHtR is it can be used to define central adiposity and it can be used in people with high muscle mass and is not known to be inaccurate in older people. In line with the high correlation between measures and the lack of evidence for additive risk the committee decided not to recommend utilising both measures to assess levels of health risk. Instead, they agreed that overweight/obesity is defined utilising BMI and central adiposity and the associated health risks can be assessed utilising WHtR.

2014 guidance on obesity identification, assessment and management (CG189), recommends following a table linking BMI classification (overweight, obesity 1, obesity 2, obesity 3) to waist circumference (low, high, very high) and presence of comorbidities to indicate the “level” of intervention that should be offered. The committee indicated it was oversimplified and could be difficult to use practically. An example is seeing someone with obesity 1, with high waist circumference, but with no actual comorbidities. These people would be offered diet and physical activity via the table’s classification. However, if the person had a strong family history or presented with conditions such as polycystic ovary syndrome (PCOS) then it maybe be more suitable to consider pharmacotherapy with the diet and physical activity but this is not covered in the oversimplified table. The committee noted that a holistic approach is required when identifying interventions and stressed the importance of reaching a shared decision with people.

The committee consensus was to remove this table from the guideline but were aware it is the only place in the current guideline that links the measurement to possible interventions and wanted to make sure the same sentiments were captured in the new recommendations. Based on their understanding of practice, the committee recommended that level of interventions should be discussed with adults and should be dependent on the needs of the individual and taking factors such as ethnicity, weight related comorbidities, socioeconomic status and family history into consideration.

There was also consensus agreement to make a recommendation stating that people who have weight-related comorbidities can be offered a higher level of intervention regardless of their WHtR. Linked to this was an understanding that there are people with weight-related comorbidities, such as newly diagnosed type 2 diabetes, and those with BMI over 50, who would gain increased benefit from immediate weight management interventions. These people are often not offered appropriate interventions early enough and the committee made recommendations to address this. The committee also stated that the approach may be adjusted as needed, depending on the person's clinical need. This new recommendation cross refers to current recommendations in CG189 for people with a BMI over 35 kg/m^2 with recent onset of diabetes and people with BMI over 50.

Stigma and Communication of measures

This review looked for quantitative outcomes linked to the suitability of the measures in the various populations. However, no suitability outcomes were found. The committee discussed suitability when drafting the recommendations concentrating mainly on the waist-to-height ratio which is the new measure that is being brought in alongside BMI. Generally, there is stigma around measurements related to weight and for people living with obesity, identifying the waistline and potentially requiring a longer tape measure could be embarrassing and humiliating. The committee also indicated a tape measure not fitting could have profound effect on how a person feels about themselves. More generally the act of measuring someone’s waist can be invasive and potentially problematic for some people due to their beliefs and cultural practices. The cultural and religious sensitivities linked to overweight/obesity are also linked to being weighed or weighing themselves and these were discussed.

The committee agreed that health care professionals should remain sensitive to people’s needs and communicate early with people to assess their comfort with the process and what could be done to make it more agreeable and acceptable for them. The committee also highlighted that it is important that weight is discussed in a sensitive manner as terms such as overweight, obesity and high risk can be stigmatising. One of the unintended consequences this is that it runs a risk of perpetuating or triggering over emphasis on body image and size as well as disordered eating or eating disorders.

The group were also aware of other guidelines such as the Canadian clinical practice guideline on obesity in adults, which specifically highlights that obesity should be recognised as a chronic disease and healthcare professionals should ask the patient permission to offer advice to help treat obesity in an unbiased manner. The committee stated that it is very important for discussions linked to overweight or obesity to be agreed by the individual.

Healthcare professionals should also have the individual in mind when undertaking these measurements and recognising when it is not appropriate.

Based on this understanding the committee further recommended that healthcare professionals should ask for permission before discussing the degree of overweight, obesity and central adiposity. These discussions should also be conducted in a sensitive manner, recognising significant stigma associated with obesity which has negative effects on people's mental and physical health, potentially leads to further weight gain, and can impact on engagement with healthcare. This includes using words and language that avoid stigma and prejudice can help people with obesity engage in conversations about obesity and encourage weight loss.

1.1.11.4 Cost effectiveness and resource use

The committee noted that no relevant published economic evaluations had been identified and no additional economic analysis had been undertaken in this area. Therefore, they based the recommendations on the evidence, their knowledge and experience, and on existing NICE guidance.

The committee discussed the use of waist-to-height ratio in addition to BMI to indicate health risk and pointed out that the new recommendations would have a minimal cost impact to the NHS since tape measurements for waist circumference have already been widely used in primary care.

The committee recognised that the extension of lower BMI threshold values to additional minority groups (e.g. black African and African-Caribbean population groups) will increase the number of people who join weight management services. This might lead to significant resource impact related with intervention costs. However, the costs of weight-management services may be offset by savings from future obesity-related conditions avoided, depending on the cost-effectiveness of the weight management programmes.

When drafting the new recommendations, the committee noted that there might be additional training costs involved to help health care professionals identify people living with overweight or obesity. Given that there are already a number of existing training programmes for health care professionals to support weight management in adults (e.g. Healthy Weight Coach e-learning programme designed by NHS Health Education England), which are based on existing recommended practice and in line with the new recommendations. Therefore, such additional costs should have a minimal effect on costs and not result in a significant resource impact. In addition, the training could improve health care professionals' ability to support people living with overweight or obesity, reduce their stress level and time involved in implementing the new recommendations.

The committee also pointed out a likely increase in costs associated with promoting information or enhancing support to people who conduct self-measurement in terms of extra staff time needed to teach people how to measure themselves and where to record the data. However, the committee agreed that such costs are likely to be small and will be offset by better health outcomes. There are a number of free online resources available that could help people conduct self-measurements as well.

1.1.11.5 Other factors the committee took into account

BMI and waist-to-height ratio in subgroups

CG189 includes a recommendation to interpret BMI with caution in older adults. The committee were aware of evidence of a protective effect of a higher BMI in people over 65 years old. This is due to potential undernutrition because of multiple factors such as physiologic changes associated with aging, chronic disease, polypharmacy, and psychosocial changes in older adults. Undernutrition can go unrecognized because nutrition assessment is limited to one measure of BMI or weight. There is published research which indicates risk of all-cause mortality is lowest in people over 65 years old with BMIs between 27 and 28 kg/m^2 which is formally categorised as ‘overweight’.

In this review only Yang 2018 looked at BMI in an older population (over 60 years old). It indicated BMI (and WC and WHtR) were ‘adequate’ classifiers but it was hard to draw out firm conclusions of a protective effect of BMI from the likelihood ratio results of a single study. However, the committee agreed with the conclusions around potential undernutrition in older adults and made a consensus recommendation for people to utilise caution when interpreting the overweight BMI categories in people 65 years of age. The committee noted that being over 65 can limit the health and social care services people can access.

CG189 also included a recommendation to apply caution to interpretations of BMI in adults with high muscle mass. This is a known subgroup of people for whom BMI is not a suitable measure of obesity as they may well be living with overweight or obesity as defined by BMI but it’s linked to their muscle mass rather than central obesity i.e. the accumulation of excess fat in the abdominal area which is linked to the conditions of interest. No formal evidence was found in the review to support this recommendation, but it is a commonly known limitation of BMI and the committee were comfortable sustaining this recommendation. The committee noted that utilising waist-to-height ratio in adults with high muscle mass is appropriate as they tend not to live with central adiposity. The committee highlighted this by recommending that waist-to-height ratio is utilised instead of, rather than accompanying, BMI in this subgroup.

The committee discussed the potential challenges in utilising BMI or waist-to-height ratio in people with physical impairments and learning disabilities. People with skeletal dysplasia or inability to stand independently, such as wheelchair users, may well be unable to either measure height or waist circumference and may require their sitting height or demispan to be measured. It can also be difficult if a person is unable to get on scales independently or be lifted safely. Committee also noted that in order to measure height accurately a person needs to stand up straight and be still, and this might be difficult in people with mental health issues or learning disabilities. The committee agreed that the person tasked with undertaking these investigations will decide if it is appropriate, or indeed possible, on a person-by-person basis. Committee noted there is published Public Health England guidance on obesity and weight management for people with learning disabilities. Additionally, people with growth pattern abnormalities may require specialist assessment rather than utilising BMI or WHtR to assess their overweight/obesity or central adiposity.

Weight-related co-morbidities

Furthermore, 2014 CG189 guidance also highlighted that healthcare professionals should give adults information about their classification of obesity and the impact this has on risk factors for developing other long-term health problems. While this review focused on a number of health conditions associated with overweight and obesity, the committee mentioned other conditions linked to overweight and obesity such as metabolic syndrome, respiratory conditions, non-alcoholic fatty liver disease (NAFLD), and musculoskeletal conditions.

The search for evidence did uncover a number of studies linking metabolic syndrome as well as other conditions to relevant overweight and obesity measures. The committee accepted that this review could not cover all the conditions linked to overweight and obesity but wanted to acknowledge some of the other significant conditions. The committee also highlighted that people with overweight and obesity are at higher risk of more severe COVID-19 infection. Based on their clinical understanding and knowledge of the wider evidence base the committee amended the existing recommendation to include conditions such as respiratory conditions, musculoskeletal conditions, metabolic syndrome and NAFLD.

1.1.12 Recommendations supported by this evidence review

This evidence review supports recommendations 1.1.2 to 1.1.4 and 1.1.6 to 1.1.14 and the research recommendation on measurements for assessing health risks in adults

1.1.13 References – included studies

1.1.13.1 Prognostic accuracy

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1.1.13.2 Diagnostic accuracy

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Gupta, Shilpi and Kapoor, Satwanti (2012) Optimal cut-off values of anthropometric markers to predict hypertension in North Indian population. Journal of community health 37(2): 441-7

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Appendices

Appendix A – Review protocols

Review protocol for accuracy of anthropometric measures for measuring health risks associated with central adiposity in adults

ID	Field	Content
0.	PROSPERO registration number	Not applicable - Not registered
1.	Review title	Accuracy of simple measures of overweight and obesity to predict health outcomes in adults, particularly those in black, Asian and minority ethnic groups.
2.	Review question	What are the most accurate and suitable anthropometric methods and associated boundary values for different ethnicities, to assess the health risk associated with overweight and obesity in adults, particularly those in black, Asian and minority ethnic groups?
3.	Objective	1.1 To identify the most accurate anthropometric measures, or combination of methods, in measuring health risks associated with overweight and obesity, including central obesity, in adults particularly those in black, Asian and minority ethnic groups 1.2 To identify optimal boundary values for different anthropometric measures that are associated with health risks associated with overweight and obesity, including central obesity, in adults particularly those in black, Asian and minority ethnic groups.

4.	Searches	[Cochrane Central Register of Controlled Trials (CENTRAL) • Cochrane Database of Systematic Reviews (CDSR) • Database of Abstracts of Reviews of Effect (DARE) • Embase • MEDLINE • MEDLINE in Process • MEDLINE ePub ahead of print Searches will be restricted by: • Date: 1990-current • English language • Human studies • Prognosis studies • Diagnosis studies • Observational studies • Systematic reviews The searches will be re-run 6 weeks before final submission of the review and further studies retrieved for inclusion. The full search strategies will be published in the final review.
5.	Condition or domain being studied	Weight management
6.	Population	Inclusion: Adults aged 18 years and above. Population will be stratified by ethnicity: • White • Black African/ Caribbean • Asian (South Asian, Chinese, any other Asian background) • Other ethnic groups (Arab, any other ethnic group) • Multiple/mixed ethnic group Further stratification within these groups will be informed by the evidence identified.

		Exclusion: People included should not have a condition of interest prior to joining a longitudinal prognostic study
7.	Test	Method of measurement: • BMI • Waist-to-height ratio • Waist-to-hip ratio • Waist circumference Combinations of methods of measurement.
8.	Reference standard	Development of a condition of interest: • *Type 2 diabetes* • *Cardiovascular disease (including coronary heart disease)* • *Cancer* • *Dyslipidaemia* • *Hypertension* • *All-cause Mortality*
9.	Types of study to be included	**Prognostic accuracy studies:** • Relevant systematic reviews of prognostic accuracy evidence • Prospective/ retrospective cohort studies If insufficient prognostic accuracy studies[1] are identified for different ethnicities, comparative diagnostic accuracy studies will be utilised. Prognostic studies should have a minimum average group follow up of at least 3 years. [1:] This will be assessed for the review. There is no strict definition, but in discussion with the guideline committee we will consider whether we have enough to form the basis for a recommendation. Studies utilising univariate and multivariate analysis on relevant accuracy outcomes will be included.

10.	Other exclusion criteria	• Studies only evaluating bioimpedance
		• *Studies with mixed population (including people of white and BAME backgrounds) will only be considered if:*
		    o *Data has been reported for different ethnic groups.*
		    o *If study contains ≥80% of population from a particular ethnic group, the data will be extrapolated for that ethnic group.*
		• Studies published prior to 1990.
		• Non-English language studies
		• Conference abstracts

11.	Context	This review is part of an update of the NICE guideline preventing, assessing and managing overweight and obesity (update). This question updates review questions that were originally part of PH46 (BMI: preventing ill health and premature death in black, Asian and other minority ethnic groups) and CG189 (Obesity: identification, assessment and management). Overweight and obesity as well as a person's central adiposity, is a risk factor for development of health problems such as CVD, type 2 diabetes, hypertension, dyslipidaemia or some type of cancer. This question seeks to find a simple measurement method to assess a person's central adiposity with boundary values that indicate management. These boundary values are thought to vary depending on a person's ethnic background.
12.	Primary outcomes (critical outcomes)	Prediction of people later developing: 1. Type 2 diabetes 2. Cardiovascular disease (including coronary heart disease) 3. Cancer 4. Dyslipidaemia 5. Hypertension 6. All-cause mortality Prognostic/ diagnostic accuracy: • Sensitivity • Specificity • Likelihood ratios • Predictive values

		Optimal boundary values will be explored using the following methods: • Area under the curve (c-statistic) • Youden index
13.	Secondary outcomes (important outcomes)	Suitability of the method of measurement explored using validated questionnaires.
14.	Data extraction (selection and coding)	All references identified by the searches and from other sources will be uploaded into EPPI reviewer and de-duplicated. 10% of the abstracts will be reviewed by two reviewers, with any disagreements resolved by discussion or, if necessary, a third independent reviewer. The full text of potentially eligible studies will be retrieved and will be assessed in line with the criteria outlined above. A standardised form will be used to extract data from studies (see Developing NICE guidelines: the manual section 6.4). Study investigators may be contacted for missing data where time and resources allow. This review will make use of the priority screening functionality within the EPPI-reviewer software. A stopping rule will also be used. We will sift at least 60% of the database. After that we will stop screening if a further 5% (of the total records) of the records are sifted and not included.
15.	Risk of bias (quality) assessment	Risk of bias will be assessed using the preferred checklist as described in Developing NICE guidelines: the manual.
16.	Strategy for data synthesis	For details please see section 6 of Developing NICE guidelines: the manual. Meta-analysis will be conducted where appropriate. If there is high heterogeneity it will not be possible to undertake meta-analysis. Evidence will be stratified according to ethnicity.
17.	Analysis of sub-groups	Data will be broken up into the following subgroups where provided by the included studies.

		• Gender: m/f • Age
18.	Type and method of review	☐ Intervention ☐ Diagnostic ☒ Prognostic ☐ Qualitative ☐ Epidemiologic ☐ Service Delivery ☐ Other (please specify)
19.	Language	English
20.	Country	England
21.	Anticipated or actual start date	5th July 2021
22.	Anticipated completion date	8th September 2022
23.	Stage of review at time of this submission	**Review stage** / **Started** Preliminary searches / ☑

		Piloting of the study selection process	☑
		Formal screening of search results against eligibility criteria	☑
		Data extraction	☐
		Risk of bias (quality) assessment	☐
		Data analysis	☐
24.	Named contact	**5a. Named contact** Guideline Updates Team **5b Named contact e-mail** weightmgt@nice.org.uk **5e Organisational affiliation of the review** National Institute for Health and Care Excellence (NICE) and NICE Guideline Updates Team.	

25.	Review team members	From the Guideline Updates Team: Shreya Shukla Alexander Allen Lindsay Claxton Kusal Lokuge Miaoqing Yang Amy Finnegan
26.	Funding sources/sponsor	This systematic review is being completed by the Centre for Guidelines which receives funding from NICE.
27.	Conflicts of interest	All guideline committee members and anyone who has direct input into NICE guidelines (including the evidence review team and expert witnesses) must declare any potential conflicts of interest in line with NICE's code of practice for declaring and dealing with conflicts of interest. Any relevant interests, or changes to interests, will also be declared publicly at the start of each guideline committee meeting. Before each meeting, any potential conflicts of interest will be considered by the guideline committee Chair and a senior member of the development team. Any decisions to exclude a person from all or part of a meeting will be documented. Any changes to a member's declaration of interests will be recorded in the minutes of the meeting. Declarations of interests will be published with the final guideline.
28.	Collaborators	Development of this systematic review will be overseen by an advisory committee who will use the review to inform the development of evidence-based recommendations in line with section 3 of Developing NICE guidelines: the manual. Members of the guideline committee are available on the NICE website: [NICE guideline webpage].
29.	Other registration details	None
30.	Reference/URL for published protocol	None

31.	Dissemination plans	NICE may use a range of different methods to raise awareness of the guideline. These include standard approaches such as: • notifying registered stakeholders of publication • publicising the guideline through NICE's newsletter and alerts • issuing a press release or briefing as appropriate, posting news articles on the NICE website, using social media channels, and publicising the guideline within NICE.
32.	Keywords	Anthropometric measures, BMI, Waist-to-height ratio, waist-to-hip ratio, waist circumference, overweight, obesity, diabetes, cardiovascular disease, cancer, dyslipidaemia, hypertension, all-cause mortality.
33.	Details of existing review of same topic by same authors	None
34.	Current review status	☒ Ongoing ☐ Completed but not published ☐ Completed and published ☐ Completed, published and being updated ☐ Discontinued
35..	Additional information	None
36.	Details of final publication	www.nice.org.uk

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Appendix B – Methods

Reviewing research evidence

Review protocols

Review protocols were developed with the guideline committee to outline the inclusion and exclusion criteria used to select studies for each evidence review. Where possible, review protocols were prospectively registered in the PROSPERO register of systematic reviews.

Searching for evidence

Evidence was searched for each review question using the methods specified in the 2018 NICE guidelines manual.

Selecting studies for inclusion

All references identified by the literature searches and from other sources (for example, previous versions of the guideline or studies identified by committee members) were uploaded into EPPI reviewer software (version 5) and de-duplicated. Titles and abstracts were assessed for possible inclusion using the criteria specified in the review protocol. 10% of the abstracts were reviewed by two reviewers, with any disagreements resolved by discussion or, if necessary, a third independent reviewer.

The following evidence reviews made use of the priority screening functionality within the EPPI-reviewer software: [insert links to evidence reviews that used the priority screening functionality in EPPI]. This functionality uses a machine learning algorithm (specifically, an Stochastic Gradient Descent (SGD) classifier) to take information on features (1, 2 and 3 word blocks) in the titles and abstract of papers marked as being ‘includes’ or ‘excludes’ during the title and abstract screening process, and re-orders the remaining records from most likely to least likely to be an include, based on that algorithm. This re-ordering of the remaining records occurs every time 25 additional records have been screened. Research is currently ongoing as to what are the appropriate thresholds where reviewing of abstracts can be stopped, assuming a defined threshold for the proportion of relevant papers it is acceptable to miss on primary screening. As a conservative approach until that research has been completed, the following rules were adopted during the production of this guideline:

- In this review, at least 60% of the identified abstracts were a screened.

After this point, screening was only terminated if 5% of the total records were screened without a single new include being identified. As an additional check to ensure this approach did not miss relevant studies, systematic reviews (or qualitative evidence syntheses in the case of reviews of qualitative studies) were included in the review protocol and search strategy for all review questions. Relevant systematic reviews or qualitative evidence syntheses were used to identify any papers not found through the primary search. Committee members were also consulted to identify studies that were missed. If additional studies were found that were erroneously excluded during the priority screening process, the full database was subsequently screened.

The decision whether or not to use priority screening was taken by the reviewing team depending on the perceived likelihood that stopping criteria would be met, based on the size of the database, heterogeneity of studies included in the review and predicted number of includes. If it was thought that stopping criteria were unlikely to be met, priority screening was not used, and the full database was screened.

The full text of potentially eligible studies was retrieved and assessed according to the criteria specified in the review protocol. A standardised form was used to extract data from included studies. Study investigators were contacted for missing data when time and resources allowed (when this occurred, this was noted in the evidence review and relevant data was included).

Diagnostic accuracy studies

Individual diagnostic accuracy studies were quality assessed using the QUADAS-2 tool. Each individual study was classified into one of the following three groups:

- Low risk of bias – The true effect size for the study is likely to be close to the estimated effect size.
- Moderate risk of bias – There is a possibility the true effect size for the study is substantially different to the estimated effect size.
- High risk of bias – It is likely the true effect size for the study is substantially different to the estimated effect size.

Each individual study was also classified into one of three groups for directness, based on if there were concerns about the population, index features and/or reference standard in the study and how directly these variables could address the specified review question. Studies were rated as follows:

- Direct – No important deviations from the protocol in population, index feature and/or reference standard.
- Partially indirect – Important deviations from the protocol in one of the population, index feature and/or reference standard.
- Indirect – Important deviations from the protocol in at least two of the population, index feature and/or reference standard.

GRADE for diagnostic accuracy evidence

Evidence from diagnostic accuracy studies was initially rated as high-quality, and then downgraded according to the standard GRADE criteria (risk of bias, inconsistency, imprecision and indirectness) as detailed in Table 90 below.

The choice of primary outcome for decision making was determined by the committee and GRADE assessments were undertaken based on these outcomes.

In all cases, the downstream effects of diagnostic accuracy on patient- important outcomes were considered. This was done explicitly during committee deliberations and reported as part of the discussion section of the review detailing the likely consequences of true positive, true negative, false positive and false negative test results. In reviews where a decision model is being carried (for example, as part of an economic analysis), these consequences were incorporated here in addition.

Using likelihood ratios as the primary outcomes

The following schema (Table 89), adapted from the suggestions of Jaeschke et al. (1994), was used to interpret the likelihood ratio findings from diagnostic test accuracy reviews.

Table 89: Interpretation of likelihood ratios

Value of likelihood ratio	Interpretation
LR ≤ 0.1	**Very large** decrease in probability of disease
0.1 < LR ≤ 0.2	**Large** decrease in probability of disease
0.2 < LR ≤ 0.5	**Moderate** decrease in probability of disease
0.5 < LR ≤ 1.0	**Slight** decrease in probability of disease
1.0 < LR < 2.0	**Slight** increase in probability of disease
2.0 ≤ LR < 5.0	**Moderate** increase in probability of disease
5.0 ≤ LR < 10.0	**Large** increase in probability of disease
LR ≥ 10.0	**Very large** increase in probability of disease

The schema above has the effect of setting a clinical decision threshold for positive likelihoods ratio at 2, and a corresponding clinical decision threshold for negative likelihood ratios at 0.5. Likelihood ratios (whether positive or negative) falling between these thresholds were judged to indicate no meaningful change in the probability of disease.

GRADE assessments were only undertaken for positive and negative likelihood ratios but results for sensitivity and specificity are also presented alongside those data.

The committee were consulted to set 2 clinical decision thresholds for each measure: the likelihood ratio above (or below for negative likelihood ratios) which a test would be recommended, and a second below (or above for negative likelihood ratios) which a test would be considered of no clinical use. These were used to judge imprecision (see below). If the committee were unsure which values to pick, then the default values of 2 for LR+ and 0.5 for LR- were used based on Table 89, with the line of no effect as the second clinical decision line in both cases.

Table 90: Rationale for downgrading quality of evidence for diagnostic accuracy data

If studies could not be pooled in a meta-analysis, GRADE assessments were undertaken for each study individually and reported as separate lines in the GRADE profile.

GRADE criteria	Reasons for downgrading quality
Risk of bias	Not serious: If less than 33.3% of the weight in a meta-analysis came from studies at moderate or high risk of bias, the overall outcome was not downgraded. Serious: If greater than 33.3% of the weight in a meta-analysis came from studies at moderate or high risk of bias, the outcome was downgraded one level. Very serious: If greater than 33.3% of the weight in a meta-analysis came from studies at high risk of bias, the outcome was downgraded two levels.
Indirectness	Not serious: If less than 33.3% of the weight in a meta-analysis came from partially indirect or indirect studies, the overall outcome was not downgraded. Serious: If greater than 33.3% of the weight in a meta-analysis came from partially indirect or indirect studies, the outcome was downgraded one level. Very serious: If greater than 33.3% of the weight in a meta-analysis came from indirect studies, the outcome was downgraded two levels.
Inconsistency	Concerns about inconsistency of effects across studies, occurring when there is unexplained variability in the treatment effect demonstrated across studies (heterogeneity), after appropriate pre-specified subgroup analyses have been conducted. This was assessed using the I^2 statistic. Inconsistency was marked as not applicable if data on the outcome was only available from one study. Not serious: If the I^2 was less than 33.3%, the outcome was not downgraded.

GRADE criteria	Reasons for downgrading quality
	Serious: If the I^2 was between 33.3% and 66.7%, the outcome was downgraded one level. Very serious: If the I^2 was greater than 66.7%, the outcome was downgraded two levels.
Imprecision	If the 95% confidence interval for the outcome crossed one of the clinical decision thresholds, the outcome was downgraded one level. If the 95% confidence interval spanned both thresholds (crossing line of no effect), the outcome was downgraded twice. See the sections on 'Using sensitivity and specificity as the primary outcome' and 'Using likelihood ratios as the primary outcome' for a description of how clinical decision thresholds were agreed.
Publication bias	If the review team became aware of evidence of publication bias (for example, evidence of unpublished trials where there was evidence that the effect estimate differed in published and unpublished data), the outcome was downgraded once. If no evidence of publication bias was found for any outcomes in a review (as was often the case), this domain was excluded from GRADE profiles to improve readability.

Predictive accuracy studies

Individual prognostic studies that did not assess or develop a prediction model were quality assessed using the QUIPS checklist. Studies that developed or assessed a prediction model were assessed using the PROBAST checklist. Each individual study was classified into one of the following three groups:

- Low risk of bias – The true effect size for the study is likely to be close to the estimated effect size.
- Moderate risk of bias – There is a possibility the true effect size for the study is substantially different to the estimated effect size.
- High risk of bias – It is likely the true effect size for the study is substantially different to the estimated effect size.

Each individual study was also classified into one of three groups for directness, based on if there were concerns about the population, index features and/or reference standard in the study and how directly these variables could address the specified review question. Studies were rated as follows:

- Direct – No important deviations from the protocol in population, index feature and/or outcome to be predicted.
- Partially indirect – Important deviations from the protocol in one of the population, index feature and/or outcome to be predicted.
- Indirect – Important deviations from the protocol in at least two of the population, index feature and/or outcome to be predicted.

Modified GRADE for predictive accuracy data

GRADE has not been developed for use with predictive accuracy data, therefore a modified approach was applied using the GRADE framework. Evidence from cohort, cross sectional or case-control studies was initially rated as high-quality, and then assessed according to the same criteria as described in the section on standard GRADE criteria (risk of bias, inconsistency, imprecision and indirectness) as detailed in Table 92 below.

The choice of primary outcome for decision making was determined by the committee and GRADE assessments were undertaken based on these outcomes.

Using likelihood ratios as the primary outcomes

The following schema (Table 91), adapted from the suggestions of Jaeschke et al. (1994), was used to interpret the likelihood ratio findings from predictive accuracy reviews.

Table 91: Interpretation of likelihood ratios

Value of likelihood ratio	Interpretation
LR ≤ 0.1	**Very large** decrease in probability of disease or outcome
0.1 < LR ≤ 0.2	**Large** decrease in probability of disease or outcome
0.2 < LR ≤ 0.5	**Moderate** decrease in probability of disease or outcome
0.5 < LR ≤ 1.0	**Slight** decrease in probability of disease or outcome
1.0 < LR < 2.0	**Slight** increase in probability of disease or outcome
2.0 ≤ LR < 5.0	**Moderate** increase in probability of disease or outcome
5.0 ≤ LR < 10.0	**Large** increase in probability of disease or outcome
LR ≥ 10.0	**Very large** increase in probability of disease or outcome

The schema above has the effect of setting a clinical decision threshold for positive likelihoods ratio at 2, and a corresponding clinical decision threshold for negative likelihood ratios at 0.5. Likelihood ratios (whether positive or negative) falling between these thresholds were judged to indicate no meaningful change in the probability of disease.

GRADE assessments were only undertaken for positive and negative likelihood ratios but results for sensitivity and specificity are also presented alongside those data.

The committee were consulted to set 2 clinical decision thresholds for each measure: the likelihood ratio above (or below for negative likelihood ratios) which a prognostic feature would be incorporated into a recommendation, and a second below (or above for negative likelihood ratios) which a prognostic feature would be considered of no clinical use. These were used to judge imprecision (see below). If the committee were unsure which values to pick, then the default values of 2 for LR+ and 0.5 for LR- were used based on Table 91, with the line of no effect as the second clinical decision line in both cases.

Table 92: Rationale for downgrading quality of evidence for predictive accuracy data

If studies could not be pooled in a meta-analysis, GRADE assessments were undertaken for each study individually and reported as separate lines in the GRADE profile.

GRADE criteria	Reasons for downgrading quality
Risk of bias	Not serious: If less than 33.3% of the weight in a meta-analysis came from studies at moderate or high risk of bias, the overall outcome was not downgraded. Serious: If greater than 33.3% of the weight in a meta-analysis came from studies at moderate or high risk of bias, the outcome was downgraded one level. Very serious: If greater than 33.3% of the weight in a meta-analysis came from studies at high risk of bias, the outcome was downgraded two levels.
Indirectness	Not serious: If less than 33.3% of the weight in a meta-analysis came from partially indirect or indirect studies, the overall outcome was not downgraded. Serious: If greater than 33.3% of the weight in a meta-analysis came from partially indirect or indirect studies, the outcome was downgraded one level.

GRADE criteria	Reasons for downgrading quality
	Very serious: If greater than 33.3% of the weight in a meta-analysis came from indirect studies, the outcome was downgraded two levels.
Inconsistency	Concerns about inconsistency of effects across studies, occurring when there is unexplained variability in the treatment effect demonstrated across studies (heterogeneity), after appropriate pre-specified subgroup analyses have been conducted. This was assessed using the I^2 statistic. Inconsistency was marked as not applicable if data on the outcome was only available from one study. Not serious: If the I^2 was less than 33.3%, the outcome was not downgraded. Serious: If the I^2 was between 33.3% and 66.7%, the outcome was downgraded one level. Very serious: If the I^2 was greater than 66.7%, the outcome was downgraded two levels.
Imprecision	If the 95% confidence interval for the outcome crossed one of the clinical decision thresholds, the outcome was downgraded one level. If the 95% confidence interval spanned both thresholds, the outcome was downgraded twice. See the sections on 'Using sensitivity and specificity as the primary outcome' and 'Using likelihood ratios as the primary outcome' for a description of how clinical decision thresholds were agreed.
Publication bias	If the review team became aware of evidence of publication bias (for example, evidence of unpublished trials where there was evidence that the effect estimate differed in published and unpublished data), the outcome was downgraded once. If no evidence of publication bias was found for any outcomes in a review (as was often the case), this domain was excluded from GRADE profiles to improve readability.

Methods for combining c-statistics

C-statistics were assessed in a similar manner to likelihood ratios using the categories in Table 93 below.

Table 93: Interpretation of c-statistics

Value of c-statistic	Interpretation
c-statistic <0.6	**Poor classification accuracy**
0.6 ≤ c-statistic <0.7	**Adequate classification accuracy**
0.7 ≤ c-statistic <0.8	**Good classification accuracy**
0.8 ≤ c-statistic <0.9	**Excellent classification accuracy**
0.9 ≤ c-statistic < 1.0	**Outstanding classification accuracy**

Meta-analyses were carried out using the metamisc package in R v3.4.0, which confines the analysis results to between 0 and 1 matching the limited range of values that c-statistics can take. Random effects meta-analysis was used when the I^2 was 50% or greater.

In any meta-analyses where some (but not all) of the data came from studies at high risk of bias, a sensitivity analysis was conducted, excluding those studies from the analysis. Results from both the full and restricted meta-analyses are reported. Similarly, in any meta-analyses where some (but not all) of the data came from indirect studies, a sensitivity analysis was conducted, excluding those studies from the analysis.

A modified version of GRADE was carried out to assess the quality of the meta-analysed c-statistics as follows:

- imprecision - the 95% CI boundaries were examined and if they crossed 2 categories of test classification accuracy then the study was downgraded once (imprecision rated as serious); if the boundaries crossed 3 categories (or more) then the study was downgraded twice (very serious imprecision).
- Inconsistency, indirectness and risk of bias were determined using the methods in the section on GRADE for prognostic or diagnostic test accuracy evidence.

In cases where meta-analyses could not be carried out due to the large numbers of studies without 95% CI, the following decision rules were used to assess risk of bias, indirectness, imprecision and inconsistency for each outcome:

1. Risk of bias and indirectness were assessed as detailed in Table 90 (diagnostic accuracy studies) and Table 92 (predictive accuracy studies) but using the study weight by population, rather than weight in the meta-analysis.
2. Imprecision
    a. Single study with 95% CI: the 95% CI boundaries were examined and if they crossed 2 categories of test classification accuracy then the study was downgraded once (imprecision rated as serious); if the boundaries crossed 3 categories then the study was downgraded twice (very serious imprecision).
    b. Multiple studies with 95% CI: the individual studies were rated as in a. and then if >33.3% of the studies by population weight were rated serious then the analysis was downgraded once; if > 33.33% were rated very serious the analysis was downgraded twice.
    c. Single study or multiple studies without 95% CI: the mean sample size was calculated and if this was < 250 then the analysis was downgraded twice (very serious); if it was >250, but < 500 the analysis was downgraded once (serious); if the mean was > 500 people/study then the analysis was not downgraded (Not serious).
    d. Multiple studies with and without 95% CI: the studies without 95% CI were analysed as in 2c; those with 95% CI were analysed as in 2b. The results were averaged, but the number of studies in each group were also taken into account with the result that if there were a lot more studies in one group compared to the other then that group rating would be used. In general, Not serious and serious or Not serious and very serious were averaged to serious; serious and very serious resulted in a very serious rating.
3. Inconsistency
    a. Single study with or without 95% CI: N/A
    b. Multiple studies with or without 95% CI: the highest and lowest point estimates were examined. If they spanned < 2 categories of c-statistic classification accuracy the analysis was rated as Not serious for inconsistency; if they spanned 2 categories this was rated as serious and ≥ 3 categories was rated as very serious.

Appendix C - Literature search strategies

Search design and peer review

A NICE information specialist conducted the literature searches for the evidence review. The searches were originally run on 5th July 2021 and 6th July 2021. This search report is compliant with the requirements of PRISMA-S.

The MEDLINE strategy below was quality assured (QA) by a trained NICE information specialist. All translated search strategies were peer reviewed to ensure their accuracy. Both procedures were adapted from the 2016 PRESS Checklist.

The principal search strategy was developed in MEDLINE (Ovid interface) and adapted, as appropriate, for use in the other sources listed in the protocol, taking into account their size, search functionality and subject coverage.

Review management

The search results were managed in EPPI-Reviewer v5. Duplicates were removed in EPPI-R5 using a two-step process. First, automated deduplication is performed using a high-value algorithm. Second, manual deduplication is used to assess 'low-probability' matches. All decisions made for the review can be accessed via the deduplication history.

Prior work

A set of test papers were gathered from a range of source; one paper had been identified by a committee member, 4 were selected a random from a HTA systematic review (Simmonds M et al 2015), 23 papers were supplied by the analysts. The references were sources from previous surveillance searches.

Limits and restrictions

English language limits were applied in adherence to standard NICE practice and the review protocol.

Limits to exclude [e.g. letters, editorials, news, conferences] were applied in adherence to standard NICE practice and the review protocol.

The search was limited from 1st January 1990 to 5th July 2021 as defined in the review protocol.

The limit to remove animal studies in the searches was the standard NICE practice, which has been adapted from: Dickersin, K., Scherer, R., & Lefebvre, C. (1994). Systematic Reviews: Identifying relevant studies for systematic reviews. BMJ, 309(6964), 1286.

Search filters

- Systematic reviews filters:
  - Lee, E. et al. (2012) An optimal search filter for retrieving systematic reviews and meta-analyses. *BMC Medical Research Methodology,* 12(1), 51.

    In MEDLINE, the standard NICE modifications were used: pubmed.tw added; systematic review.pt added from MeSH update 2019.

In Embase, the standard NICE modifications were used: pubmed.tw added to line medline.tw.

- Diagnosis filter:
  - McMaster Diagnosis filter [optimal]
- Prognosis filter:
  - McMaster Prognosis filter [sensitive]
- Observational filter:
  - The terms used for observational studies are standard NICE practice that have been developed in house.
  - For the prognosis searches, the observational filter was adapted to remove case-control studies, cross-sectional studies, case series studies.

Clinical/public health searches

Cost effectiveness searches

The NICE cost utility (specific) filter was applied to the Medline and Embase searches to identify cost utility studies.

- Cost Utility filter is available via the ISSG search filters resource

Key decisions

- The searches for this question were done in two parts, the first search was limited to finding systematic reviews and observational studies, from an amended list from a population strategy that had been narrowed using the prognostic filter.
- The second search limited the population terms using a diagnostic filter, this was then limited to systematic review and observational studies. The observational studies filter was not amended for this search.
- The population terms (line 1-47) were the same for both the prognostic and diagnostic searches.

1 # Clinical/public health searches

2 ## Main search – Databases

Database	searched	atabase platform	ıbase segment or version	lo. of results downloaded
Cochrane Central Register of Controlled Trials (CENTRAL)	/07/2021	ochrane	ıe 7 of 12, July 2021	6195
:hrane Database of Systematic Reviews (CDSR)	/07/2021	ochrane	ıe 7 of 12, July 2021	34
base of Abstracts of Reviews of Effect (DARE)	/07/2021	CRD	n/a	138
Embase (Ovid) [prognostic]	/07/2021	OVID	to 2021 July 02	3991
IEDLINE (Ovid) [prognostic]	/07/2021	OVID	46 to July 02, 2021	5211
IEDLINE In-Process (Ovid) [prognostic]	/07/2021	OVID	46 to July 02, 2021	55
EDLINE Epub Ahead of Print [prognostic]	/07/2021	OVID	uly 02, 2021	34
Embase (Ovid) [Diagnostic]	/07/2021	OVID	to 2021 July 02	1344
IEDLINE (Ovid) [Diagnostic]	/07/2021	OVID	46 to July 02, 2021	2059
IEDLINE In-Process (Ovid) [Diagnostic]	/07/2021	OVID	46 to July 02, 2021	26
EDLINE Epub Ahead of Print [Diagnostic]	/07/2021	OVID	uly 02, 2021	14

3

Main search – Additional methods

Additional method	Date searched	of results downloaded
analysts added an additional 54 records to the EPPI review. These records were found in previous guidelines/surveillance/pubmed searches or were suggested by the committee.	y – 1st September 2021	54

Re-run search – Databases

The guideline for weight management adopted a living guideline approach and published recommendations for each review question once they were made. Therefore, re-runs were not required for RQ1.1 and RQ1.2.

Search strategy history

Database name: Cochrane – CDSR and CENTRAL

1 [mh Obesity[mj]] 9567

2 [mh "Body Weight"[mj]] 12380

3 [mh "Body Fat Distribution"[mj]] 163

4 [mh "Body Composition"[mj]] 1043

5 [mh "Adipose Tissue"[mj]] 1267

6 (obes* or overweight or adipos* or anthropometr* or nonobese* or nonoverweight*):ti 23134

7 ((obes* or overweight or adipos* or anthropometr* or nonobese* or nonoverweight*) near/4 (central* or measur* or mark* or identify* or identifi* or indicat* or categor* or threshold*)):ab 7819

8 (body near/1 (fat or composit* or weight*)):ti 5268

9 (body near/1 (fat or composit* or weight*) near/4 (central* or measur* or mark* or identify* or identifi* or indicat* or categor* or threshold*)):ab4865

10 ((visceral or subcutaneous) near/1 (fat or fatty or tissue*)):ti416

11 ((visceral or subcutaneous) near/1 (fat or fatty or tissue*) near/4 (central* or measur* or mark* or identify* or identifi* or indicat* or categor* or threshold*)):ab 293

12 {or 1-11} 39696

13 [mh "body mass index"[mj]] 5

14 ("body mass ind*" or "body fat ind*" or BMI or BFI):ti 650

15 ("body mass ind*" or "body fat ind*" or BMI or BFI):ab 43065

16 [mh "Waist-Hip Ratio"[mj]] 2

17 [mh "Body Weights and Measures"[mj]] 11907

18 (waist near/3 (height* or hip*)):ti 55

19 (waist near/3 (height* or hip*) near/1 (ratio* or measur* or mark* or cut-off* or identify* or identifi* or indicat*)):ab 2136

20 (WHR or WHtR):ti,ab 735

21 (waist near/1 circumference*):ti,ab 7902

22 {or 13-21} 55185

23 12 and 22 21809

24 {or 13-15} 43166

25 {or 16-21} 19958

26 24 and 25 7939

27	23 or 26	23723
28	MeSH descriptor: [Cardiovascular Diseases] explode all trees	111228
29	MeSH descriptor: [Stroke] explode all trees	10417
30	MeSH descriptor: [Hypertension] this term only	17958
31	MeSH descriptor: [Dyslipidemias] this term only	1287
32	((cardiovascular or cardio* or coronary* or vascular or peripheral or heart* or cardiac* or myocardia*) near/3 (disease* or disorder* or syndrome* or failure* or event* or attack* or arrest* or infarct* or condition* or dysfunct*)):ti,ab	120023
33	(CVD or CHD or IHD or MI):ti,ab	20089
34	(circulatory near/3 (disease* or disorder*)):ti,ab	733
35	(angina* or hypertensi* or atrial-fibrillat* or stroke* or poststroke* or cerebrovascular* or cerebro-vascular*):ti,ab	128534
36	((brain* or cereb* or lacunar) near/2 (accident* or infarc*)):ti,ab	5482
37	((high or raised or elevated or increas*) near/2 (blood pressure or bp)):ti,ab	19581
38	high cholesterol:ti,ab	16852
39	(hypercholesterolaemi* or hypercholesterolemi* or hypercholesteraemi* or hypercholesteremi* or hyperlipidaemi* or hyperlipidemi* or Dyslipidaemi* or Dyslipidemi):ti,ab	10839
40	cardiometabolic-risk*:ti,ab	1626
41	{or 28-40}	284015
42	MeSH descriptor: [Diabetes Mellitus, Type 2] this term only	18433
43	MeSH descriptor: [Metabolic Syndrome] this term only	1865
44	(diabetes near/2 type 2):ti,ab	40220
45	(diabetes near/2 type II):ti,ab	3999
46	(diabetes near/2 (non insulin or noninsulin)):ti,ab	4055
47	(NIDDM or T2DM or T2D):ti,ab	11156
48	((metabolic or dysmetabolic or reaven or insulin resistance) near/2 syndrome*):ti,ab	6702
49	{or 42-48}	53759
50	MeSH descriptor: [Neoplasms] explode all trees	82548
51	(cancer* or neoplas* or oncolog* or malignan* or tumour* or tumor* or carcinoma* or adenocarcinoma*):ti,ab	209034
52	{or 50-51}	226678
53	41 or 49 or 52	528189

54 27 and 53 with Cochrane Library publication date Between Jan 1990 and Jul 2021, in Cochrane Reviews 38

55 27 and 53 with Publication Year from 1990 to 2021, in Trials 9797

56 "conference":pt or (clinicaltrials or trialsearch):so 553775

57 55 not 56 6195

Database name: DARE

1 MeSH DESCRIPTOR Obesity EXPLODE ALL TREES IN DARE 637

2 MeSH DESCRIPTOR Body Weight IN DARE 171

3 MeSH DESCRIPTOR body fat distribution IN DARE3

4 MeSH DESCRIPTOR Body Composition IN DARE 75

5 MeSH DESCRIPTOR Adipose Tissue EXPLODE ALL TREES IN DARE 31

6 ((obes* or overweight or adipos* or anthropometr* or nonobese* or nonoverweight*)):TI IN DARE 385

7 (((obes* or overweight or adipos* or anthropometr* or nonobese* or nonoverweight*) adj4 (central* or measur* or mark* or identify* or identifi* or indicat* or categor* or threshold*))) IN DARE 73

8 ((body adj1 (fat or composit* or weight*))):TI IN DARE 70

9 ((body adj1 (fat or composit* or weight*) adj4 (central* or measur* or mark* or identify* or identifi* or indicat* or categor* or threshold*))) IN DARE 31

10 (((visceral or subcutaneous) adj1 (fat or fatty or tissue*))):TI IN DARE 5

11 (((visceral or subcutaneous) adj1 (fat or fatty or tissue*) adj4 (central* or measur* or mark* or identify* or identifi* or indicat* or categor* or threshold*))) IN DARE 1

12 #1 OR #2 OR #3 OR #4 OR #5 OR #6 OR #7 OR #8 OR #9 OR #10 OR #11 909

13 MeSH DESCRIPTOR body mass index IN DARE 236

14 (("body mass ind*" or "body fat ind*" or BMI or BFI)) IN DARE 786

15 MeSH DESCRIPTOR waist-hip ratio IN DARE 4

16 MeSH DESCRIPTOR body weights and measures IN DARE 6

17 ((waist adj3 (height* or hip*))):TI IN DARE 2

18 ((waist adj3 (height* or hip*) adj1 (ratio* or measur* or mark* or cut-off* or identify* or identifi* or indicat*))) IN DARE 27

19 ((WHR or WHtR)) IN DARE 0

20 ((waist adj1 circumference*)) IN DARE 73

21 #13 OR #14 OR #15 OR #16 OR #17 OR #18 OR #19 OR #20 803

22 #12 AND #21 351

23 #13 OR #14 786

24 #15 OR #16 OR #17 OR #18 OR #19 OR #20 90

25 #23 AND #24 73

26 #22 OR #25 372

27 MeSH DESCRIPTOR Cardiovascular Diseases EXPLODE ALL TREES IN DARE 5989

28 MeSH DESCRIPTOR Stroke EXPLODE ALL TREES IN DARE 878

29 MeSH DESCRIPTOR Hypertension IN DARE 504

30 MeSH DESCRIPTOR Dyslipidemias IN DARE 40

31 (((cardiovascular or cardio* or coronary* or vascular or peripheral or heart* or cardiac* or myocardia*) adj3 (disease* or disorder* or syndrome* or failure* or event* or attack* or arrest* or infarct* or condition* or dysfunct*))) IN DARE 4324

32 ((CVD or CHD or IHD or MI)) IN DARE 549

33 ((circulatory adj3 (disease* or disorder*))) IN DARE 2

34 ((angina* or hypertensi* or atrial-fibrillat* or stroke* or poststroke* or cerebrovascular* or cerebro-vascular*)) IN DARE 3824

35 (((brain* or cereb* or lacunar) adj2 (accident* or infarc*))) IN DARE 118

36 (((high or raised or elevated or increas*) adj2 (blood pressure or bp))) IN DARE 136

37 (high cholesterol) IN DARE 15

38 ((hypercholesterol?emi* or hypercholester?emi* or hyperlipid?emi* or Dyslipid?emi*)) IN DARE 380

39 (cardiometabolic-risk*) IN DARE 9

40 #27 OR #28 OR #29 OR #30 OR #31 OR #32 OR #33 OR #34 OR #35 OR #36 OR #37 OR #38 OR #39 8375

41 MeSH DESCRIPTOR Diabetes Mellitus, Type 2 IN DARE 685

42 MeSH DESCRIPTOR Metabolic Syndrome IN DARE 0

43 ((diabetes adj2 type 2)) IN DARE 699

44 ((diabetes adj2 type II)) IN DARE 1

45 ((diabetes adj2 (non insulin or noninsulin))) IN DARE 4

46 ((NIDDM or T2DM or T2D)) IN DARE 16

47 (((metabolic or dysmetabolic or reaven or insulin resistance) adj2 syndrome*)) IN DARE 87

48 (#41 OR #42 OR #43 OR #44 OR #45 OR #46 OR #47) IN DARE 775

49 MeSH DESCRIPTOR Neoplasms EXPLODE ALL TREES 12016

50 ((cancer* or neoplas* or oncolog* or malignan* or tumo?r* or carcinoma* or adenocarcinoma*)) IN DARE 8135

51 (#49 OR #50) IN DARE 8428

52 (#40 OR #48 OR #51) IN DARE 16571

53 (#26 and #52) IN DARE FROM 1990 TO 2021 138

Database name: Medline [Prognostic]

1 exp *Obesity/ or *Body Weight/ or *body fat distribution/ or exp *Body Composition/ or exp *Adipose Tissue/ (255863)

2 (obes* or overweight or adipos* or anthropometr* or nonobese* or nonoverweight*).ti. (161823)

3 ((obes* or overweight or adipos* or anthropometr* or nonobese* or nonoverweight*) adj4 (central* or measur* or mark* or identify* or identifi* or indicat* or categor* or threshold*)).ab. (47515)

4 (body adj1 (fat or composit* or weight*)).ti. (27783)

5 (body adj1 (fat or composit* or weight*) adj4 (central* or measur* or mark* or identify* or identifi* or indicat* or categor* or threshold*)).ab. (18068)

6 ((visceral or subcutaneous) adj1 (fat or fatty or tissue*)).ti. (3524)

7 ((visceral or subcutaneous) adj1 (fat or fatty or tissue*) adj4 (central* or measur* or mark* or identify* or identifi* or indicat* or categor* or threshold*)).ab. (1605)

8 or/1-7 (313457)

9 *body mass index/ (22403)

10 ("body mass ind*" or "body fat ind*" or BMI or BFI).ti. (19123)

11 ("body mass ind*" or "body fat ind*" or BMI or BFI).ab. /freq=2 (111508)

12 *waist-hip ratio/ or *"body weights and measures"/ (3117)

13 (waist adj3 (height* or hip*)).ti. (842)

14 (waist adj3 (height* or hip*) adj1 (ratio* or measur* or mark* or cut-off* or identify* or identifi* or indicat*)).ab. /freq=2 (2500)

15 (WHR or WHtR).ti. (47)

16 (WHR or WHtR).ab. /freq=2 (3765)

17 (waist adj1 circumference*).ti. (1808)

18 (waist adj1 circumference*).ab. /freq=2 (7255)

19 or/9-18 (124530)

20 8 and 19 (58896)

21 or/9-11 (117305)

22 or/12-18 (15378)

23 21 and 22 (8153)

24 20 or 23 (60872)

25 exp Cardiovascular Diseases/ or exp Stroke/ or Hypertension/ or Dyslipidemias/ (2507987)

26 ((cardiovascular or cardio* or coronary* or vascular or peripheral or heart* or cardiac* or myocardia*) adj3 (disease* or disorder* or syndrome* or failure* or event* or attack* or arrest* or infarct* or condition* or dysfunct*)).ti,ab. (870724)

27 (CVD or CHD or IHD or MI).ti,ab. (99281)

28 (circulatory adj3 (disease* or disorder*)).ti,ab. (5434)

29 (angina* or hypertensi* or atrial-fibrillat* or stroke* or poststroke* or cerebrovascular* or cerebro-vascular*).ti,ab. (729583)

30 ((brain* or cereb* or lacunar) adj2 (accident* or infarc*)).ti,ab. (33801)

31 ((high or raised or elevated or increas*) adj2 (blood pressure or bp)).ti,ab. (46855)

32 high cholesterol.ti,ab. (6679)

33 (hypercholesterol?emi* or hypercholester?emi* or hyperlipid?emi* or Dyslipid?emi*).ti,ab. (87349)

34 cardiometabolic-risk*.ti,ab. (5044)

35 or/25-34 (2910858)

36 *Diabetes Mellitus, Type 2/ (117022)

37 *Metabolic Syndrome/ (26728)

38 (diabetes adj2 type 2).ti,ab. (114709)

39 (diabetes adj2 type II).ti,ab. (8250)

40 (diabetes adj2 (non insulin or noninsulin)).ti,ab. (9634)

41 (NIDDM or T2DM or T2D).ti,ab. (33597)

42 ((metabolic or dysmetabolic or reaven or insulin resistance) adj2 syndrome$).ti,ab. (47862)

43 or/36-42 (204638)

44 exp *Neoplasms/ (3073109)

45 (cancer* or neoplas* or oncolog* or malignan$ or tumo?r* or carcinoma* or adenocarcinoma*).ti,ab. (3083040)

46 or/44-45 (3881287)

47 35 or 43 or 46 (6651029)

48 incidence.sh. (278079)

49 exp mortality/ (402176)

50 follow-up studies.sh. (666060)

51 prognos:.tw. (557258)

52 predict:.tw. (1410817)

53 course:.tw. (569117)

54 or/48-53 (3275882)

55 24 and 47 and 54 (8396)

56 Observational Studies as Topic/ (6536)

57 Observational Study/ (103100)

58 Epidemiologic Studies/ (8734)

59 exp Cohort Studies/ (2169797)

60 Comparative Study.pt. (1893237)

61 (cohort adj (study or studies)).tw. (199356)

62 cohort analy$.tw. (7735)

63 (follow up adj (study or studies)).tw. (47130)

64 (observational adj (study or studies)).tw. (99977)

65 longitudinal.tw. (224846)

66 prospective.tw. (535364)

67 retrospective.tw. (497170)

68 or/56-67 (4093532)

69 (MEDLINE or pubmed).tw. (192740)

70 systematic review.tw. (148166)

71 systematic review.pt. (157935)

72 meta-analysis.pt. (136627)

73 intervention$.ti. (137272)

74 or/69-73 (435723)

75 68 or 74 (4426102)

76 55 and 75 (5407)

77 limit 76 to ed=19900101-20211231 (5382)

78 animals/ not humans/ (4822395)

79 77 not 78 (5380)

80 limit 79 to yr="1990-Current" (5380)

81 limit 80 to english language (5243)

82 limit 81 to (letter or historical article or comment or editorial or news or case reports) (32)

83 81 not 82 (5211)

Database name: Medline in process [Prognostic]

1 exp *Obesity/ or *Body Weight/ or *body fat distribution/ or exp *Body Composition/ or exp *Adipose Tissue/ (0)

2 (obes* or overweight or adipos* or anthropometr* or nonobese* or nonoverweight*).ti. (4793)

3 ((obes* or overweight or adipos* or anthropometr* or nonobese* or nonoverweight*) adj4 (central* or measur* or mark* or identify* or identifi* or indicat* or categor* or threshold*)).ab. (1562)

4 (body adj1 (fat or composit* or weight*)).ti. (685)

5 (body adj1 (fat or composit* or weight*) adj4 (central* or measur* or mark* or identify* or identifi* or indicat* or categor* or threshold*)).ab. (505)

6 ((visceral or subcutaneous) adj1 (fat or fatty or tissue*)).ti. (85)

7 ((visceral or subcutaneous) adj1 (fat or fatty or tissue*) adj4 (central* or measur* or mark* or identify* or identifi* or indicat* or categor* or threshold*)).ab. (38)

8 or/1-7 (6448)

9 *body mass index/ (0)

10 ("body mass ind*" or "body fat ind*" or BMI or BFI).ti. (663)

11 ("body mass ind*" or "body fat ind*" or BMI or BFI).ab. /freq=2 (4061)

12 *waist-hip ratio/ or *"body weights and measures"/ (0)

13 (waist adj3 (height* or hip*)).ti. (22)

14 (waist adj3 (height* or hip*) adj1 (ratio* or measur* or mark* or cut-off* or identify* or identifi* or indicat*)).ab. /freq=2 (70)

15 (WHR or WHtR).ti. (1)

16 (WHR or WHtR).ab. /freq=2 (108)

17 (waist adj1 circumference*).ti. (62)

18 (waist adj1 circumference*).ab. /freq=2 (222)

19 or/9-18 (4309)

20 8 and 19 (1471)

21 or/9-11 (4132)

22 or/12-18 (394)

23 21 and 22 (217)

24 20 or 23 (1536)

25 exp Cardiovascular Diseases/ or exp Stroke/ or Hypertension/ or Dyslipidemias/ (0)

26 ((cardiovascular or cardio* or coronary* or vascular or peripheral or heart* or cardiac* or myocardia*) adj3 (disease* or disorder* or syndrome* or failure* or event* or attack* or arrest* or infarct* or condition* or dysfunct*)).ti,ab. (20472)

27 (CVD or CHD or IHD or MI).ti,ab. (3203)

28 (circulatory adj3 (disease* or disorder*)).ti,ab. (53)

29 (angina* or hypertensi* or atrial-fibrillat* or stroke* or poststroke* or cerebrovascular* or cerebro-vascular*).ti,ab. (16288)

30 ((brain* or cereb* or lacunar) adj2 (accident* or infarc*)).ti,ab. (579)

31 ((high or raised or elevated or increas*) adj2 (blood pressure or bp)).ti,ab. (887)

32 high cholesterol.ti,ab. (122)

33 (hypercholesterol?emi* or hypercholester?emi* or hyperlipid?emi* or Dyslipid?emi*).ti,ab. (2118)

34 cardiometabolic-risk*.ti,ab. (341)

35 or/25-34 (34164)

36 *Diabetes Mellitus, Type 2/ (0)

37 *Metabolic Syndrome/ (0)

38 (diabetes adj2 type 2).ti,ab. (4844)

39 (diabetes adj2 type II).ti,ab. (170)

40 (diabetes adj2 (non insulin or noninsulin)).ti,ab. (22)

41 (NIDDM or T2DM or T2D).ti,ab. (2029)

42 ((metabolic or dysmetabolic or reaven or insulin resistance) adj2 syndrome$).ti,ab. (1530)

43 or/36-42 (6401)

44 exp *Neoplasms/ (0)

45 (cancer* or neoplas* or oncolog* or malignan$ or tumo?r* or carcinoma* or adenocarcinoma*).ti,ab. (73189)

46 or/44-45 (73189)

47 35 or 43 or 46 (108411)

48	incidence.sh. (0)
49	exp mortality/ (0)
50	follow-up studies.sh. (0)
51	prognos:.tw. (18237)
52	predict:.tw. (45122)
53	course:.tw. (8970)
54	or/48-53 (64431)
55	24 and 47 and 54 (166)
56	Observational Studies as Topic/ (0)
57	Observational Study/ (0)
58	Epidemiologic Studies/ (0)
59	exp Cohort Studies/ (0)
60	Comparative Study.pt. (1)
61	(cohort adj (study or studies)).tw. (10631)
62	cohort analy$.tw. (394)
63	(follow up adj (study or studies)).tw. (716)
64	(observational adj (study or studies)).tw. (5245)
65	longitudinal.tw. (8344)
66	prospective.tw. (15611)
67	retrospective.tw. (20721)
68	or/56-67 (47804)
69	(MEDLINE or pubmed).tw. (10453)
70	systematic review.tw. (10000)
71	systematic review.pt. (237)
72	meta-analysis.pt. (60)
73	intervention$.ti. (5456)
74	or/69-73 (19093)
75	68 or 74 (63817)
76	55 and 75 (55)
77	limit 76 to dt=19900101-20211231 (55)
78	animals/ not humans/ (0)
79	77 not 78 (55)

80 limit 79 to yr="1990-Current" (55)

81 limit 80 to english language (55)

82 limit 81 to (letter or historical article or comment or editorial or news or case reports) (0)

83 81 not 82 (55)

Database name: Medline epub ahead [Prognostic]

1 exp *Obesity/ or *Body Weight/ or *body fat distribution/ or exp *Body Composition/ or exp *Adipose Tissue/ (0)

2 (obes* or overweight or adipos* or anthropometr* or nonobese* or nonoverweight*).ti. (2813)

3 ((obes* or overweight or adipos* or anthropometr* or nonobese* or nonoverweight*) adj4 (central* or measur* or mark* or identify* or identifi* or indicat* or categor* or threshold*)).ab. (984)

4 (body adj1 (fat or composit* or weight*)).ti. (433)

5 (body adj1 (fat or composit* or weight*) adj4 (central* or measur* or mark* or identify* or identifi* or indicat* or categor* or threshold*)).ab. (318)

6 ((visceral or subcutaneous) adj1 (fat or fatty or tissue*)).ti. (48)

7 ((visceral or subcutaneous) adj1 (fat or fatty or tissue*) adj4 (central* or measur* or mark* or identify* or identifi* or indicat* or categor* or threshold*)).ab. (35)

8 or/1-7 (3890)

9 *body mass index/ (0)

10 ("body mass ind*" or "body fat ind*" or BMI or BFI).ti. (488)

11 ("body mass ind*" or "body fat ind*" or BMI or BFI).ab. /freq=2 (2867)

12 *waist-hip ratio/ or *"body weights and measures"/ (0)

13 (waist adj3 (height* or hip*)).ti. (12)

14 (waist adj3 (height* or hip*) adj1 (ratio* or measur* or mark* or cut-off* or identify* or identifi* or indicat*)).ab. /freq=2 (44)

15 (WHR or WHtR).ti. (0)

16 (WHR or WHtR).ab. /freq=2 (80)

17 (waist adj1 circumference*).ti. (21)

18 (waist adj1 circumference*).ab. /freq=2 (114)

19 or/9-18 (3024)

20 8 and 19 (951)

21 or/9-11 (2929)

22 or/12-18 (222)

23 21 and 22 (127)

24 20 or 23 (984)

25 exp Cardiovascular Diseases/ or exp Stroke/ or Hypertension/ or Dyslipidemias/ (0)

26 ((cardiovascular or cardio* or coronary* or vascular or peripheral or heart* or cardiac* or myocardia*) adj3 (disease* or disorder* or syndrome* or failure* or event* or attack* or arrest* or infarct* or condition* or dysfunct*)).ti,ab. (15357)

27 (CVD or CHD or IHD or MI).ti,ab. (2394)

28 (circulatory adj3 (disease* or disorder*)).ti,ab. (55)

29 (angina* or hypertensi* or atrial-fibrillat* or stroke* or poststroke* or cerebrovascular* or cerebro-vascular*).ti,ab. (13038)

30 ((brain* or cereb* or lacunar) adj2 (accident* or infarc*)).ti,ab. (497)

31 ((high or raised or elevated or increas*) adj2 (blood pressure or bp)).ti,ab. (658)

32 high cholesterol.ti,ab. (86)

33 (hypercholesterol?emi* or hypercholester?emi* or hyperlipid?emi* or Dyslipid?emi*).ti,ab. (1331)

34 cardiometabolic-risk*.ti,ab. (206)

35 or/25-34 (26245)

36 *Diabetes Mellitus, Type 2/ (0)

37 *Metabolic Syndrome/ (0)

38 (diabetes adj2 type 2).ti,ab. (2763)

39 (diabetes adj2 type II).ti,ab. (100)

40 (diabetes adj2 (non insulin or noninsulin)).ti,ab. (34)

41 (NIDDM or T2DM or T2D).ti,ab. (1092)

42 ((metabolic or dysmetabolic or reaven or insulin resistance) adj2 syndrome$).ti,ab. (824)

43 or/36-42 (3630)

44 exp *Neoplasms/ (0)

45 (cancer* or neoplas* or oncolog* or malignan$ or tumo?r* or carcinoma* or adenocarcinoma*).ti,ab. (48473)

46 or/44-45 (48473)

47 35 or 43 or 46 (74718)

48 incidence.sh. (0)

49 exp mortality/ (0)

50 follow-up studies.sh. (0)

51 prognos:.tw. (11751)

52	predict:.tw. (36058)
53	course:.tw. (8593)
54	or/48-53 (51004)
55	24 and 47 and 54 (86)
56	Observational Studies as Topic/ (0)
57	Observational Study/ (4)
58	Epidemiologic Studies/ (0)
59	exp Cohort Studies/ (0)
60	Comparative Study.pt. (0)
61	(cohort adj (study or studies)).tw. (9566)
62	cohort analy$.tw. (355)
63	(follow up adj (study or studies)).tw. (642)
64	(observational adj (study or studies)).tw. (4624)
65	longitudinal.tw. (7378)
66	prospective.tw. (13597)
67	retrospective.tw. (19743)
68	or/56-67 (43439)
69	(MEDLINE or pubmed).tw. (9545)
70	systematic review.tw. (9608)
71	systematic review.pt. (126)
72	meta-analysis.pt. (104)
73	intervention$.ti. (4158)
74	or/69-73 (17317)
75	68 or 74 (57796)
76	55 and 75 (35)
77	limit 76 to dt=19900101-20211231 (35)
78	animals/ not humans/ (0)
79	77 not 78 (35)
80	limit 79 to yr="1990-Current" (35)
81	limit 80 to english language (34)
82	limit 81 to (letter or historical article or comment or editorial or news or case reports) (0)
83	81 not 82 (34)

Database name: Embase [Prognostic]

1 exp *obese patient/ or exp *obesity/ or *body weight/ or exp *body composition/ or exp *adipose tissue/ (343970)

2 (obes* or overweight or adipos* or anthropometr* or nonobese* or nonoverweight*).ti. (248280)

3 ((obes* or overweight or adipos* or anthropometr* or nonobese* or nonoverweight*) adj4 (central* or measur* or mark* or identify* or identifi* or indicat* or categor* or threshold*)).ab. (82099)

4 (body adj1 (fat or composit* or weight*)).ti. (38434)

5 (body adj1 (fat or composit* or weight*) adj4 (central* or measur* or mark* or identify* or identifi* or indicat* or categor* or threshold*)).ab. (29749)

6 ((visceral or subcutaneous) adj1 (fat or fatty or tissue*)).ti. (4879)

7 ((visceral or subcutaneous) adj1 (fat or fatty or tissue*) adj4 (central* or measur* or mark* or identify* or identifi* or indicat* or categor* or threshold*)).ab. (2948)

8 or/1-7 (456102)

9 *body mass/ (35086)

10 ("body mass ind*" or "body fat ind*" or BMI or BFI).ti. (34182)

11 ("body mass ind*" or "body fat ind*" or BMI or BFI).ab. /freq=2 (232692)

12 *waist hip ratio/ or *morphometry/ (3591)

13 (waist adj3 (height* or hip*)).ti. (1390)

14 (waist adj3 (height* or hip*) adj1 (ratio* or measur* or mark* or cut-off* or identify* or identifi* or indicat*)).ab. /freq=2 (4172)

15 (WHR or WHtR).ti. (105)

16 (WHR or WHtR).ab. /freq=2 (6406)

17 (waist adj1 circumference*).ti. (2945)

18 (waist adj1 circumference*).ab. /freq=2 (13709)

19 or/9-18 (252381)

20 8 and 19 (99959)

21 or/9-11 (240433)

22 or/12-18 (26137)

23 21 and 22 (14189)

24 20 or 23 (103619)

25 exp cardiovascular disease/ or exp cerebrovascular accident/ or hypertension/ or dyslipidemia/ (4307322)

26 ((cardiovascular or cardio* or coronary* or vascular or peripheral or heart* or cardiac* or myocardia*) adj3 (disease* or disorder* or syndrome* or failure* or event* or attack* or arrest* or infarct* or condition* or dysfunct*)).ti,ab. (1433748)

27 (CVD or CHD or IHD or MI).ti,ab. (198181)

28 (circulatory adj3 (disease* or disorder*)).ti,ab. (5660)

29 (angina* or hypertensi* or atrial-fibrillat* or stroke* or poststroke* or cerebrovascular* or cerebro-vascular*).ti,ab. (1247242)

30 ((brain* or cereb* or lacunar) adj2 (accident* or infarc*)).ti,ab. (55651)

31 ((high or raised or elevated or increas*) adj2 (blood pressure or bp)).ti,ab. (74728)

32 high cholesterol.ti,ab. (10688)

33 (hypercholesterol?emi* or hypercholester?emi* or hyperlipid?emi* or Dyslipid?emi*).ti,ab. (159260)

34 cardiometabolic-risk*.ti,ab. (9153)

35 or/25-34 (4758959)

36 *non insulin dependent diabetes mellitus/ (152844)

37 *metabolic syndrome X/ (42695)

38 (diabetes adj2 type 2).ti,ab. (214820)

39 (diabetes adj2 type II).ti,ab. (15630)

40 (diabetes adj2 (non insulin or noninsulin)).ti,ab. (11490)

41 (NIDDM or T2DM or T2D).ti,ab. (72312)

42 ((metabolic or dysmetabolic or reaven or insulin resistance) adj2 syndrome$).ti,ab. (88930)

43 or/36-42 (349825)

44 exp *neoplasm/ (3513091)

45 (cancer* or neoplas* or oncolog* or malignan$ or tumo?r* or carcinoma* or adenocarcinoma*).ti,ab. (4707753)

46 or/44-45 (5396085)

47 35 or 43 or 46 (9779627)

48 incidence.sh. (458247)

49 exp mortality/ (1164922)

50 follow-up studies.sh. (107)

51 prognos:.tw. (994903)

52 predict:.tw. (2316883)

53 course:.tw. (877026)

54 or/48-53 (4962613)

55	24 and 47 and 54 (15596)
56	(MEDLINE or pubmed).tw. (304215)
57	exp systematic review/ or systematic review.tw. (362151)
58	meta-analysis/ (219105)
59	intervention$.ti. (220125)
60	or/56-59 (750317)
61	Clinical study/ (155798)
62	Family study/ (25315)
63	Longitudinal study/ (157525)
64	Retrospective study/ (1096542)
65	comparative study/ (905917)
66	Prospective study/ (694714)
67	Randomized controlled trials/ (206139)
68	66 not 67 (686826)
69	Cohort analysis/ (723590)
70	cohort analy$.tw. (14813)
71	(Cohort adj (study or studies)).tw. (348402)
72	(follow up adj (study or studies)).tw. (66443)
73	(observational adj (study or studies)).tw. (193528)
74	(epidemiologic$ adj (study or studies)).tw. (111603)
75	case series.tw. (117588)
76	prospective.tw. (933248)
77	retrospective.tw. (994773)
78	or/61-65,68-77 (4113252)
79	60 or 78 (4707344)
80	55 and 79 (6514)
81	limit 80 to english language (6392)
82	81 not (letter or editorial).pt. (6384)
83	nonhuman/ not (human/ and nonhuman/) (4817226)
84	82 not 83 (6376)
85	limit 84 to yr="1990-Current" (6360)
86	limit 85 to dc=19900101-20211231 (6360)

87 (conference abstract or conference paper or conference proceeding or "conference review").pt. (4892778)

88 86 not 87 (3991)

Database name: Medline [Diagnostic]

1 exp *Obesity/ or *Body Weight/ or *body fat distribution/ or exp *Body Composition/ or exp *Adipose Tissue/ (255863)

2 (obes* or overweight or adipos* or anthropometr* or nonobese* or nonoverweight*).ti. (161823)

3 ((obes* or overweight or adipos* or anthropometr* or nonobese* or nonoverweight*) adj4 (central* or measur* or mark* or identify* or identifi* or indicat* or categor* or threshold*)).ab. (47515)

4 (body adj1 (fat or composit* or weight*)).ti. (27783)

5 (body adj1 (fat or composit* or weight*) adj4 (central* or measur* or mark* or identify* or identifi* or indicat* or categor* or threshold*)).ab. (18068)

6 ((visceral or subcutaneous) adj1 (fat or fatty or tissue*)).ti. (3524)

7 ((visceral or subcutaneous) adj1 (fat or fatty or tissue*) adj4 (central* or measur* or mark* or identify* or identifi* or indicat* or categor* or threshold*)).ab. (1605)

8 or/1-7 (313457)

9 *body mass index/ (22403)

10 ("body mass ind*" or "body fat ind*" or BMI or BFI).ti. (19123)

11 ("body mass ind*" or "body fat ind*" or BMI or BFI).ab. /freq=2 (111508)

12 *waist-hip ratio/ or *"body weights and measures"/ (3117)

13 (waist adj3 (height* or hip*)).ti. (842)

14 (waist adj3 (height* or hip*) adj1 (ratio* or measur* or mark* or cut-off* or identify* or identifi* or indicat*)).ab. /freq=2 (2500)

15 (WHR or WHtR).ti. (47)

16 (WHR or WHtR).ab. /freq=2 (3765)

17 (waist adj1 circumference*).ti. (1808)

18 (waist adj1 circumference*).ab. /freq=2 (7255)

19 or/9-18 (124530)

20 8 and 19 (58896)

21 or/9-11 (117305)

22 or/13-18 (13014)

23 21 and 22 (7909)

24 20 or 23 (60811)

25 exp Cardiovascular Diseases/ or exp Stroke/ or Hypertension/ or Dyslipidemias/ (2507987)

26 ((cardiovascular or cardio* or coronary* or vascular or peripheral or heart* or cardiac* or myocardia*) adj3 (disease* or disorder* or syndrome* or failure* or event* or attack* or arrest* or infarct* or condition* or dysfunct*)).ti,ab. (870724)

27 (CVD or CHD or IHD or MI).ti,ab. (99281)

28 (circulatory adj3 (disease* or disorder*)).ti,ab. (5434)

29 (angina* or hypertensi* or atrial-fibrillat* or stroke* or poststroke* or cerebrovascular* or cerebro-vascular*).ti,ab. (729583)

30 ((brain* or cereb* or lacunar) adj2 (accident* or infarc*)).ti,ab. (33801)

31 ((high or raised or elevated or increas*) adj2 (blood pressure or bp)).ti,ab. (46855)

32 high cholesterol.ti,ab. (6679)

33 (hypercholesterol?emi* or hypercholester?emi* or hyperlipid?emi* or Dyslipid?emi*).ti,ab. (87349)

34 cardiometabolic-risk*.ti,ab. (5044)

35 or/25-34 (2910858)

36 *Diabetes Mellitus, Type 2/ (117022)

37 *Metabolic Syndrome/ (26728)

38 (diabetes adj2 type 2).ti,ab. (114709)

39 (diabetes adj2 type II).ti,ab. (8250)

40 (diabetes adj2 (non insulin or noninsulin)).ti,ab. (9634)

41 (NIDDM or T2DM or T2D).ti,ab. (33597)

42 ((metabolic or dysmetabolic or reaven or insulin resistance) adj2 syndrome$).ti,ab. (47862)

43 or/36-42 (204638)

44 exp *Neoplasms/ (3073109)

45 (cancer* or neoplas* or oncolog* or malignan$ or tumo?r* or carcinoma* or adenocarcinoma*).ti,ab. (3083040)

46 or/44-45 (3881287)

47 35 or 43 or 46 (6651029)

48 sensitiv:.mp. (1581578)

49 predictive value:.mp. (278127)

50 accurac:.tw. (353278)

51 or/48-50 (1990392)

52 24 and 47 and 51 (3538)

53	Observational Studies as Topic/ (6536)
54	Observational Study/ (103100)
55	Epidemiologic Studies/ (8734)
56	exp Cohort Studies/ (2169797)
57	Comparative Study.pt. (1893237)
58	(cohort adj (study or studies)).tw. (199356)
59	cohort analy$.tw. (7735)
60	(follow up adj (study or studies)).tw. (47130)
61	(observational adj (study or studies)).tw. (99977)
62	longitudinal.tw. (224846)
63	prospective.tw. (535364)
64	retrospective.tw. (497170)
65	Cross-Sectional Studies/ (375692)
66	cross sectional.tw. (323772)
67	or/53-66 (4395385)
68	(MEDLINE or pubmed).tw. (192740)
69	systematic review.tw. (148166)
70	systematic review.pt. (157935)
71	meta-analysis.pt. (136627)
72	intervention$.ti. (137272)
73	or/68-72 (435723)
74	67 or 73 (4722557)
75	52 and 74 (2130)
76	limit 75 to ed=19900101-20211231 (2128)
77	animals/ not humans/ (4822395)
78	76 not 77 (2127)
79	limit 78 to yr="1990-Current" (2127)
80	limit 79 to english language (2064)
81	limit 80 to (letter or historical article or comment or editorial or news or case reports) (5)
82	80 not 81 (2059)

Database name: Medline in process [Diagnostic]

1 exp *Obesity/ or *Body Weight/ or *body fat distribution/ or exp *Body Composition/ or exp *Adipose Tissue/ (0)

2 (obes* or overweight or adipos* or anthropometr* or nonobese* or nonoverweight*).ti. (4793)

3 ((obes* or overweight or adipos* or anthropometr* or nonobese* or nonoverweight*) adj4 (central* or measur* or mark* or identify* or identifi* or indicat* or categor* or threshold*)).ab. (1562)

4 (body adj1 (fat or composit* or weight*)).ti. (685)

5 (body adj1 (fat or composit* or weight*) adj4 (central* or measur* or mark* or identify* or identifi* or indicat* or categor* or threshold*)).ab. (505)

6 ((visceral or subcutaneous) adj1 (fat or fatty or tissue*)).ti. (85)

7 ((visceral or subcutaneous) adj1 (fat or fatty or tissue*) adj4 (central* or measur* or mark* or identify* or identifi* or indicat* or categor* or threshold*)).ab. (38)

8 or/1-7 (6448)

9 *body mass index/ (0)

10 ("body mass ind*" or "body fat ind*" or BMI or BFI).ti. (663)

11 ("body mass ind*" or "body fat ind*" or BMI or BFI).ab. /freq=2 (4061)

12 *waist-hip ratio/ or *"body weights and measures"/ (0)

13 (waist adj3 (height* or hip*)).ti. (22)

14 (waist adj3 (height* or hip*) adj1 (ratio* or measur* or mark* or cut-off* or identify* or identifi* or indicat*)).ab. /freq=2 (70)

15 (WHR or WHtR).ti. (1)

16 (WHR or WHtR).ab. /freq=2 (108)

17 (waist adj1 circumference*).ti. (62)

18 (waist adj1 circumference*).ab. /freq=2 (222)

19 or/9-18 (4309)

20 8 and 19 (1471)

21 or/9-11 (4132)

22 or/13-18 (394)

23 21 and 22 (217)

24 20 or 23 (1536)

25 exp Cardiovascular Diseases/ or exp Stroke/ or Hypertension/ or Dyslipidemias/ (0)

26 ((cardiovascular or cardio* or coronary* or vascular or peripheral or heart* or cardiac* or myocardia*) adj3 (disease* or disorder* or syndrome* or failure* or event* or attack* or arrest* or infarct* or condition* or dysfunct*)).ti,ab. (20472)

27 (CVD or CHD or IHD or MI).ti,ab. (3203)

28 (circulatory adj3 (disease* or disorder*)).ti,ab. (53)

29 (angina* or hypertensi* or atrial-fibrillat* or stroke* or poststroke* or cerebrovascular* or cerebro-vascular*).ti,ab. (16288)

30 ((brain* or cereb* or lacunar) adj2 (accident* or infarc*)).ti,ab. (579)

31 ((high or raised or elevated or increas*) adj2 (blood pressure or bp)).ti,ab. (887)

32 high cholesterol.ti,ab. (122)

33 (hypercholesterol?emi* or hypercholester?emi* or hyperlipid?emi* or Dyslipid?emi*).ti,ab. (2118)

34 cardiometabolic-risk*.ti,ab. (341)

35 or/25-34 (34164)

36 *Diabetes Mellitus, Type 2/ (0)

37 *Metabolic Syndrome/ (0)

38 (diabetes adj2 type 2).ti,ab. (4844)

39 (diabetes adj2 type II).ti,ab. (170)

40 (diabetes adj2 (non insulin or noninsulin)).ti,ab. (22)

41 (NIDDM or T2DM or T2D).ti,ab. (2029)

42 ((metabolic or dysmetabolic or reaven or insulin resistance) adj2 syndrome$).ti,ab. (1530)

43 or/36-42 (6401)

44 exp *Neoplasms/ (0)

45 (cancer* or neoplas* or oncolog* or malignan$ or tumo?r* or carcinoma* or adenocarcinoma*).ti,ab. (73189)

46 or/44-45 (73189)

47 35 or 43 or 46 (108411)

48 sensitiv:.mp. (25044)

49 predictive value:.mp. (2933)

50 accurac:.tw. (11820)

51 or/48-50 (35127)

52 24 and 47 and 51 (61)

53 Observational Studies as Topic/ (0)

54 Observational Study/ (0)

55 Epidemiologic Studies/ (0)

56 exp Cohort Studies/ (0)

57 Comparative Study.pt. (1)

58 (cohort adj (study or studies)).tw. (10631)

59 cohort analy$.tw. (394)

60 (follow up adj (study or studies)).tw. (716)

61 (observational adj (study or studies)).tw. (5245)

62 longitudinal.tw. (8344)

63 prospective.tw. (15611)

64 retrospective.tw. (20721)

65 Cross-Sectional Studies/ (0)

66 cross sectional.tw. (13909)

67 or/53-66 (58816)

68 (MEDLINE or pubmed).tw. (10453)

69 systematic review.tw. (10000)

70 systematic review.pt. (237)

71 meta-analysis.pt. (60)

72 intervention$.ti. (5456)

73 or/68-72 (19093)

74 67 or 73 (74550)

75 52 and 74 (27)

76 limit 75 to dt=19900101-20211231 (27)

77 animals/ not humans/ (0)

78 76 not 77 (27)

79 limit 78 to yr="1990-Current" (27)

80 limit 79 to english language (26)

81 limit 80 to (letter or historical article or comment or editorial or news or case reports) (0)

82 80 not 81 (26)

Database name: Medline ePub ahead [Diagnostic]

1 exp *Obesity/ or *Body Weight/ or *body fat distribution/ or exp *Body Composition/ or exp *Adipose Tissue/ (0)

2 (obes* or overweight or adipos* or anthropometr* or nonobese* or nonoverweight*).ti. (2813)

3 ((obes* or overweight or adipos* or anthropometr* or nonobese* or nonoverweight*) adj4 (central* or measur* or mark* or identify* or identifi* or indicat* or categor* or threshold*)).ab. (984)

4 (body adj1 (fat or composit* or weight*)).ti. (433)

5 (body adj1 (fat or composit* or weight*) adj4 (central* or measur* or mark* or identify* or identifi* or indicat* or categor* or threshold*)).ab. (318)

6 ((visceral or subcutaneous) adj1 (fat or fatty or tissue*)).ti. (48)

7 ((visceral or subcutaneous) adj1 (fat or fatty or tissue*) adj4 (central* or measur* or mark* or identify* or identifi* or indicat* or categor* or threshold*)).ab. (35)

8 or/1-7 (3890)

9 *body mass index/ (0)

10 ("body mass ind*" or "body fat ind*" or BMI or BFI).ti. (488)

11 ("body mass ind*" or "body fat ind*" or BMI or BFI).ab. /freq=2 (2867)

12 *waist-hip ratio/ or *"body weights and measures"/ (0)

13 (waist adj3 (height* or hip*)).ti. (12)

14 (waist adj3 (height* or hip*) adj1 (ratio* or measur* or mark* or cut-off* or identify* or identifi* or indicat*)).ab. /freq=2 (44)

15 (WHR or WHtR).ti. (0)

16 (WHR or WHtR).ab. /freq=2 (80)

17 (waist adj1 circumference*).ti. (21)

18 (waist adj1 circumference*).ab. /freq=2 (114)

19 or/9-18 (3024)

20 8 and 19 (951)

21 or/9-11 (2929)

22 or/13-18 (222)

23 21 and 22 (127)

24 20 or 23 (984)

25 exp Cardiovascular Diseases/ or exp Stroke/ or Hypertension/ or Dyslipidemias/ (0)

26 ((cardiovascular or cardio* or coronary* or vascular or peripheral or heart* or cardiac* or myocardia*) adj3 (disease* or disorder* or syndrome* or failure* or event* or attack* or arrest* or infarct* or condition* or dysfunct*)).ti,ab. (15357)

27 (CVD or CHD or IHD or MI).ti,ab. (2394)

28 (circulatory adj3 (disease* or disorder*)).ti,ab. (55)

29 (angina* or hypertensi* or atrial-fibrillat* or stroke* or poststroke* or cerebrovascular* or cerebro-vascular*).ti,ab. (13038)

30 ((brain* or cereb* or lacunar) adj2 (accident* or infarc*)).ti,ab. (497)

31 ((high or raised or elevated or increas*) adj2 (blood pressure or bp)).ti,ab. (658)

32 high cholesterol.ti,ab. (86)

33 (hypercholesterol?emi* or hypercholester?emi* or hyperlipid?emi* or Dyslipid?emi*).ti,ab. (1331)

34 cardiometabolic-risk*.ti,ab. (206)

35 or/25-34 (26245)

36 *Diabetes Mellitus, Type 2/ (0)

37 *Metabolic Syndrome/ (0)

38 (diabetes adj2 type 2).ti,ab. (2763)

39 (diabetes adj2 type II).ti,ab. (100)

40 (diabetes adj2 (non insulin or noninsulin)).ti,ab. (34)

41 (NIDDM or T2DM or T2D).ti,ab. (1092)

42 ((metabolic or dysmetabolic or reaven or insulin resistance) adj2 syndrome$).ti,ab. (824)

43 or/36-42 (3630)

44 exp *Neoplasms/ (0)

45 (cancer* or neoplas* or oncolog* or malignan$ or tumo?r* or carcinoma* or adenocarcinoma*).ti,ab. (48473)

46 or/44-45 (48473)

47 35 or 43 or 46 (74718)

48 sensitiv:.mp. (18627)

49 predictive value:.mp. (2290)

50 accurac:.tw. (10029)

51 or/48-50 (27042)

52 24 and 47 and 51 (37)

53 Observational Studies as Topic/ (0)

54 Observational Study/ (4)

55 Epidemiologic Studies/ (0)

56 exp Cohort Studies/ (0)

57 Comparative Study.pt. (0)

58 (cohort adj (study or studies)).tw. (9566)

59 cohort analy$.tw. (355)

60 (follow up adj (study or studies)).tw. (642)
61 (observational adj (study or studies)).tw. (4624)
62 longitudinal.tw. (7378)
63 prospective.tw. (13597)
64 retrospective.tw. (19743)
65 Cross-Sectional Studies/ (0)
66 cross sectional.tw. (11732)
67 or/53-66 (52757)
68 (MEDLINE or pubmed).tw. (9545)
69 systematic review.tw. (9608)
70 systematic review.pt. (126)
71 meta-analysis.pt. (104)
72 intervention$.ti. (4158)
73 or/68-72 (17317)
74 67 or 73 (66889)
75 52 and 74 (14)
76 limit 75 to dt=19900101-20211231 (14)
77 animals/ not humans/ (0)
78 76 not 77 (14)
79 limit 78 to yr="1990-Current" (14)
80 limit 79 to english language (14)
81 limit 80 to (letter or historical article or comment or editorial or news or case reports) (0)
82 80 not 81 (14)

Database name: Embase [Diagnostic]

1 exp *obese patient/ or exp *obesity/ or *body weight/ or exp *body composition/ or exp *adipose tissue/ (343970)

2 (obes* or overweight or adipos* or anthropometr* or nonobese* or nonoverweight*).ti. (248280)

3 ((obes* or overweight or adipos* or anthropometr* or nonobese* or nonoverweight*) adj4 (central* or measur* or mark* or identify* or identifi* or indicat* or categor* or threshold*)).ab. (82099)

4 (body adj1 (fat or composit* or weight*)).ti. (38434)

5 (body adj1 (fat or composit* or weight*) adj4 (central* or measur* or mark* or identify* or identifi* or indicat* or categor* or threshold*)).ab. (29749)

6 ((visceral or subcutaneous) adj1 (fat or fatty or tissue*)).ti. (4879)

7 ((visceral or subcutaneous) adj1 (fat or fatty or tissue*) adj4 (central* or measur* or mark* or identify* or identifi* or indicat* or categor* or threshold*)).ab. (2948)

8 or/1-7 (456102)

9 *body mass/ (35086)

10 ("body mass ind*" or "body fat ind*" or BMI or BFI).ti. (34182)

11 ("body mass ind*" or "body fat ind*" or BMI or BFI).ab. /freq=2 (232692)

12 *waist hip ratio/ or *morphometry/ (3591)

13 (waist adj3 (height* or hip*)).ti. (1390)

14 (waist adj3 (height* or hip*) adj1 (ratio* or measur* or mark* or cut-off* or identify* or identifi* or indicat*)).ab. /freq=2 (4172)

15 (WHR or WHtR).ti. (105)

16 (WHR or WHtR).ab. /freq=2 (6406)

17 (waist adj1 circumference*).ti. (2945)

18 (waist adj1 circumference*).ab. /freq=2 (13709)

19 or/9-18 (252381)

20 8 and 19 (99959)

21 or/9-11 (240433)

22 or/12-18 (26137)

23 21 and 22 (14189)

24 20 or 23 (103619)

25 exp cardiovascular disease/ or exp cerebrovascular accident/ or hypertension/ or dyslipidemia/ (4307322)

26 ((cardiovascular or cardio* or coronary* or vascular or peripheral or heart* or cardiac* or myocardia*) adj3 (disease* or disorder* or syndrome* or failure* or event* or attack* or arrest* or infarct* or condition* or dysfunct*)).ti,ab. (1433748)

27 (CVD or CHD or IHD or MI).ti,ab. (198181)

28 (circulatory adj3 (disease* or disorder*)).ti,ab. (5660)

29 (angina* or hypertensi* or atrial-fibrillat* or stroke* or poststroke* or cerebrovascular* or cerebro-vascular*).ti,ab. (1247242)

30 ((brain* or cereb* or lacunar) adj2 (accident* or infarc*)).ti,ab. (55651)

31 ((high or raised or elevated or increas*) adj2 (blood pressure or bp)).ti,ab. (74728)

32 high cholesterol.ti,ab. (10688)

33 (hypercholesterol?emi* or hypercholester?emi* or hyperlipid?emi* or Dyslipid?emi*).ti,ab. (159260)

34 cardiometabolic-risk*.ti,ab. (9153)

35 or/25-34 (4758959)

36 *non insulin dependent diabetes mellitus/ (152844)

37 *metabolic syndrome X/ (42695)

38 (diabetes adj2 type 2).ti,ab. (214820)

39 (diabetes adj2 type II).ti,ab. (15630)

40 (diabetes adj2 (non insulin or noninsulin)).ti,ab. (11490)

41 (NIDDM or T2DM or T2D).ti,ab. (72312)

42 ((metabolic or dysmetabolic or reaven or insulin resistance) adj2 syndrome$).ti,ab. (88930)

43 or/36-42 (349825)

44 exp *neoplasm/ (3513091)

45 (cancer* or neoplas* or oncolog* or malignan$ or tumo?r* or carcinoma* or adenocarcinoma*).ti,ab. (4707753)

46 or/44-45 (5396085)

47 35 or 43 or 46 (9779627)

48 sensitiv:.tw. (1839818)

49 diagnostic accuracy.sh. (267004)

50 diagnostic.tw. (1061007)

51 or/48-50 (2822373)

52 24 and 47 and 51 (5709)

53 (MEDLINE or pubmed).tw. (304215)

54 exp systematic review/ or systematic review.tw. (362151)

55 meta-analysis/ (219105)

56 intervention$.ti. (220125)

57 or/53-56 (750317)

58 Clinical study/ (155798)

59 Family study/ (25315)

60 Longitudinal study/ (157525)

61 Retrospective study/ (1096542)

62 comparative study/ (905917)

63 Prospective study/ (694714)

64 Randomized controlled trials/ (206139)

65 63 not 64 (686826)

66 Cohort analysis/ (723590)

67 cohort analy$.tw. (14813)

68 (Cohort adj (study or studies)).tw. (348402)

69 (follow up adj (study or studies)).tw. (66443)

70 (observational adj (study or studies)).tw. (193528)

71 (epidemiologic$ adj (study or studies)).tw. (111603)

72 (cross sectional adj (study or studies)).tw. (255683)

73 case series.tw. (117588)

74 prospective.tw. (933248)

75 retrospective.tw. (994773)

76 or/58-62,65-75 (4311206)

77 57 or 76 (4902007)

78 52 and 77 (2014)

79 limit 78 to english language (1955)

80 79 not (letter or editorial).pt. (1955)

81 nonhuman/ not (human/ and nonhuman/) (4817226)

82 80 not 81 (1952)

83 limit 82 to yr="1990-Current" (1947)

84 limit 83 to dc=19900101-20211231 (1947)

85 (conference abstract or conference paper or conference proceeding or "conference review").pt. (4892778)

86 84 not 85 (1322)

Cost-Utility searches

Main search – Databases

Database	e searched	Database Platform	abase segment or version	No. of results downloaded
Lit (Ovid)	/2021	)	to June 24, 2021	7
Embase (Ovid)	/2021	)	to 2021 July 02	44
NHS EED	/2021			52
national HTA database (INAHTA)	/2021	ITA		45
LINE (Ovid) (Cost utility)	/2021	)	to July 02, 2021	54
LINE In-Process (Ovid)	/2021	)	to July 02, 2021	2
LINE Epub Ahead of Print	/2021	)	02, 2021	1

Database name: Medline

1 exp *Obesity/ or *Body Weight/ or *body fat distribution/ or exp *Body Composition/ or exp *Adipose Tissue/ (255863)

2 (obes* or overweight or adipos* or anthropometr* or nonobese* or nonoverweight*).ti. (161823)

3 ((obes* or overweight or adipos* or anthropometr* or nonobese* or nonoverweight*) adj4 (central* or measur* or mark* or identify* or identifi* or indicat* or categor* or threshold*)).ab. (47515)

4 (body adj1 (fat or composit* or weight*)).ti. (27783)

5 (body adj1 (fat or composit* or weight*) adj4 (central* or measur* or mark* or identify* or identifi* or indicat* or categor* or threshold*)).ab. (18068)

6 ((visceral or subcutaneous) adj1 (fat or fatty or tissue*)).ti. (3524)

7 ((visceral or subcutaneous) adj1 (fat or fatty or tissue*) adj4 (central* or measur* or mark* or identify* or identifi* or indicat* or categor* or threshold*)).ab. (1605)

8 or/1-7 (313457)

9 *body mass index/ (22403)

10 ("body mass ind*" or "body fat ind*" or BMI or BFI).ti. (19123)

11 ("body mass ind*" or "body fat ind*" or BMI or BFI).ab. /freq=2 (111508)

12 *waist-hip ratio/ or *"body weights and measures"/ (3117)

13 (waist adj3 (height* or hip*)).ti. (842)

14 (waist adj3 (height* or hip*) adj1 (ratio* or measur* or mark* or cut-off* or identify* or identifi* or indicat*)).ab. /freq=2 (2500)

15 (WHR or WHtR).ti. (47)

16 (WHR or WHtR).ab. /freq=2 (3765)

17 (waist adj1 circumference*).ti. (1808)

18 (waist adj1 circumference*).ab. /freq=2 (7255)

19 or/9-18 (124530)

20 8 and 19 (58896)

21 or/9-11 (117305)

22 or/12-18 (15378)

23 21 and 22 (8153)

24 20 or 23 (60872)

25 exp Cardiovascular Diseases/ or exp Stroke/ or Hypertension/ or Dyslipidemias/ (2507987)

26 ((cardiovascular or cardio* or coronary* or vascular or peripheral or heart* or cardiac* or myocardia*) adj3 (disease* or disorder* or syndrome* or failure* or event* or attack* or arrest* or infarct* or condition* or dysfunct*)).ti,ab. (870724)

27 (CVD or CHD or IHD or MI).ti,ab. (99281)

28 (circulatory adj3 (disease* or disorder*)).ti,ab. (5434)

29 (angina* or hypertensi* or atrial-fibrillat* or stroke* or poststroke* or cerebrovascular* or cerebro-vascular*).ti,ab. (729583)

30 ((brain* or cereb* or lacunar) adj2 (accident* or infarc*)).ti,ab. (33801)

31 ((high or raised or elevated or increas*) adj2 (blood pressure or bp)).ti,ab. (46855)

32 high cholesterol.ti,ab. (6679)

33 (hypercholesterol?emi* or hypercholester?emi* or hyperlipid?emi* or Dyslipid?emi*).ti,ab. (87349)

34 cardiometabolic-risk*.ti,ab. (5044)

35 or/25-34 (2910858)

36 *Diabetes Mellitus, Type 2/ (117022)

37 *Metabolic Syndrome/ (26728)

38 (diabetes adj2 type 2).ti,ab. (114709)

39 (diabetes adj2 type II).ti,ab. (8250)

40 (diabetes adj2 (non insulin or noninsulin)).ti,ab. (9634)

41 (NIDDM or T2DM or T2D).ti,ab. (33597)

42 ((metabolic or dysmetabolic or reaven or insulin resistance) adj2 syndrome$).ti,ab. (47862)

43 or/36-42 (204638)

44 exp *Neoplasms/ (3073109)

45 (cancer* or neoplas* or oncolog* or malignan$ or tumo?r* or carcinoma* or adenocarcinoma*).ti,ab. (3083040)

46 or/44-45 (3881287)

47 35 or 43 or 46 (6651029)

48 24 and 47 (23848)

49 Cost-Benefit Analysis/ (85302)

50 (cost* and ((qualit* adj2 adjust* adj2 life*) or qaly*)).tw. (12096)

51 ((incremental* adj2 cost*) or ICER).tw. (12474)

52 (cost adj2 utilit*).tw. (4794)

53 (cost* and ((net adj benefit*) or (net adj monetary adj benefit*) or (net adj health adj benefit*))).tw. (1550)

54 ((cost adj2 (effect* or utilit*)) and (quality adj of adj life)).tw. (16650)

55 (cost and (effect* or utilit*)).ti. (28607)

56 or/49-55 (96340)

57 48 and 56 (59)

58 limit 57 to ed=19900101-20211231 (58)

59 animals/ not humans/ (4822395)

60 58 not 59 (58)

61 limit 60 to yr="1990-Current" (58)

62 limit 61 to english language (55)

63 limit 62 to (letter or historical article or comment or editorial or news or case reports) (1)

64 62 not 63 (54)

Database name: Medline in process

1 exp *Obesity/ or *Body Weight/ or *body fat distribution/ or exp *Body Composition/ or exp *Adipose Tissue/ (0)

2 (obes* or overweight or adipos* or anthropometr* or nonobese* or nonoverweight*).ti. (4793)

3 ((obes* or overweight or adipos* or anthropometr* or nonobese* or nonoverweight*) adj4 (central* or measur* or mark* or identify* or identifi* or indicat* or categor* or threshold*)).ab. (1562)

4 (body adj1 (fat or composit* or weight*)).ti. (685)

5 (body adj1 (fat or composit* or weight*) adj4 (central* or measur* or mark* or identify* or identifi* or indicat* or categor* or threshold*)).ab. (505)

6 ((visceral or subcutaneous) adj1 (fat or fatty or tissue*)).ti. (85)

7 ((visceral or subcutaneous) adj1 (fat or fatty or tissue*) adj4 (central* or measur* or mark* or identify* or identifi* or indicat* or categor* or threshold*)).ab. (38)

8 or/1-7 (6448)

9 *body mass index/ (0)

10 ("body mass ind*" or "body fat ind*" or BMI or BFI).ti. (663)

11 ("body mass ind*" or "body fat ind*" or BMI or BFI).ab. /freq=2 (4061)

12 *waist-hip ratio/ or *"body weights and measures"/ (0)

13 (waist adj3 (height* or hip*)).ti. (22)

14 (waist adj3 (height* or hip*) adj1 (ratio* or measur* or mark* or cut-off* or identify* or identifi* or indicat*)).ab. /freq=2 (70)

15 (WHR or WHtR).ti. (1)

16 (WHR or WHtR).ab. /freq=2 (108)

17 (waist adj1 circumference*).ti. (62)

18 (waist adj1 circumference*).ab. /freq=2 (222)

19 or/9-18 (4309)

20 8 and 19 (1471)

21 or/9-11 (4132)

22 or/12-18 (394)

23 21 and 22 (217)

24 20 or 23 (1536)

25 exp Cardiovascular Diseases/ or exp Stroke/ or Hypertension/ or Dyslipidemias/ (0)

26 ((cardiovascular or cardio* or coronary* or vascular or peripheral or heart* or cardiac* or myocardia*) adj3 (disease* or disorder* or syndrome* or failure* or event* or attack* or arrest* or infarct* or condition* or dysfunct*)).ti,ab. (20472)

27 (CVD or CHD or IHD or MI).ti,ab. (3203)

28 (circulatory adj3 (disease* or disorder*)).ti,ab. (53)

29 (angina* or hypertensi* or atrial-fibrillat* or stroke* or poststroke* or cerebrovascular* or cerebro-vascular*).ti,ab. (16288)

30 ((brain* or cereb* or lacunar) adj2 (accident* or infarc*)).ti,ab. (579)

31 ((high or raised or elevated or increas*) adj2 (blood pressure or bp)).ti,ab. (887)

32 high cholesterol.ti,ab. (122)

33 (hypercholesterol?emi* or hypercholester?emi* or hyperlipid?emi* or Dyslipid?emi*).ti,ab. (2118)

34 cardiometabolic-risk*.ti,ab. (341)

35 or/25-34 (34164)

36 *Diabetes Mellitus, Type 2/ (0)

37 *Metabolic Syndrome/ (0)

38 (diabetes adj2 type 2).ti,ab. (4844)

39 (diabetes adj2 type II).ti,ab. (170)

40 (diabetes adj2 (non insulin or noninsulin)).ti,ab. (22)

41 (NIDDM or T2DM or T2D).ti,ab. (2029)

42 ((metabolic or dysmetabolic or reaven or insulin resistance) adj2 syndrome$).ti,ab. (1530)

43 or/36-42 (6401)

44 exp *Neoplasms/ (0)

45 (cancer* or neoplas* or oncolog* or malignan$ or tumo?r* or carcinoma* or adenocarcinoma*).ti,ab. (73189)

46 or/44-45 (73189)

47 35 or 43 or 46 (108411)

48 24 and 47 (541)

49 Cost-Benefit Analysis/ (0)

50 (cost* and ((qualit* adj2 adjust* adj2 life*) or qaly*)).tw. (564)

51 ((incremental* adj2 cost*) or ICER).tw. (576)

52 (cost adj2 utilit*).tw. (182)

53 (cost* and ((net adj benefit*) or (net adj monetary adj benefit*) or (net adj health adj benefit*))).tw. (69)

54 ((cost adj2 (effect* or utilit*)) and (quality adj of adj life)).tw. (664)

55 (cost and (effect* or utilit*)).ti. (753)

56 or/49-55 (1217)

57 48 and 56 (2)

58 limit 57 to dt=19900101-20211231 (2)

59 animals/ not humans/ (0)

60 58 not 59 (2)

61 limit 60 to yr="1990-Current" (2)

62 limit 61 to english language (2)

63 limit 62 to (letter or historical article or comment or editorial or news or case reports) (0)

64 62 not 63 (2)

Database name: Medline epub ahead

1 exp *Obesity/ or *Body Weight/ or *body fat distribution/ or exp *Body Composition/ or exp *Adipose Tissue/ (0)

2 (obes* or overweight or adipos* or anthropometr* or nonobese* or nonoverweight*).ti. (2813)

3 ((obes* or overweight or adipos* or anthropometr* or nonobese* or nonoverweight*) adj4 (central* or measur* or mark* or identify* or identifi* or indicat* or categor* or threshold*)).ab. (984)

4 (body adj1 (fat or composit* or weight*)).ti. (433)

5 (body adj1 (fat or composit* or weight*) adj4 (central* or measur* or mark* or identify* or identifi* or indicat* or categor* or threshold*)).ab. (318)

6 ((visceral or subcutaneous) adj1 (fat or fatty or tissue*)).ti. (48)

7 ((visceral or subcutaneous) adj1 (fat or fatty or tissue*) adj4 (central* or measur* or mark* or identify* or identifi* or indicat* or categor* or threshold*)).ab. (35)

8 or/1-7 (3890)

9 *body mass index/ (0)

10 ("body mass ind*" or "body fat ind*" or BMI or BFI).ti. (488)

11 ("body mass ind*" or "body fat ind*" or BMI or BFI).ab. /freq=2 (2867)

12 *waist-hip ratio/ or *"body weights and measures"/ (0)

13 (waist adj3 (height* or hip*)).ti. (12)

14 (waist adj3 (height* or hip*) adj1 (ratio* or measur* or mark* or cut-off* or identify* or identifi* or indicat*)).ab. /freq=2 (44)

15 (WHR or WHtR).ti. (0)

16 (WHR or WHtR).ab. /freq=2 (80)

17 (waist adj1 circumference*).ti. (21)

18 (waist adj1 circumference*).ab. /freq=2 (114)

19 or/9-18 (3024)

20 8 and 19 (951)

21 or/9-11 (2929)

22 or/12-18 (222)

23 21 and 22 (127)

24 20 or 23 (984)

25 exp Cardiovascular Diseases/ or exp Stroke/ or Hypertension/ or Dyslipidemias/ (0)

26 ((cardiovascular or cardio* or coronary* or vascular or peripheral or heart* or cardiac* or myocardia*) adj3 (disease* or disorder* or syndrome* or failure* or event* or attack* or arrest* or infarct* or condition* or dysfunct*)).ti,ab. (15357)

27 (CVD or CHD or IHD or MI).ti,ab. (2394)

28 (circulatory adj3 (disease* or disorder*)).ti,ab. (55)

29 (angina* or hypertensi* or atrial-fibrillat* or stroke* or poststroke* or cerebrovascular* or cerebro-vascular*).ti,ab. (13038)

30 ((brain* or cereb* or lacunar) adj2 (accident* or infarc*)).ti,ab. (497)

31 ((high or raised or elevated or increas*) adj2 (blood pressure or bp)).ti,ab. (658)

32 high cholesterol.ti,ab. (86)

33 (hypercholesterol?emi* or hypercholester?emi* or hyperlipid?emi* or Dyslipid?emi*).ti,ab. (1331)

34 cardiometabolic-risk*.ti,ab. (206)

35 or/25-34 (26245)

36 *Diabetes Mellitus, Type 2/ (0)

37 *Metabolic Syndrome/ (0)

38 (diabetes adj2 type 2).ti,ab. (2763)

39 (diabetes adj2 type II).ti,ab. (100)

40 (diabetes adj2 (non insulin or noninsulin)).ti,ab. (34)

41 (NIDDM or T2DM or T2D).ti,ab. (1092)

42 ((metabolic or dysmetabolic or reaven or insulin resistance) adj2 syndrome$).ti,ab. (824)

43 or/36-42 (3630)

44 exp *Neoplasms/ (0)

45 (cancer* or neoplas* or oncolog* or malignan$ or tumo?r* or carcinoma* or adenocarcinoma*).ti,ab. (48473)

46 or/44-45 (48473)

47 35 or 43 or 46 (74718)

48 24 and 47 (330)

49 Cost-Benefit Analysis/ (0)

50 (cost* and ((qualit* adj2 adjust* adj2 life*) or qaly*)).tw. (461)

51 ((incremental* adj2 cost*) or ICER).tw. (388)

52 (cost adj2 utilit*).tw. (212)

53 (cost* and ((net adj benefit*) or (net adj monetary adj benefit*) or (net adj health adj benefit*))).tw. (58)

54 ((cost adj2 (effect* or utilit*)) and (quality adj of adj life)).tw. (620)

55 (cost and (effect* or utilit*)).ti. (621)

56 or/49-55 (1193)

57 48 and 56 (1)

58 limit 57 to dt=19900101-20211231 (1)

59 animals/ not humans/ (0)

60 58 not 59 (1)

61 limit 60 to yr="1990-Current" (1)

62 limit 61 to english language (1)

63 limit 62 to (letter or historical article or comment or editorial or news or case reports) (0)

64 62 not 63 (1)

Database name: Embase

1 exp *obese patient/ or exp *obesity/ or *body weight/ or exp *body composition/ or exp *adipose tissue/ (343970)

2 (obes* or overweight or adipos* or anthropometr* or nonobese* or nonoverweight*).ti. (248280)

3 ((obes* or overweight or adipos* or anthropometr* or nonobese* or nonoverweight*) adj4 (central* or measur* or mark* or identify* or identifi* or indicat* or categor* or threshold*)).ab. (82099)

4 (body adj1 (fat or composit* or weight*)).ti. (38434)

5 (body adj1 (fat or composit* or weight*) adj4 (central* or measur* or mark* or identify* or identifi* or indicat* or categor* or threshold*)).ab. (29749)

6 ((visceral or subcutaneous) adj1 (fat or fatty or tissue*)).ti. (4879)

7 ((visceral or subcutaneous) adj1 (fat or fatty or tissue*) adj4 (central* or measur* or mark* or identify* or identifi* or indicat* or categor* or threshold*)).ab. (2948)

8 or/1-7 (456102)

9 *body mass/ (35086)

10 ("body mass ind*" or "body fat ind*" or BMI or BFI).ti. (34182)

11 ("body mass ind*" or "body fat ind*" or BMI or BFI).ab. /freq=2 (232692)

12 *waist hip ratio/ or *morphometry/ (3591)

13 (waist adj3 (height* or hip*)).ti. (1390)

14 (waist adj3 (height* or hip*) adj1 (ratio* or measur* or mark* or cut-off* or identify* or identifi* or indicat*)).ab. /freq=2 (4172)

15 (WHR or WHtR).ti. (105)

16 (WHR or WHtR).ab. /freq=2 (6406)

17 (waist adj1 circumference*).ti. (2945)

18 (waist adj1 circumference*).ab. /freq=2 (13709)

19 or/9-18 (252381)

20 8 and 19 (99959)

21 or/9-11 (240433)

22 or/12-18 (26137)

23 21 and 22 (14189)

24 20 or 23 (103619)

25 exp cardiovascular disease/ or exp cerebrovascular accident/ or hypertension/ or dyslipidemia/ (4307322)

26 ((cardiovascular or cardio* or coronary* or vascular or peripheral or heart* or cardiac* or myocardia*) adj3 (disease* or disorder* or syndrome* or failure* or event* or attack* or arrest* or infarct* or condition* or dysfunct*)).ti,ab. (1433748)

27 (CVD or CHD or IHD or MI).ti,ab. (198181)

28 (circulatory adj3 (disease* or disorder*)).ti,ab. (5660)

29 (angina* or hypertensi* or atrial-fibrillat* or stroke* or poststroke* or cerebrovascular* or cerebro-vascular*).ti,ab. (1247242)

30 ((brain* or cereb* or lacunar) adj2 (accident* or infarc*)).ti,ab. (55651)

31 ((high or raised or elevated or increas*) adj2 (blood pressure or bp)).ti,ab. (74728)

32 high cholesterol.ti,ab. (10688)

33 (hypercholesterol?emi* or hypercholester?emi* or hyperlipid?emi* or Dyslipid?emi*).ti,ab. (159260)

34 cardiometabolic-risk*.ti,ab. (9153)

35 or/25-34 (4758959)

36 *non insulin dependent diabetes mellitus/ (152844)

37 *metabolic syndrome X/ (42695)

38 (diabetes adj2 type 2).ti,ab. (214820)

39 (diabetes adj2 type II).ti,ab. (15630)

40 (diabetes adj2 (non insulin or noninsulin)).ti,ab. (11490)

41 (NIDDM or T2DM or T2D).ti,ab. (72312)

42 ((metabolic or dysmetabolic or reaven or insulin resistance) adj2 syndrome$).ti,ab. (88930)

43 or/36-42 (349825)

44 exp *neoplasm/ (3513091)

45 (cancer* or neoplas* or oncolog* or malignan$ or tumo?r* or carcinoma* or adenocarcinoma*).ti,ab. (4707753)

46 or/44-45 (5396085)

47 35 or 43 or 46 (9779627)

48 cost utility analysis/ (10469)

49 (cost* and ((qualit* adj2 adjust* adj2 life*) or qaly*)).tw. (24820)

50 ((incremental* adj2 cost*) or ICER).tw. (25414)

51 (cost adj2 utilit*).tw. (9197)

52 (cost* and ((net adj benefit*) or (net adj monetary adj benefit*) or (net adj health adj benefit*))).tw. (2562)

53 ((cost adj2 (effect* or utilit*)) and (quality adj of adj life)).tw. (30312)

54 (cost and (effect* or utilit*)).ti. (49377)

55 or/48-54 (77885)

56 24 and 47 and 55 (81)

57 limit 56 to english language (77)

58 57 not (letter or editorial).pt. (77)

59 nonhuman/ not (human/ and nonhuman/) (4817226)

60 58 not 59 (76)

61 limit 60 to yr="1990-Current" (76)

62 limit 61 to dc=19900101-20211231 (76)

63 (conference abstract or conference paper or conference proceeding or "conference review").pt. (4892778)

64 62 not 63 (44)

Database name: Econlit

1 [exp *Obesity/ or *Body Weight/ or *body fat distribution/ or exp *Body Composition/ or exp *Adipose Tissue/] (0)

2 (obes* or overweight or adipos* or anthropometr* or nonobese* or nonoverweight*).ti. (1126)

3 ((obes* or overweight or adipos* or anthropometr* or nonobese* or nonoverweight*) adj4 (central* or measur* or mark* or identify* or identifi* or indicat* or categor* or threshold*)).ab. (337)

4 (body adj1 (fat or composit* or weight*)).ti. (119)

5 (body adj1 (fat or composit* or weight*) adj4 (central* or measur* or mark* or identify* or identifi* or indicat* or categor* or threshold*)).ab. (38)

6 ((visceral or subcutaneous) adj1 (fat or fatty or tissue*)).ti. (0)

7 ((visceral or subcutaneous) adj1 (fat or fatty or tissue*) adj4 (central* or measur* or mark* or identify* or identifi* or indicat* or categor* or threshold*)).ab. (0)

8 or/1-7 (1416)

9 [*body mass index/] (0)

10 ("body mass ind*" or "body fat ind*" or BMI or BFI).ti. (182)

11 ("body mass ind*" or "body fat ind*" or BMI or BFI).ab. /freq=2 (593)

12 [*waist-hip ratio/ or *"body weights and measures"/] (0)

13 (waist adj3 (height* or hip*)).ti. (0)

14 (waist adj3 (height* or hip*) adj1 (ratio* or measur* or mark* or cut-off* or identify* or identifi* or indicat*)).ab. /freq=2 (1)

15 (WHR or WHtR).ti. (1)

16 (WHR or WHtR).ab. /freq=2 (5)

17 (waist adj1 circumference*).ti. (2)

18 (waist adj1 circumference*).ab. /freq=2 (3)

19 or/9-18 (632)

20 8 and 19 (281)

21 or/9-11 (625)

22 or/12-18 (11)

23 21 and 22 (4)

24 20 or 23 (281)

25 [exp Cardiovascular Diseases/ or exp Stroke/ or Hypertension/ or Dyslipidemias/] (0)

26 ((cardiovascular or cardio* or coronary* or vascular or peripheral or heart* or cardiac* or myocardia*) adj3 (disease* or disorder* or syndrome* or failure* or event* or attack* or arrest* or infarct* or condition* or dysfunct*)).ti,ab. (1090)

27 (CVD or CHD or IHD or MI).ti,ab. (381)

28 (circulatory adj3 (disease* or disorder*)).ti,ab. (44)

29 (angina* or hypertensi* or atrial-fibrillat* or stroke* or poststroke* or cerebrovascular* or cerebro-vascular*).ti,ab. (637)

30 ((brain* or cereb* or lacunar) adj2 (accident* or infarc*)).ti,ab. (7)

31 ((high or raised or elevated or increas*) adj2 (blood pressure or bp)).ti,ab. (68)

32 high cholesterol.ti,ab. (28)

33 (hypercholesterol?emi* or hypercholester?emi* or hyperlipid?emi* or Dyslipid?emi*).ti,ab. (34)

34 cardiometabolic-risk*.ti,ab. (2)

35 or/25-34 (1948)

36 [*Diabetes Mellitus, Type 2/] (0)

37 [*Metabolic Syndrome/] (0)

38 (diabetes adj2 type 2).ti,ab. (96)

39 (diabetes adj2 type II).ti,ab. (13)

40 (diabetes adj2 (non insulin or noninsulin)).ti,ab. (2)

41 (NIDDM or T2DM or T2D).ti,ab. (18)

42 ((metabolic or dysmetabolic or reaven or insulin resistance) adj2 syndrome$).ti,ab. (13)

43 or/36-42 (123)

44 [exp *Neoplasms/] (0)

45 (cancer* or neoplas* or oncolog* or malignan$ or tumo?r* or carcinoma* or adenocarcinoma*).ti,ab. (1766)

46 or/44-45 (1766)

47 35 or 43 or 46 (3600)

48 24 and 47 (7)

49 limit 48 to yr="1990 -Current" (7)

Database name: NHS EED

1 MeSH DESCRIPTOR Obesity EXPLODE ALL TREES 1025

2 MeSH DESCRIPTOR body weight 218

3 MeSH DESCRIPTOR body fat distribution 3

4 MeSH DESCRIPTOR body composition 86

5 MeSH DESCRIPTOR adipose tissue EXPLODE ALL TREES 42

6 ((obes* or overweight or adipos* or anthropometr* or nonobese* or nonoverweight*)):TI 651

7 (((obes* or overweight or adipos* or anthropometr* or nonobese* or nonoverweight*) adj4 (central* or measur* or mark* or identify* or identifi* or indicat* or categor* or threshold*))) 97

8 ((body adj1 (fat or composit* or weight*))):TI 73

9 ((body adj1 (fat or composit* or weight*) adj4 (central* or measur* or mark* or identify* or identifi* or indicat* or categor* or threshold*))) 37

10 (((visceral or subcutaneous) adj1 (fat or fatty or tissue*))):TI 5

11 (((visceral or subcutaneous) adj1 (fat or fatty or tissue*) adj4 (central* or measur* or mark* or identify* or identifi* or indicat* or categor* or threshold*))) 1

12 (#1 OR #2 OR #3 OR #4 OR #5 OR #6 OR #7 OR #8 OR #9 OR #10 OR #11) 1373

13 MeSH DESCRIPTOR body mass index 363

14 (("body mass ind*" or "body fat ind*" or BMI or BFI)) 1164

15 MeSH DESCRIPTOR waist-hip ratio 6

16 MeSH DESCRIPTOR body weights and measures 7

17 ((waist adj3 (height* or hip*))) 36

18 ((waist adj3 (height* or hip*) adj1 (ratio* or measur* or mark* or cut-off* or identify* or identifi* or indicat*))) 30

19 (WHR or WHtR) 1

20 ((waist adj1 circumference*)) 91

21 (#13 OR #14 OR #15 OR #16 OR #17 OR #18 OR #19 OR #20) 1190

22 (#12 AND #21) 526

23 (#13 OR #14) 1164

24 (#15 OR #16 OR #17 OR #18 OR #19 OR #20) 113

25 (#23 AND #24) 87

26 (#22 OR #25) 549

27 MeSH DESCRIPTOR Cardiovascular Diseases EXPLODE ALL TREES 10752

28 MeSH DESCRIPTOR Stroke EXPLODE ALL TREES 1356

29 MeSH DESCRIPTOR Hypertension 846

30 MeSH DESCRIPTOR Dyslipidemias 57

31 (((cardiovascular or cardio* or coronary* or vascular or peripheral or heart* or cardiac* or myocardia*) adj3 (disease* or disorder* or syndrome* or failure* or event* or attack* or arrest* or infarct* or condition* or dysfunct*))) 7710

32 (CVD or CHD or IHD or MI) 1151

33 ((circulatory adj3 (disease* or disorder*))) 3

34 ((angina* or hypertensi* or atrial-fibrillat* or stroke* or poststroke* or cerebrovascular* or cerebro-vascular*)) 6157

35 ((brain* or cereb* or lacunar) adj2 (accident* or infarc*)) 188

36 ((high or raised or elevated or increas*) adj2 (blood pressure or bp)) 224

37 (high cholesterol) 35

38 (((hypercholesterol?emi* or hypercholester?emi* or hyperlipid?emi* or Dyslipid?emi*))) 634

39 (cardiometabolic-risk*) 10

40 (#27 OR #28 OR #29 OR #30 OR #31 OR #32 OR #33 OR #34 OR #35 OR #36 OR #37 OR #38 OR #39) 14573

41 MeSH DESCRIPTOR Diabetes Mellitus, Type 2 1216

42 MeSH DESCRIPTOR Metabolic Syndrome 0

43 ((diabetes adj2 type 2)) 1236

44 ((diabetes adj2 type II)) 6

45 ((diabetes adj2 (non insulin or noninsulin))) 6

46 (NIDDM or T2DM or T2D) 50

47 (((metabolic or dysmetabolic or reaven or insulin resistance) adj2 syndrome*)) 120

48 (#41 OR #42 OR #43 OR #44 OR #45 OR #46 OR #47) 1345

49 MeSH DESCRIPTOR Neoplasms EXPLODE ALL TREES 12016

50 ((cancer* or neoplas* or oncolog* or malignan* or tumo?r* or carcinoma* or adenocarcinoma*)) 14922

51 (#49 OR #50) 15703

52 (#40 OR #48 OR #51)29840

53 (#26 and #52) IN NHSEED FROM 1990 TO 2021 52

Database name: INAHTA

1. (obes* or overweight or adipos* or anthropometr* or nonobese* or nonoverweight*)[Title] OR (obes* or overweight or adipos* or anthropometr* or nonobese* or nonoverweight*)[abs] 278
2. (body)[Title] AND (fat or composit* or weight*)[Title] 2
3. (body)[abs] AND (fat or composit* or weight*)[abs] 116
4. (visceral OR subcutaneous)[Title] AND (fat OR fatty OR tissue*)[Title] 0
5. (visceral OR subcutaneous)[abs] AND (fat OR fatty OR tissue*)[abs] 11
6. "Obesity"[mhe] 216
7. "Body Weight"[mh] 11
8. "Body Fat Distribution"[mh] 0
9. "Body Composition"[mh] 4
10. "Adipose Tissue"[mh] 5
11. #10 OR #9 OR #8 OR #7 OR #6 OR #5 OR #4 OR #3 OR #2 OR #1 386
12. "Body Mass Index"[mh] 20
13. ("body mass index" or "body mass indexes" or "body mass indices" or "body fat index" or "body fat indexes" or "body fat indices" or BMI or BFI)[Title] OR ("body mass index" or "body mass indexes" or "body mass indices" or "body fat index" or "body fat indexes" or "body fat indices" or BMI or BFI)[abs] 77
14. "Waist-Hip Ratio"[mh] 1
15. "body weights and measures" 0
16. "Body Weights and Measures"[mh] 1
17. (waist)[Title] AND (height* OR hip*)[Title] 0
18. (waist AND (height* OR hip*))[abs] AND (ratio* or measur* or mark* or cut-off* or identify* or identifi* or indicat*)[abs] 2
19. (WHR or WHtR)[Title] OR (WHR or WHtR)[abs] 1
20. (waist AND circumference*)[Title] OR (waist AND circumference*)[abs] 9
21. #20 OR #19 OR #18 OR #17 OR #16 OR #15 OR #14 OR #13 OR #12 91
22. #21 AND #11 72
23. #13 OR #12 87

24. #20 OR #19 OR #18 OR #17 OR #16 OR #15 OR #14 10

25. #24 AND #23 6

26. #25 OR #22 72

27. "Cardiovascular Diseases"[mhe] 2031

28. "Stroke"[mhe] 205

29. "Hypertension"[mh] 143

30. "Dyslipidemias"[mh] 5

31. (cardiovascular or cardio* or coronary* or vascular or peripheral or heart* or cardiac* or myocardia*)[Title] AND (disease* or disorder* or syndrome* or failure* or event* or attack* or arrest* or infarct* or condition* or dysfunct*)[Title] 617

32. (cardiovascular or cardio* or coronary* or vascular or peripheral or heart* or cardiac* or myocardia*)[abs] AND (disease* or disorder* or syndrome* or failure* or event* or attack* or arrest* or infarct* or condition* or dysfunct*)[abs] 1158

33. (CVD or CHD or IHD or MI)[Title] OR (CVD or CHD or IHD or MI)[abs] 89

34. (circulatory)[Title] AND (disease* or disorder*)[Title] 0

35. (circulatory)[abs] AND (disease* OR disorder*)[abs] 5

36. (angina* or hypertensi* or atrial-fibrillat* or stroke* or poststroke* or cerebrovascular* or cerebro-vascular*)[Title] OR (angina* or hypertensi* or atrial-fibrillat* or stroke* or poststroke* or cerebrovascular* or cerebro-vascular*)[abs] 959

37. (brain* or cereb* or lacunar)[Title] AND (accident* or infarc*)[Title] 5

38. (brain* or cereb* or lacunar)[abs] AND (accident* or infarc*)[abs] 36

39. (high or raised or elevated or increas*)[Title] AND (blood pressure OR bp)[Title] 12

40. (high or raised or elevated or increas*)[abs] AND (blood pressure OR bp)[abs] 117

41. (high cholesterol)[Title] OR (high cholesterol)[abs] 32

42. (hypercholesterolaemi* or hypercholesterolemi* or hypercholesteraemi* or hypercholesteremi* or hyperlipidaemi* or hyperlipidemi* or Dyslipidaemi* or Dyslipidemi)[Title] OR (hypercholesterolaemi* or hypercholesterolemi* or hypercholesteraemi* or hypercholesteremi* or hyperlipidaemi* or hyperlipidemi* or Dyslipidaemi* or Dyslipidemi)[abs] 48

43. (cardiometabolic-risk*)[Title] OR (cardiometabolic-risk*)[abs] 2843

44. #43 OR #42 OR #41 OR #40 OR #39 OR #38 OR #37 OR #36 OR #35 OR #34 OR #33 OR #32 OR #31 OR #30 OR #29 OR #28 OR #27 4855

45. "Diabetes Mellitus Type 2"[mh] 146

46. "Metabolic Syndrome"[mh] 0

47. (diabetes AND type 2)[Title] OR (diabetes AND type 2)[abs] 311

48. ((diabetes AND type II)[Title] OR (diabetes AND type II)[abs]) 311

49. (Diabetes)[Title] AND (non insulin OR noninsulin)[Title] 2

50. (Diabetes)[abs] AND (non insulin OR noninsulin)[abs] 23

51. (NIDDM OR T2DM OR T2D)[Title] OR (NIDDM OR T2DM OR T2D)[abs] 12

52. (metabolic or dysmetabolic or reaven or insulin resistance)[Title] AND (syndrome*)[Title] 5

53. (metabolic or dysmetabolic or reaven or insulin resistance)[abs] AND (syndrome*)[abs] 30

54. #53 OR #52 OR #51 OR #50 OR #49 OR #48 OR #47 OR #46 OR #45 371

55. "Neoplasms"[mh] 2298

56. (cancer* or neoplas* or oncolog* or malignan* or tumour* or tumor* or carcinoma* or adenocarcinoma*)[Title] OR (cancer* or neoplas* or oncolog* or malignan* or tumour* or tumor* or carcinoma* or adenocarcinoma*)[abs] 3088

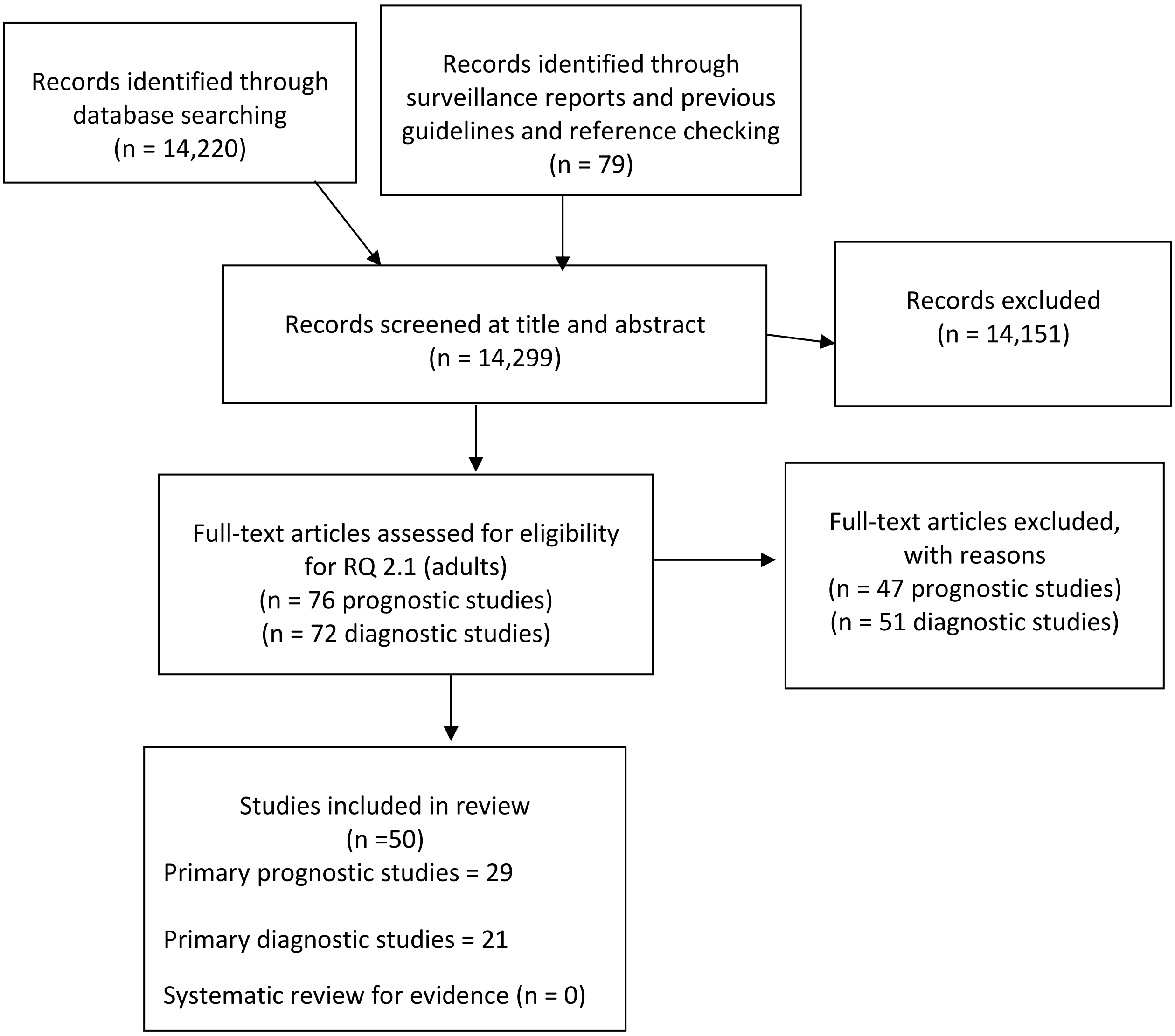
57. #56 OR #55 3357

58. #57 OR #54 OR #44 7635

59. #58 AND #26 45

Appendix D Prognostic and diagnostic evidence study selection

A combined search was conducted for RQ1.1 which covers the adult population and RQ1.2 which covers children and young people..



Appendix E –Prognostic and Diagnostic evidence tables

Prognostic accuracy studies

Aekplakorn, 2007

Bibliographic Reference	Aekplakorn, Wichai; Pakpeankitwatana, Varapat; Lee, Crystal M Y; Woodward, Mark; Barzi, Federica; Yamwong, Sukit; Unkurapinun, Nongnuj; Sritara, Piyamitr; Abdominal obesity and coronary heart disease in Thai men.; Obesity (Silver Spring, Md.); 2007; vol. 15 (no. 4); 1036-42

Study Characteristics

Study type	Prospective cohort study
Study details	Study location Thailand Setting The Electricity Generating Authority Study dates People were recruited in1985 and followed until 2002 Sources of funding Support from: Faculty of Medicine Ramathibodi Hospital, Mahidol University; the Electricity Generating Authority of Thailand; and the Thai Health Promotion Foundation. The National Health and Medical Research Council (Australia) Public Health Postgraduate Scholarship (to. C.M.Y.L.).

	Ethnicity Asian (other): the population in the study were assumed to be at least 80% of Thai ethnicity.
Inclusion criteria	Employees of the Electricity Generating Authority of Thailand, 35 to 59 years of age
Exclusion criteria	CHD and other overt chronic diseases but who might possess cardiovascular risk factors at baseline
Number of participants	2702 men volunteered. After people with missing data were excluded and there were 2536 people remaining for analysis.
Length of follow-up	The men were followed for 17 years
Loss to follow-up	166 (6%) were lost to follow-up
Index test(s)	BMI Subjects wore indoor clothing but without shoes while their height and weight were measured. WHR Waist circumference and hip circumference were measured by trained nurses using tape-measures. Measurements were made with the subject unclothed, standing erect, abdomen relaxed, arms at the side, and feet together with weight equally divided over both legs. Waist circumference was measured at 1 cm above the umbilicus, and hip circumference was measured at the level of the maximal protrusion of the gluteal muscles. WHtR Waist circumference was measured by trained nurses using tape-measures. Measurements were made with the subject unclothed, standing erect, abdomen relaxed, arms at the side, and feet together with weight equally divided over both legs. Waist circumference was measured at 1 cm above the umbilicus, and hip circumference was measured at the level of the maximal protrusion of the gluteal muscles. Subjects wore indoor clothing but without shoes while their height was measured. WC

	Waist circumference was measured at 1 cm above the umbilicus, and hip circumference was measured at the level of the maximal protrusion of the gluteal muscles.
Reference standard (s)	A person developing coronary heart disease during follow-up
Additional comments	Wald tests were performed to compare the AUC between the four anthropometric indices using the formula (AUC1 -AUC2) 2 (SE1 2 SE2 2), where it is compared with 2 on 1 df. The optimal cut-off point was taken as the value where the sum of sensitivity and specificity is at maximum, provided that sensitivity and specificity are both 50%, to protect against unacceptable rates of classification error. Statistical analyses were performed using SAS 9.1 for Windows (SAS Institute, Inc., Cary, NC) and SPSS 12.0.1 for Windows (SPSS, Inc., Chicago, IL)

Population characteristics

Study-level characteristics

Characteristic	**Study (N = 3499)**
% Female Custom value	0
Mean age (SD) Mean (SD)	43 (5)
Diabetes Custom value	5%

Critical appraisal - GUT QUIPS checklist- PROGNOSIS ADULTS

Section	**Question**	**Answer**
Study participation	Summary Study participation	Low risk of bias
Study Attrition	Study Attrition Summary	Low risk of bias

Section	Question	Answer
Prognostic factor measurement	Prognostic factor Measurement Summary	Moderate risk of bias
Outcome Measurement	Outcome Measurement Summary	Low risk of bias
Study Confounding	Study Confounding Summary	Low risk of bias
Statistical Analysis and Reporting	Statistical Analysis and Presentation Summary	Low risk of bias
Overall risk of bias and directness	Risk of Bias	Moderate
Overall risk of bias and directness	Directness	Directly applicable

1 **Bozorgmanesh, 2010**

Bibliographic Reference	Bozorgmanesh, Mohammadreza; Hadaegh, Farzad; Azizi, Fereidoun; Diabetes prediction, lipid accumulation product, and adiposity measures; 6-year follow-up: Tehran lipid and glucose study.; Lipids in health and disease; 2010; vol. 9; 45

2 **Study Characteristics**

Study type	Prospective cohort study
Study details	Study location Residents in Tehran, Iran Setting Measurements undertaken in medical centres in district No.13 of Tehran. Regular follow up appointments scheduled. Study dates

	Recruitment 1999-2001. This population was followed for 6 years. Sources of funding Funding not detailed. The authors declared no competing interests Ethnicity The group were assumed to be >80% Iranian ethnicity.
Inclusion criteria	Population-based cohort of residents aged over 20 years from district 13 of Tehran
Number of participants	Individuals assigned to the intervention study, those with prevalent diabetes mellitus (using oral hypoglycaemic agents or insulin, baseline fasting plasma glucose (FPG) ≥7.0 mmol/l or 2 hour post challenge plasma glucose (2h-PCPG) ≥ 11.1 mmol/l, n = 698), and those with incomplete data on their diabetes status (n = 623) or baseline clinical measurements (n = 98)
Length of follow-up	Approximately 6 years
Loss to follow-up	45% were lost to follow-up. The main reasons for lack of attendance at follow-up examinations, despite repeated calls, were either migration or other personal reasons.
Index test(s)	BMI BMI was calculated as weight in kilograms divided by height in meters squared. WHR WC was measured at the narrowest level and that of hip at the maximal level over light clothing, using unstretched tape meter, without any pressure to body surface, and was recorded to the nearest 0.1 cm. WHR was calculated as WC divided by hip circumference. To avoid subjective error, all measurements were taken by the same person. WHtR

	WC was measured at the narrowest level and that of hip at the maximal level over light clothing, using unstretched tape meter, without any pressure to body surface, and was recorded to the nearest 0.1 cm. WHtR was calculated as WC divided by height. To avoid subjective error, all measurements were taken by the same person.
Reference standard (s)	A person developing T2DM during follow-up Participants were classified as having developed new diabetes during follow-up if they met at least one of these criteria: FPG ≥ 7 mmol/l, or 2h-PCPG ≥ 11.1 mmol/l or taking anti-diabetic medication.
Subgroup analyses	Analysis stratified by gender and age (20-49 and 50+)
Additional comments	The protocols and cut off values are derived according to last medical nutrition therapy manual texts -therapeutic lifestyle changes (TLC) DASH (Dietary Approach to Stop Hypertension) restricted-energy diets and 2007 ADA Nutrition Principles and Recommendations for persons with Diabetes Mellitus . DASH and ADA nutrition principles and recommendations for diabetes, have been adopted for Tehranians in previous study

Population characteristics

Study-level characteristics

Characteristic	**Study (N = 5018)**
% Female Custom value	58
Mean age (SD) Mean (SD)	41.6 (13.2)

Critical appraisal - GUT QUIPS checklist- PROGNOSIS ADULTS

Section	**Question**	**Answer**
Study participation	Summary Study participation	Low risk of bias

Section	Question	Answer
Study Attrition	Study Attrition Summary	High risk of bias *(Missing data (n=1617))*
Prognostic factor measurement	Prognostic factor Measurement Summary	Low risk of bias
Outcome Measurement	Outcome Measurement Summary	Low risk of bias
Study Confounding	Study Confounding Summary	Low risk of bias
Statistical Analysis and Reporting	Statistical Analysis and Presentation Summary	Low risk of bias
Overall risk of bias and directness	Risk of Bias	High
Overall risk of bias and directness	Directness	Directly applicable

1 **Chen, 2018**

Bibliographic Reference	Chen, Xu; Liu, Yu; Sun, Xizhuo; Yin, Zhaoxia; Li, Honghui; Deng, Kunpeng; Cheng, Cheng; Liu, Leilei; Luo, Xinping; Zhang, Ruiyuan; Liu, Feiyan; Zhou, Qionggui; Wang, Chongjian; Li, Linlin; Zhang, Lu; Wang, Bingyuan; Zhao, Yang; Zhou, Junmei; Han, Chengyi; Zhang, Hongyan; Yang, Xiangyu; Pang, Chao; Yin, Lei; Feng, Tianping; Zhao, Jingzhi; Zhang, Ming; Hu, Dongsheng; Comparison of body mass index, waist circumference, conicity index, and waist-to-height ratio for predicting incidence of hypertension: the rural Chinese cohort study.; Journal of human hypertension; 2018; vol. 32 (no. 3); 228-235

2 **Study Characteristics**

Study type	Prospective cohort study
Study details	Study location In a rural district in Henan Province of China.

	Study dates Recruitment in July-August in 2007 and 2008. Follow-up examinations took place in July-August in 2013 and 2014 Sources of funding This study was supported by the National Natural Science Foundation of China (grant numbers 81373074, 81402752, and 81673260); the Natural Science Foundation of Guangdong Province (grant number 2017A03013452); the Medical Research Foundation of Guangdong Province (grant number A2017181); and the Science and Technology Development Foundation of Shenzhen (grant numbers JCYJ20140418091413562, JCYJ 2016030715570, JCYJ 20170302143855721, and JCYJ20170412110537191). Recruitment Participants were selected by using cluster random sampling method
Inclusion criteria	Adults over 18 years old
Exclusion criteria	Excluded people aged >70 years (n = 1441), with diagnosis of hypertension (n = 4745), and with missing height and weight and WC values (n = 5) at baseline as well as people who died before the follow-up examination (n = 345) or had unknown hypertension at follow-up (n = 824).
Number of participants	9905 eligible participants (6039 women) were included and attended follow-up
Length of follow-up	6 years
Loss to follow-up	15% of the recruited population did not attend follow-up
Index test(s)	BMI Height, and weight were measured twice according to a standard protocol and the average used WHtR

	Height and WC were measured to the nearest 0.1 cm by using a metric scale; weight was measured to the nearest 0.5 kg by using a vertical weight scale WC WC were measured to the nearest 0.1 cm by using a metric scale
Reference standard (s)	A person developing hypertension during follow-up
Subgroup analyses	Analysis stratified by gender
Additional comments	calculated optimal cut-off values by using the maximum Youden index (sensitivity+specificity−1)

Population characteristics

Study-level characteristics

Characteristic	**Study (N = 20194)**
% Female Custom value	61
Mean age (SD) Median (IQR)	47 (*empty data* to *empty data*)
Family history of hypertension Custom value	3007 (34.5%)

Critical appraisal - GUT QUIPS checklist- PROGNOSIS ADULTS

Section	**Question**	**Answer**
Study participation	Summary Study participation	Low risk of bias

Section	Question	Answer
Study Attrition	Study Attrition Summary	High risk of bias *(high numbers of missing data*
Prognostic factor measurement	Prognostic factor Measurement Summary	Low risk of bias
Outcome Measurement	Outcome Measurement Summary	Low risk of bias
Study Confounding	Study Confounding Summary	Low risk of bias
Statistical Analysis and Reporting	Statistical Analysis and Presentation Summary	Low risk of bias
Overall risk of bias and directness	Risk of Bias	High *(high Attrition Bias)*
Overall risk of bias and directness	Directness	Directly applicable

1 **Choi, 2018**

Bibliographic Reference	Choi, J R; Ahn, S V; Kim, J Y; Koh, S B; Choi, E H; Lee, G Y; Jang, Y E; Comparison of various anthropometric indices for the identification of a predictor of incident hypertension: the ARIRANG study.; Journal of human hypertension; 2018; vol. 32 (no. 4); 294-300

2 **Study Characteristics**

Study type	Prospective cohort study
Study details	Study location South Korea Study dates

	Recruitment From November 2005 to January 2008. People were followed up from April 2008 to January 2011 Sources of funding Supported by the Basic Science Research Program through the National Research Foundation of Korea (NRF) funded by the Ministry of Education (2017R1D1A3B03034119). Additional support from Korea Centers for Disease Control and Prevention (2005-E71013-00, 2006- E71002-00, 2007-E71013-00, 2008-E71004-00, 2009-E71006-00, and 2010-E71003-00). This research was supported by Medical Research Center Program 2017R1A5A2015369. Recruitment Data from the Korean Genome and Epidemiology Study on Atherosclerosis Risk of Rural Areas in the Korean General Population (KoGES-ARIRANG) used, a population based prospective cohort study Ethnicity The population of the study was assumed to be <80% South Korean ethnicity.
Inclusion criteria	Adults aged 40 to 70 years old
Exclusion criteria	People with prior existence of hypertension and missing data, including waist circumference and blood pressure.
Number of participants	5178 people were recruited. Most of these people were excluded from analysis either due to already having hypertension or missing data, including weight circumference. The final dataset included 1718 people.
Length of follow-up	2.8 years
Loss to follow-up	Unclear but it would appear to be a large number.
Index test(s)	BMI WHR WHtR WC

	WC was measured in the horizontal plane at the middle point between the anterior iliac crest and the inferior margin of the rib using a tape measure (SECA-200, SECA, Hamburg, Germany).
Reference standard (s)	A person developing hypertension during follow-up Hypertension defined as SBP of ≥140 mmHg, and/or DBP of ≥90 mmHg and/or current treatment with antihypertensive medication at the baseline and follow-up surveys. All participants were examined after fasting.

Population characteristics

Study-level characteristics

Characteristic	Study (N = 1718)
% Female Custom value	63
Mean age (SD) Custom value	Mean of 53 years in those who did not develop hypertension and 57 in those who did

Critical appraisal - GUT QUIPS checklist- PROGNOSIS ADULTS

Section	Question	Answer
Study participation	Summary Study participation	Low risk of bias
Study Attrition	Study Attrition Summary	Moderate risk of bias *(Loss to follow-up = 36study doesn't attempts to collect information on participants who dropped out)*
Prognostic factor measurement	Prognostic factor Measurement Summary	Low risk of bias
Outcome Measurement	Outcome Measurement Summary	Moderate risk of bias

Section	Question	Answer
Study Confounding	Study Confounding Summary	Low risk of bias
Statistical Analysis and Reporting	Statistical Analysis and Presentation Summary	Low risk of bias
Overall risk of bias and directness	Risk of Bias	High
Overall risk of bias and directness	Directness	Partially applicable *(The applicability is dependent on whether the outcome studied is hypertension of hypertension risk factors)*

1 ## Gus, 2009

Bibliographic Reference	Gus, M; Cichelero, F Tremea; Moreira, C Medaglia; Escobar, G Fortes; Moreira, L Beltrami; Wiehe, M; Fuchs, S Costa; Fuchs, F Danni; Waist circumference cut-off values to predict the incidence of hypertension: an estimation from a Brazilian population-based cohort.; Nutrition, metabolism, and cardiovascular diseases : NMCD; 2009; vol. 19 (no. 1); 15-9

2 ## Study Characteristics

Study type	Cross-sectional study
Study details	Study location Brazil Setting Porto Alegre, a state capital in Southern Brazil Study dates

	1989 to 1991 Sources of funding Supported by grants from: Conselho Nacional de Pesquisa (CNPq) and Fundacao de Amparo a Pesquisa do Rio Grande do Sul Recruitment A population-based cohort of adults living in Porto Alegre, a state capital in Southern Brazil Ethnicity study sample had a 530 (90%) white ethnicity population
Inclusion criteria	Not detailed
Exclusion criteria	People who were hypertensive on the first visit and/or with missing data,
Number of participants	1091 participants, study sample had 589 at follow up
Length of follow-up	The mean follow-up period was 5.5 ———————————— 0.9 years.
Loss to follow-up	A total of 71 individuals became deceased and 201 were lost to follow-up, leading to a total of 819 individuals in the whole cohort available for analysis (75%).
Index test(s)	WC (cm)
Reference standard (s)	A person developing hypertension during follow-up
Additional comments	A receiver operating characteristics (ROC) curve analysis was employed to select the best WC cut-off point to predict the incidence of hypertension. This was not adjusted for covariates.

Population characteristics

Study-level characteristics

Characteristic	Study (N =)
% Female Sample size	n = 334 ; % = 56.7
Mean age (SD) Mean (SD)	38.6 (17.7)

1 **Critical appraisal - GUT QUIPS checklist- PROGNOSIS ADULTS**

Section	Question	Answer
Study participation	Summary Study participation	Low risk of bias
Study Attrition	Study Attrition Summary	High risk of bias *(Loss to follow-up =201 attempted to collect information from participants who dropped out but doesn't report any significant factors apart from mean age)*
Prognostic factor measurement	Prognostic factor Measurement Summary	Low risk of bias
Outcome Measurement	Outcome Measurement Summary	Low risk of bias
Study Confounding	Study Confounding Summary	Low risk of bias
Statistical Analysis and Reporting	Statistical Analysis and Presentation Summary	Low risk of bias
Overall risk of bias and directness	Risk of Bias	High
Overall risk of bias and directness	Directness	Directly applicable

1 **Hadaegh, 2006**

Bibliographic Reference	Hadaegh, F; Zabetian, A; Harati, H; Azizi, F; Waist/height ratio as a better predictor of type 2 diabetes compared to body mass index in Tehranian adult men--a 3.6-year prospective study.; Experimental and clinical endocrinology & diabetes : official journal, German Society of Endocrinology [and] German Diabetes Association; 2006; vol. 114 (no. 6); 310-5

2 **Study Characteristics**

Study type	Prospective cohort study
Study details	Study location Tehran, Iran Study dates Recruitment 1999-2001 with follow-up by February 2005. Sources of funding Study was supported by grant No.121 from the National Research Council of the Islamic Republic of Iran and by the combined support of the National Research Council of Islamic Republic of Iran and Endocrine Research Center of Shaheed Beheshti University of Medical Sciences. Recruitment Study conducted within the framework of the Tehran Lipid and Glucose Study (TLGS), a population-based prospective study conducted on residents of district 13 of Tehran. People were selected by a multistage cluster random-sampling method Ethnicity The ethnicity of the population in this study was not stated but assumed to be >80% Iranian ethnicity.
Inclusion criteria	Adults over 20 years old

Exclusion criteria	Subjects with a history of insulin injection or oral hypoglycaemic agent usage for control of diabetes or those whose plasma glucose was ≥ 126 mg/dl after a 12–14 hours overnight fast or ≥ 200 mg/dl 2 hours after a 75-g oral-glucose-tolerance test at baseline
Number of participants	4573 people were possible includes in the study. Of this group,1852 men with full relevant data were included.
Length of follow-up	3.6 years
Loss to follow-up	Unclear how many were lost to follow-up
Index test(s)	BMI Weight was then measured, while subjects minimally clothed without shoes using digital scales and recorded to the nearest 100 g. Height was measured in a standing position, without shoes, using tape meter, while the shoulders were in a normal position. BMI was calculated as weight in kilograms divided by height in meters squared WHR WHR was calculated as WC divided by hip circumference WHtR WHtR as WC divided by height. WC WC was measured at the narrowest level and that of hip at the maximal level over light clothing, using unstretched tape meter, without any pressure to body surface, and was recorded to the nearest 0.1 cm.
Reference standard (s)	A person developing T2DM during follow-up FBS≥ 126 mg/dl and/or 2 hpG ≥ 200 mg/dl) (American Diabetes Association, 2004

Population characteristics

1 **Study-level characteristics**

Characteristic	Study (N = 1852)
% Female Custom value	0%
Mean age (SD) Mean (SD)	45.1 (14.5)

2 **Critical appraisal - GUT QUIPS checklist- PROGNOSIS ADULTS**

Section	Question	Answer
Study participation	Summary Study participation	Low risk of bias
Study Attrition	Study Attrition Summary	High risk of bias *(Lost to follow up: only 54% of patients completed the study, study doesn't attempt to collect outcome and prognostic factor information on those lost to follow-up)*
Prognostic factor measurement	Prognostic factor Measurement Summary	Low risk of bias
Outcome Measurement	Outcome Measurement Summary	Low risk of bias
Study Confounding	Study Confounding Summary	Low risk of bias
Statistical Analysis and Reporting	Statistical Analysis and Presentation Summary	Moderate risk of bias *(selective/partial reporting of results)*
Overall risk of bias and directness	Risk of Bias	High

Section	Question	Answer
Overall risk of bias and directness	Directness	Directly applicable

1 **Hadaegh, 2009 A**

Bibliographic Reference	Hadaegh, F; Zabetian, A; Sarbakhsh, P; Khalili, D; James, W P T; Azizi, F; Appropriate cutoff values of anthropometric variables to predict cardiovascular outcomes: 7.6 years follow-up in an Iranian population.; International journal of obesity (2005); 2009; vol. 33 (no. 12); 1437-45

2 **Study Characteristics**

Study type	Prospective cohort study
Study details	Study location District 13 in Tehran, Iran Study dates Recruited 1999 to 2001 and followed up until March 2008 Sources of funding Study was supported by Grant No. 121 from the National Research Council of the Islamic Republic of Iran. Recruitment Study conducted within the framework of the Tehran Lipid and Glucose Study (TLGS). Ethnicity Ethnicity of the group not stated but it was assumed that >80% of the population were of Iranian ethnicity.

Inclusion criteria	Adults, 40 years and older, who are free of CVD at baseline
Exclusion criteria	People with a history of CVD at baseline and those with missing data
Number of participants	N=4477
Length of follow-up	7.6 years
Loss to follow-up	26% of the participants were lost to follow-up
Index test(s)	BMI WHR WHtR WC
Reference standard (s)	A person developing CVD during follow-up
Subgroup analyses	Analysis stratified by gender and age (</=60 and >60)
Additional comments	The discrimination ability of models was calculated using the C index. To determine the usual approach of specifying the cut-off values of each anthropometric variable for predicting CVD, the receiver operator characteristic (ROC) curve analysis was used with an estimation of the variable’s sensitivity and specificity. The cut-off point for each variable was assessed by the minimum value of O(1-sensitivity)2 þ (1-specificity)2 , 19 which represented the maximum sum of sensitivity and specificity (MAXss) in each gender stratified by age.

Population characteristics

Study-level characteristics

Characteristic	**Study (N = 3620)**
% Female Custom value	2006 (55%)

Characteristic	Study (N = 3620)
Mean age (SD) Custom value	Men: 55 (10). Women: 53 (9)

1 **Critical appraisal - GUT QUIPS checklist- PROGNOSIS ADULTS**

Section	Question	Answer
Study participation	Summary Study participation	Low risk of bias
Study Attrition	Study Attrition Summary	High risk of bias *(40% of the participants in baseline cohort were excluded from analysis due to loss at follow-up. study reports some data on outcome and prognostic factor information on those lost to follow-up)*
Prognostic factor measurement	Prognostic factor Measurement Summary	Low risk of bias
Outcome Measurement	Outcome Measurement Summary	Low risk of bias
Study Confounding	Study Confounding Summary	Low risk of bias
Statistical Analysis and Reporting	Statistical Analysis and Presentation Summary	High risk of bias *(Selective/partial reporting of results - only analysed female population)* Low risk of bias
Overall risk of bias and directness	Risk of Bias	Moderate

Section	Question	Answer
Overall risk of bias and directness	Directness	Directly applicable

1 **Hadaegh, 2009 B**

Bibliographic Reference	Hadaegh, Farzad; Shafiee, Gita; Azizi, Fereidoun; Anthropometric predictors of incident type 2 diabetes mellitus in Iranian women.; Annals of Saudi medicine; 2009; vol. 29 (no. 3); 194-200

2 **Study Characteristics**

Study type	Prospective cohort study
Study details	Study location District 13 of Tehran, Iran Study dates Sources of funding Conducted within the framework of the Tehran Lipid and Glucose Study (TLGS), a prospective study conducted on a representative sample of residents of district 13 of Tehran Recruitment Recruited Match 1999 to December 2001. Follow-up appointments ran from 2002 to 2005 Ethnicity The ethnicity of the population was not stated but it was assumed to be >80% Iranian ethnicity
Inclusion criteria	Women over 20 years old

Exclusion criteria	743 with diabetes (271 subjects with current use of a hypoglycaemic agent and 472 with newly diagnosed diabetes according to the oral glucose tolerance test results [OGTT]) and 448 with missing data
Number of participants	N=2970
Length of follow-up	3.6 years
Loss to follow-up	169 were lost to follow-up
Index test(s)	BMI Weight was recorded to the nearest 100 grams while minimally clothed without shoes using digital scales. Height was measured in a standing position, without shoes, using a tape stadiometer with a minimum measurement of 1 mm, while the shoulders were in a normal state. BMI was calculated as weight in kilograms divided by height in meters squared. WHR WC was recorded to the nearest 0.1cm at the umbilical level and hip circumference at the maximal level over light clothing, using an unstretched tape meter, without pressure on the body surface. WHR was calculated as WC divided by hip circumference. WHtR WC was recorded to the nearest 0.1cm at the umbilical level and hip circumference at the maximal level over light clothing, using an unstretched tape meter, without pressure on the body surface. WHtR was WC (cm) divided by height (cm). WC WC was recorded to the nearest 0.1cm at the umbilical level and hip circumference at the maximal level over light clothing, using an unstretched tape meter, without pressure on the body surface. WHR was calculated as WC divided by hip circumference and
Reference standard (s)	A person developing T2DM during follow-up

Additional comments	The discrimination ability of models was calculated using the C index. To determine the usual approach of specifying the cut-off values of each anthropometric variable for predicting CVD, the receiver operator characteristic (ROC) curve analysis was used with an estimation of the variable's sensitivity and specificity. The cut-off point for each variable was assessed by the minimum value of O(1-sensitivity)2 þ (1-specificity)2 , 19 which represented the maximum sum of sensitivity and specificity (MAXss) in each gender stratified by age.

1 **Population characteristics**

2 **Study-level characteristics**

Characteristic	**Study (N = 2801)**
% Female Custom value	100%
Mean age (SD) Mean (SD)	54 (12.9)

3 **Critical appraisal - GUT QUIPS checklist- PROGNOSIS ADULTS**

Section	**Question**	**Answer**
Study participation	Summary Study participation	Low risk of bias
Study Attrition	Study Attrition Summary	High risk of bias *(Loss to follow-up data (n =435))*
Prognostic factor measurement	Prognostic factor Measurement Summary	Low risk of bias
Outcome Measurement	Outcome Measurement Summary	Low risk of bias
Study Confounding	Study Confounding Summary	Low risk of bias

Section	Question	Answer
Statistical Analysis and Reporting	Statistical Analysis and Presentation Summary	High risk of bias *((CVD outcomes) Details of cardiovascular outcomes have not been reported)*
Overall risk of bias and directness	Risk of Bias	High
Overall risk of bias and directness	Directness	Directly applicable

1 **Lee, 2015**

Bibliographic Reference	Lee, Joung-Won; Lim, Nam-Kyoo; Baek, Tae-Hwa; Park, Sung-Hee; Park, Hyun-Young; Anthropometric indices as predictors of hypertension among men and women aged 40-69 years in the Korean population: the Korean Genome and Epidemiology Study.; BMC public health; 2015; vol. 15; 140

2 **Study Characteristics**

Study type	Prospective cohort study
Study details	Study location South Korea Study dates Korean Genome and Epidemiology Study (KoGES), an ongoing community-based prospective cohort study of 10,038 participants, was utilised for this study. It was started in 2001 with the support of the Korean National Institute of Health. A baseline examination was performed on randomly selected participants in 2001–2002 and biennial follow-up examinations were subsequently conducted.

	Sources of funding This study was supported by an intramural grant of the National Institute of Health, Korea 4800-4845-302-210(2011-NG63002). Ethnicity The ethnicity of the people included in the study was not stated but was assumed to be >80% South Korean ethnicity which is Asian (other) for this systematic review.
Inclusion criteria	People aged 40-69 years of age
Exclusion criteria	People with hypertension at baseline People with previous CVD
Number of participants	N=4454
Length of follow-up	4 years
Loss to follow-up	In the study follow-up examinations were conducted every 2 years. The follow-up rates were 86.4%, 75.6%, and 68.8% at the first, second, and third follow-up surveys, respectively.
Index test(s)	BMI Height and weight were measured (to the nearest 0.1 cm and 0.1 kg, respectively) using a digital stadiometer and scale. BMI (kg/m2) was calculated by dividing weight by height squared. WHR Hip circumference was measured three times at the point of maximal protrusion of the buttocks; the mean of the three readings was considered the final hip circumference. WHtR

	WC WC was measured three times at the midpoint between the bottom of the ribcage and the top of the iliac crest using a fiberglass tape measure.
Reference standard (s)	A person developing hypertension during follow-up People with an SBP of ≥140 mmHg or a DPB of ≥90 mmHg, or who used anti-hypertensive medications, were defined as having hypertension.
Subgroup analyses	Analysis stratified by gender
Additional comments	The cut-off points for hypertension were estimated using the maximized Youden index by sexes. The AUC of each obesity marker was compared those of BMI using the DeLong method

Population characteristics

Study-level characteristics

Characteristic	**Study (N = 4454)**
% Female Custom value	52%

Critical appraisal - GUT QUIPS checklist- PROGNOSIS ADULTS

Section	Question	Answer
Study participation	Summary Study participation	Low risk of bias
Study Attrition	Study Attrition Summary	Low risk of bias
Prognostic factor measurement	Prognostic factor Measurement Summary	Moderate risk of bias (Threshold not pre-specified)

Outcome Measurement	Outcome Measurement Summary	Low risk of bias
Study Confounding	Study Confounding Summary	Low risk of bias
Statistical Analysis and Reporting	Statistical Analysis and Presentation Summary	Low risk of bias
Overall risk of bias and directness	Risk of Bias	Moderate (Threshold not pre-specified)
Overall risk of bias and directness	Directness	Directly applicable

1 **MacKay, 2009**

Bibliographic Reference	MacKay, Meredith F; Haffner, Steven M; Wagenknecht, Lynne E; D'Agostino, Ralph B Jr; Hanley, Anthony J G; Prediction of type 2 diabetes using alternate anthropometric measures in a multi-ethnic cohort: the insulin resistance atherosclerosis study.; Diabetes care; 2009; vol. 32 (no. 5); 956-8

2 Study Characteristics

Study type	Prospective cohort study
Study details	Study location Multicentre USA study Setting Unclear who undertook the measurements or the protocols used. Study dates People were recruited 1992-1994 and followed for 5 years.

	Sources of funding Supported by National Heart, Lung and Blood Institute grants U01-HL47887, U01-HL47889, U01-HL47892, U01-HL47902, DK-29867, and R01 58329 and grant M01-RR-43 from the National Institutes of Health. A.J.G.H. is supported by the Canada Research Chairs Program and the Canadian Diabetes Association. Recruitment The Insulin Resistance Atherosclerosis Study (IRAS) is the first epidemiologic study designed to assess the relationships between insulin resistance, insulinemia, glycemia, other components of the insulin resistance syndrome, and prevalent cardiovascular disease (CVD) in a large multi-ethnic cohort. Over 1600 men and women were recruited from four geographic areas to represent a range of glucose tolerance (normal, impaired, and diabetic) and ethnicity (Hispanic, non-Hispanic white, and African-American) Ethnicity Results were reported for 3 ethnicities - non-Hispanic white (40%), African American (26%), and Hispanic (34%). They will be utilised in the following ethnic groups defined in this review - white, Black / African Caribbean, and Other.
Inclusion criteria	People aged 40-69 years of age
Number of participants	N=1073
Length of follow-up	5.2 years
Loss to follow-up	Unclear how many started out in the study but were lost to follow-up
Index test(s)	BMI WHR WHtR WC

Reference standard (s)	A person developing T2DM during follow-up
Subgroup analyses	Analysis stratified into 3 ethnic groups: white (non-Hispanic white), Black / African Caribbean (African American), and other (Hispanic).

1 **Population characteristics**

2 **Study-level characteristics**

Characteristic	**Study (N = 1073)**
% Female Custom value	56%
Mean age (SD) Custom value	Not detailed

3 **Critical appraisal - GUT QUIPS checklist- PROGNOSIS ADULTS**

Section	**Question**	**Answer**
Study participation	Summary Study participation	Low risk of bias
Study Attrition	Study Attrition Summary	High risk of bias *(baseline sample not available for analysis, doesn't report information on participants who dropped out/missing data)*
Prognostic factor measurement	Prognostic factor Measurement Summary	Moderate risk of bias *(Definition and measurement of the predictive factor not reported)*
Outcome Measurement	Outcome Measurement Summary	Moderate risk of bias
Study Confounding	Study Confounding Summary	Low risk of bias

Section	Question	Answer
Statistical Analysis and Reporting	Statistical Analysis and Presentation Summary	Moderate risk of bias *(only reports AROC)*
Overall risk of bias and directness	Risk of Bias	High
Overall risk of bias and directness	Directness	Directly applicable

1 **Mansour, 2007**

Bibliographic Reference	Mansour, Abbas Ali; Al-Jazairi, Meelad Imad; Predictors of incident diabetes mellitus in Basrah, Iraq.; Annals of nutrition & metabolism; 2007; vol. 51 (no. 3); 277-80

2 **Study Characteristics**

Study type	Prospective cohort study
Study details	Study location Abu al-Khasib district, Basrah, Iraq Study dates Recruitment in January 2001 with follow-up after December 2006 Sources of funding Not detailed Recruitment

	Unclear how the population was recruited Ethnicity The ethnicity of the population was not stated but it was assumed they were <80% of Arab ethnicity.
Inclusion criteria	Adults over 18 years old
Exclusion criteria	People who had diabetes at baseline
Number of participants	13730
Length of follow-up	5 years
Loss to follow-up	No loss to follow-up was indicated. However it would appear that people who did not complete follow-up were not reported on.
Index test(s)	BMI Standing height and weight measurements were completed with subjects wearing lightweight clothing and no shoes. Height was measured to the nearest centimetre and weight was measured to the nearest 0.5 kg. BMI was calculated as body weight in kilograms divided by the squared value of body height in meters (kg/m 2). WHR WHtR WC A physician measured WC at the umbilical level from the horizontal plane in centimetres, using a plastic anthropometric tape with the subject standing erect and breathing normally.
Reference standard (s)	A person developing T2DM during follow-up
Subgroup analyses	Analysis stratified by gender

Additional comments	Cut-offs on the ROC curves were chosen to maximize sensitivity and specificity of the indices examined

1 ## Population characteristics

2 ### Study-level characteristics

Characteristic	Study (N = 13730)
% Female Custom value	6629 (48%)
Mean age (SD) Mean (SD)	44.9 (15.8)

3 ### Critical appraisal - GUT QUIPS checklist- PROGNOSIS ADULTS

Section	Question	Answer
Study participation	Summary Study participation	Moderate risk of bias *(It was unclear how they were recruited)*
Study Attrition	Study Attrition Summary	Moderate risk of bias *(doesn't report missing data)*
Prognostic factor measurement	Prognostic factor Measurement Summary	Low risk of bias
Outcome Measurement	Outcome Measurement Summary	Low risk of bias
Study Confounding	Study Confounding Summary	Low risk of bias
Statistical Analysis and Reporting	Statistical Analysis and Presentation Summary	High risk of bias *(Partial/ Selective reporting (Only AROC))*
Overall risk of bias and directness	Risk of Bias	High

Section	Question	Answer
Overall risk of bias and directness	Directness	Directly applicable

1 **Moon, 2018**

Bibliographic Reference	Moon, Shinje; Park, Jung Hwan; Ryu, Ohk-Hyun; Chung, Wankyo; Effectiveness of Z-score of log-transformed A Body Shape Index (LBSIZ) in predicting cardiovascular disease in Korea: the Korean Genome and Epidemiology Study.; Scientific reports; 2018; vol. 8 (no. 1); 12094

2 **Study Characteristics**

Study type	Prospective cohort study
Study details	Study location Ansan and Ansung in South Korea Study dates People were recruited between 2001 and 2002 and examined in biennial follow-up. Sources of funding Funding not stated Recruitment Two population-based cohorts from Ansan and Ansung, Korea as part of the Korean Genome and Epidemiology Study (KOGES), a Korean government funded survey that investigates trends in chronic non-communicable diseases. Ethnicity

	This was a population based study and the people included were assumed to be of South Korean ethnicity which is included under Asian (other) for this review.
Inclusion criteria	People aged 40-69 years of age
Exclusion criteria	People with incomplete data (demographic, anthropometric, or laboratory), those with a clinical history of CVD or cancer at baseline, and those who had received steroids or anticoagulants.
Number of participants	8485
Length of follow-up	10 years
Loss to follow-up	10038 people were recruited. 987 people were excluded due to incomplete data. 323 excluded due to CVD at baseline 209 with cancer at baseline and 34 people using steroids or anticoagulants
Index test(s)	BMI Height and body weight were measured to the nearest 0.1 cm and 0.2 kg, respectively. Blood pressure (BP) was measured in the sitting position after at least 5 minutes of rest. WC WC was measured using a flexible tape at the narrowest point between the lowest border of the rib cage and the uppermost lateral border of the iliac crest at the end of normal expiration
Reference standard (s)	A person developing CVD during follow-up CVD events were investigated with a structured questionnaire. The CVD event group was defined as having ≥ 1 of the following conditions: myocardial infarction, coronary heart disease, congestive heart failure, cerebrovascular disease, or peripheral arterial disease. If the participants did not have any of the listed CVD conditions, they were classified as the normal group.

1

Population characteristics

Study-level characteristics

Characteristic	Study (N = 8485)
% Female Custom value	4411 (52%)
Mean age (SD) Standardised Mean (SD)	52.1 (*empty data*)

Critical appraisal - GUT QUIPS checklist- PROGNOSIS ADULTS

Section	Question	Answer
Study participation	Summary Study participation	Low risk of bias
Study Attrition	Study Attrition Summary	High risk of bias *(Loss to follow-up: (Ansung, n=5,018, response rate=69.6%) & (Ansan, n=5,012, response rate=45.7%).)*
Prognostic factor measurement	Prognostic factor Measurement Summary	Low risk of bias
Outcome Measurement	Outcome Measurement Summary	Moderate risk of bias
Study Confounding	Study Confounding Summary	Low risk of bias
Statistical Analysis and Reporting	Statistical Analysis and Presentation Summary	Low risk of bias
Overall risk of bias and directness	Risk of Bias	High

Section	Question	Answer
Overall risk of bias and directness	Directness	Directly applicable

1 **Nguyen, 2008**

Bibliographic Reference	Nguyen, T Tuan; Adair, Linda S; He, Ka; Popkin, Barry M; Optimal cut-off values for overweight: using body mass index to predict incidence of hypertension in 18- to 65-year-old Chinese adults.; The Journal of nutrition; 2008; vol. 138 (no. 7); 1377-82

2 **Study Characteristics**

Study type	Prospective cohort study
Study details	Study location China Setting The China Health and Nutrition Survey (CHNS) is an ongoing study established in the late 1980s in 9 provinces that vary substantially in geography, economic development, public resources, and health indicators. Study dates 2000-2004 Sources of funding not detailed Recruitment

	Ethnicity The population in the study were assumed to be at least 80% of Chinese ethnicity.
Inclusion criteria	People who were 18- to 65-y-old men, non-pregnant or non-lactating women
Exclusion criteria	People with extreme or implausible values of anthropometric measures or blood pressure
Number of participants	4492
Length of follow-up	4 years
Loss to follow-up	not detailed
Index test(s)	BMI
Reference standard (s)	A person developing hypertension during follow-up
Additional comments	To evaluate an optimal BMI cut-off, we computed and searched for the shortest distance on the sex-specific ROC curve, estimated at each one-half unit of BMI. A distance on the ROC curve is equal to ð12sensitivityÞ 2 1ð12specificityÞ 2 q. Crude and adjusted area under the ROC curves (AUC) were estimated by using logistic regression models.

1 **Population characteristics**

2 **Study-level characteristics**

Characteristic	**Study (N = 4492)**
% Female Mean (SD)	2415 (*empty data*)
Men Mean age (SD)	41.5 (41 to 41.9)

Characteristic	Study (N = 4492)
Mean (95% CI)	
Women Mean age (SD) Mean (95% CI)	42.5 (42.1 to 42.9)

1 **Critical appraisal - GUT QUIPS checklist- PROGNOSIS ADULTS**

Section	Question	Answer
Study participation	Summary Study participation	Moderate risk of bias *(No clear exclusion criteria)*
Study Attrition	Study Attrition Summary	Moderate risk of bias *((81%) completed the study and included in the analysis)*
Prognostic factor measurement	Prognostic factor Measurement Summary	Low risk of bias
Outcome Measurement	Outcome Measurement Summary	Low risk of bias
Study Confounding	Study Confounding Summary	Low risk of bias
Statistical Analysis and Reporting	Statistical Analysis and Presentation Summary	Low risk of bias
Overall risk of bias and directness	Risk of Bias	High
Overall risk of bias and directness	Directness	Directly applicable

2 **Oda, 2013**

Bibliographic Reference	Oda, Eiji; Aizawa, Yoshifusa; Metabolic syndrome is a poor predictor of diabetes in a Japanese health screening population; Internal Medicine; 2013; vol. 52 (no. 7); 721-725

1 **Study Characteristics**

Study type	Prospective cohort study
Study details	Study location Japan Setting subjects who visited a Medical Check-up Centre Study dates 2008 - 2011 Sources of funding not detailed Recruitment subjects who visited our Medical Check-up Centre in both 2008 and 2011 and were free from diabetes, Method of recruitment not detailed. Ethnicity the population in the study were assumed to be at least 80% of Asian (other) ethnicity
Number of participants	2,034
Length of follow-up	4 years
Loss to follow-up	not detailed

Index test(s)	BMI (kg/m2)
Reference standard (s)	A person developing T2DM during follow-up
Additional comments	The optimal cut-off points (OPCs) for FG, HbA1c and BMI to discriminate the development of diabetes and the sensitivities/specificities were obtained from receiver operating characteristic (ROC) curves, and the sensitivities/specificities were compared with those of MS and JMS

1 **Population characteristics**

2 **Study-level characteristics**

Characteristic	**Study (N = 2034)**
% Female Sample size	n = 744
Mean age (SD) Mean (SD)	52 (9.2)

3 **Critical appraisal - GUT QUIPS checklist- PROGNOSIS ADULTS**

Section	**Question**	**Answer**
Study participation	Summary Study participation	High risk of bias
Study Attrition	Study Attrition Summary	High risk of bias
Prognostic factor measurement	Prognostic factor Measurement Summary	Low risk of bias
Outcome Measurement	Outcome Measurement Summary	Low risk of bias
Study Confounding	Study Confounding Summary	Low risk of bias

Section	Question	Answer
Statistical Analysis and Reporting	Statistical Analysis and Presentation Summary	Low risk of bias
Overall risk of bias and directness	Risk of Bias	High
Overall risk of bias and directness	Directness	Directly applicable

Rezende, 2018

Bibliographic Reference Rezende, Ana Carolina; Souza, Ludimila Garcia; Jardim, Thiago Veiga; Perillo, Naiana Borges; Araujo, Ymara Cassia Luciana; de Souza, Samanta Garcia; Sousa, Ana Luiza Lima; Moreira, Humberto Graner; de Souza, Weimar Kunz Sebba Barroso; do Rosario Gondim Peixoto, Maria; Jardim, Paulo Cesar Brandao Veiga; Is waist-to-height ratio the best predictive indicator of hypertension incidence? A cohort study.; BMC public health; 2018; vol. 18 (no. 1); 281

Study Characteristics

Study type	Prospective cohort study
Study details	Study location Brazil Setting city of Firminópolis, Study dates The current study represents the second phase of a population-based observational prospective cohort study that was completed in 2015. The baseline cohort was initiated in 2002.

	Sources of funding This research was funded by the Goiás Research Foundation (Fundação de Amparo à Pesquisa do Estado de Goiás - FAPEG). This foundation is a legal entity of public law Recruitment
Inclusion criteria	individuals aged over 18 years who were living in the urban area
Number of participants	471
Length of follow-up	The mean follow-up was 13.2 years
Loss to follow-up	subjects evaluated in phase 2 (n = 471) were compared to those not evaluated (n = 297), no differences were found in the general characteristics of the groups (p > 0.05). The reasons for exclusion were as follows: subject could not be found (n = 73), death (n = 55), moved to another city (n = 153), refusal (n = 5) and absent from their home (n = 11). The final study sample size was 471 (40,3%) individuals
Index test(s)	BMI (kg/m2) WC (cm) WHtR (unid)
Reference standard (s)	A person developing hypertension during follow-up
Additional comments	The ROC (receiver operating characteristic) curves were analysed to identify the best cut-off points and to evaluate and compare the predictive capacity of the anthropometric indicators for the HTN outcome by age group in men and women (< 40 years of age and ≥40 years).

Population characteristics

Study-level characteristics

Characteristic	Study (N = 471)
% Female Sample size	n = 319 ; % = 67.7
Mean age (SD) Sample size	n = 38.9
Mean age (SD) Mean (SD)	38.9 (12.3)

1 **Critical appraisal - GUT QUIPS checklist- PROGNOSIS ADULTS**

Section	Question	Answer
Study participation	Summary Study participation	Low risk of bias
Study Attrition	Study Attrition Summary	High risk of bias (high Loss to follow-up (The final study sample size was 471 (40,3%) individuals))
Prognostic factor measurement	Prognostic factor Measurement Summary	Moderate risk of bias (Cut-off not pre-specified)
Outcome Measurement	Outcome Measurement Summary	Low risk of bias
Study Confounding	Study Confounding Summary	Low risk of bias
Statistical Analysis and Reporting	Statistical Analysis and Presentation Summary	Low risk of bias

Overall risk of bias and directness	Risk of Bias	High (Cut-off not pre-specified and study attrition)
Overall risk of bias and directness	Directness	Directly applicable

1 **Sargeant, 2002**

Bibliographic Reference	Sargeant, Lincoln A; Bennett, Franklyn I; Forrester, Terrence E; Cooper, Richard S; Wilks, Rainford J; Predicting incident diabetes in Jamaica: the role of anthropometry.; Obesity research; 2002; vol. 10 (no. 8); 792-8

2 **Study Characteristics**

Study type	Prospective cohort study
Study details	Study location Jamaica Setting Residents of Spanish Town, Jamaica, Study dates These participants had been recruited between 1993 and 1996 Sources of funding This study was funded by grants from the National Heart, Lung, and Blood Institute (HL45508; HL 47910) Recruitment

	A cluster sampling method was used to recruit equal proportions of men and women in five 10-year age strata. Enumeration districts were sampled based on a probability-proportional to-size method, and households within these districts were visited to recruit individuals between 25 and 74 years old. Ethnicity The population in the study were assumed to be at least 80% of Black ethnicity.
Inclusion criteria	Not detailed
Exclusion criteria	People who had diabetes at baseline
Number of participants	728 non-diabetic adults (290 men and 438 women)
Length of follow-up	Followed for 4.0 years (0.5) (mean SD)
Loss to follow-up	There were 64 deaths, and 344 participants had moved. Six refused inclusion in the follow-up study and 192 who consented to participate had not yet been interviewed. Of the 1452 living participants, 76% had consented for follow-up and 63% or 941 participants had been interviewed.
Index test(s)	BMI (kg/m2) WC (cm) WHtR (unid) WHR (unid)
Reference standard (s)	A person developing T2DM during follow-up

Additional comments	The area under the receiver operating characteristic (ROC) curve for those significant variables in the multivariate regression model was calculated, and different curves of independent variables were compared to determine the most significant cut-off points. The "optimal" cut-off point where sensitivity and specificity are maximized

1 **Population characteristics**

2 **Study-level characteristics**

Characteristic	Study (N = 728)
% Female Sample size	n = 438
Women Mean age (SD) Mean (SD)	45.9 (13.1)
Men Mean age (SD) Mean (SD)	49.2 (14.9)

3 **Critical appraisal - GUT QUIPS checklist- PROGNOSIS ADULTS**

Section	Question	Answer
Study participation	Summary Study participation	Low risk of bias
Study Attrition	Study Attrition Summary	High risk of bias *(high Loss to follow-up (Of the 1452 living participants, 63% or 941 participants were included in the analysis))*
Prognostic factor measurement	Prognostic factor Measurement Summary	Low risk of bias
Outcome Measurement	Outcome Measurement Summary	Low risk of bias

Section	Question	Answer
Study Confounding	Study Confounding Summary	Low risk of bias
Statistical Analysis and Reporting	Statistical Analysis and Presentation Summary	Low risk of bias
Overall risk of bias and directness	Risk of Bias	High
Overall risk of bias and directness	Directness	Directly applicable

1 **Schneider, 2010**

Bibliographic Reference	Schneider, Harald J; Friedrich, Nele; Klotsche, Jens; Pieper, Lars; Nauck, Matthias; John, Ulrich; Dorr, Marcus; Felix, Stephan; Lehnert, Hendrik; Pittrow, David; Silber, Sigmund; Volzke, Henry; Stalla, Gunter K; Wallaschofski, Henri; Wittchen, Hans-Ulrich; The predictive value of different measures of obesity for incident cardiovascular events and mortality.; The Journal of clinical endocrinology and metabolism; 2010; vol. 95 (no. 4); 1777-85

2 **Study Characteristics**

Study type	Retrospective cohort study
Study details	Study location Germany Setting The DETECT study was in a primary care practice in Germany

	SHIP was a longitudinal population-based cohort study in the northeast of Germany Study dates DETECT study subjects attended a primary care practice in Germany during a specified half day in September 2003 with a follow-up visit between September 2007 and February 2008 Sources of funding DETECT is supported by an unrestricted educational grant of Pfizer GmbH, Karlsruhe, Germany. SHIP is part of the Community Medicine Research net (CMR) of the University of Greifswald, Greifswald, Germany, which is funded by the Federal Ministry of Education and Research, the Ministry of Cultural Affairs as well as the Social Ministry of the Federal State of Mecklenburg-West Pomerania. Ethnicity DETECT Study: Ethnicity was not recorded but, being representative of the German population, the participants were mainly of Caucasian ethnicity and with 1.2% inhabitants of African or Southeast-Asian origin SHIP Study: **only included subjects of Caucasian origin.**
Exclusion criteria	People with missing anthropometric data
Number of participants	10,652 DETECT Study 6,355

	SHIP Study 4,297
Length of follow-up	DETECT study (mean follow-up, 3.3 yr) SHIP study (mean follow-up, 8.5 yr)
Loss to follow-up	Detect study 610 were excluded due to loss to follow-up SHIP study no subjects were excluded due to loss to follow-up
Index test(s)	BMI (kg/m2) WC (cm) WHtR (unid) WHR (unid)
Reference standard (s)	All-cause mortality Cardiovascular mortality
Additional comments	**Cut-off levels were estimated for the sex- and age-specific percentiles of the different anthropometric parameters by calculating that point on the curve where the sum of sensitivity and specificity was highest.**

1 **Population characteristics**

2 **Study-level characteristics**

Characteristic	Study (N = 10652)
% Female Sample size	n = 5956 ; % = 55.9
Mean age (SD) Mean (SD)	54.8 (15.6)

1 **Critical appraisal - GUT QUIPS checklist- PROGNOSIS ADULTS**

Section	Question	Answer
Study participation	Summary Study participation	Low risk of bias
Study Attrition	Study Attrition Summary	High risk of bias *(High Loss to follow-up (Of the 7519 subjects, 554 were excluded because of missing anthropometric data. Of the remaining 6965 subjects, 610 were excluded due to loss to follow-up))*
Prognostic factor measurement	Prognostic factor Measurement Summary	Low risk of bias
Outcome Measurement	Outcome Measurement Summary	Low risk of bias
Study Confounding	Study Confounding Summary	Low risk of bias
Statistical Analysis and Reporting	Statistical Analysis and Presentation Summary	Low risk of bias

Section	Question	Answer
Overall risk of bias and directness	Risk of Bias	High
Overall risk of bias and directness	Directness	Directly applicable

1 **Son, 2016**

Bibliographic Reference	Son YJ; Kim J; Park HJ; Park SE; Park CY; Lee WY; Oh KW; Park SW; Rhee EJ; Association of Waist-Height Ratio with Diabetes Risk: A 4-Year Longitudinal Retrospective Study.; Endocrinology and metabolism (Seoul, Korea); 2016; vol. 31 (no. 1)

2 **Study Characteristics**

Study type	Retrospective cohort study
Study details	Study location Korea Setting The Kangbuk Samsung Health Study in medical health checkup program at the Health Promotion Center of Kangbuk Samsung Hospital, Sungkyunkwan University School of Medicine, Seoul, Study dates 2005 and 2009, Sources of funding

	Not detailed Recruitment Non-diabetic participants (mean age, 44.3 years) in a health screening program, who repeated the medical check-up in 2005 and 2009, were recruited, method of recruitment not detailed Ethnicity The population in the study were assumed to be at least 80% of Asian (other) ethnicity
Inclusion criteria	Not detailed
Exclusion criteria	People with diabetes and with missing data on WC and lipid profiles at baseline
Number of participants	2,900
Length of follow-up	4 years
Loss to follow-up	not detailed
Index test(s)	BMI (kg/m2) WC (cm) WHtR (unid)
Reference standard (s)	A person developing T2DM during follow-up
Additional comments	Authors analysed the cut-off values of each baseline anthropometric indices in newly diagnosed diabetes group, and calculated their sensitivity, specificity, and mean area under the receiver operator characteristics curves (AUROC) values and their 95% CIs by using receiver operating characteristic curves

Population characteristics

Study-level characteristics

Characteristic	Study (N = 2900)
% Female Sample size	n = 822 ; % = 28.3
Mean age (SD) Mean (SD)	44.3 (6.5)

1 **Critical appraisal - GUT QUIPS checklist- PROGNOSIS ADULTS**

Section	Question	Answer
Study participation	Summary Study participation	Moderate risk of bias *(baseline hip circumference was not measured; thus, the relationship between WHR and diabetes could not be assessed. Selection bias could have been present because study was retrospective in nature)*
Study Attrition	Study Attrition Summary	Low risk of bias
Prognostic factor measurement	Prognostic factor Measurement Summary	High risk of bias *(WC values were available only for 2,900 subjects due to inconsistencies in the measurement method.)*
Outcome Measurement	Outcome Measurement Summary	Low risk of bias
Study Confounding	Study Confounding Summary	Low risk of bias
Statistical Analysis and Reporting	Statistical Analysis and Presentation Summary	Moderate risk of bias *(selective/partial reporting of data)*
Overall risk of bias and directness	Risk of Bias	High

Section	Question	Answer
Overall risk of bias and directness	Directness	Directly applicable

1 **Stevens, 2001**

Bibliographic Reference	Stevens J; Couper D; Pankow J; Folsom AR; Duncan BB; Nieto FJ; Jones D; Tyroler HA; Sensitivity and specificity of anthropometrics for the prediction of diabetes in a biracial cohort.; Obesity research; 2001; vol. 9 (no. 11)

2 **Study Characteristics**

Study type	Prospective cohort study
Study details	Study location USA Setting four U.S. communities: Forsyth County, North Carolina; Jackson, Mississippi; the north western suburbs of Minneapolis, Minnesota; and Washington County, Maryland Study dates Between 1987 and 1989 Sources of funding Not detailed Recruitment

	Subjects were selected using probability sampling in each centre Ethnicity **Black and White, Ethnicity was assessed by self-identification of a single choice from a checklist** **Participants who were not of white or black ethnicity were excluded (n 5 48). In the Minneapolis and Washington County field centres.**
Inclusion criteria	Not detailed
Exclusion criteria	People who were not of white or black ethnicity People who were missing information on one or more of the anthropometric variables being considered. People who had diabetes at the baseline examination
Number of participants	15,792
Length of follow-up	9 years, Three follow-up examinations were performed at approximately 3-year intervals
Loss to follow-up	851 did not return for any follow-up examination. Participants who did not attend follow-up visits (including some who had died) were older than those retained (54.9 vs. 53.9 years) and also had higher mean levels of body mass index (BMI; 27.7 vs. 27.2 kg/m2), waist circumference (97.3 vs. 95.7 cm), and waist-to-hip ratio (WHR; 0.93 vs. 0.92; p , 0.05 for all). Subjects who attended only the baseline examination were excluded,
Index test(s)	BMI (kg/m2) WC (cm) WHR (unid)
Reference standard (s)	A person developing T2DM during follow-up
Subgroup analyses	African American Men African American Women

	White Men White Women
Additional comments	The optimal cut-point was defined as that measurement that corresponded to the point on the ROC curve closest to the top left corner, i.e., closest to having sensitivity = 1 and specificity = 1.

Population characteristics

Study-level characteristics

Characteristic	**Study (N = 15792)**
% Female Custom value	7110
white women Mean (SD)	53.8 (5.7)
White Men Mean (SD)	54.6 (5.7)
African American men Mean (SD)	53.3 (5.9)
African American women Mean (SD)	52.8 (5.7)

Critical appraisal - GUT QUIPS checklist- PROGNOSIS ADULTS

Section	Question	Answer
Study participation	Summary Study participation	Low risk of bias

Study Attrition	Study Attrition Summary	Moderate risk of bias (Loss to follow-up (n=851)
Prognostic factor measurement	Prognostic factor Measurement Summary	Moderate risk of bias (Cut-off not pre-specified)
Outcome Measurement	Outcome Measurement Summary	Low risk of bias
Study Confounding	Study Confounding Summary	Low risk of bias
Statistical Analysis and Reporting	Statistical Analysis and Presentation Summary	Low risk of bias
Overall risk of bias and directness	Risk of Bias	High (Cut-off not pre-specified and study attrition)
Overall risk of bias and directness	Directness	Directly applicable

Talaei, 2012

Bibliographic Reference	Talaei, Mohammad; Thomas, G Neil; Marshall, Tom; Sadeghi, Masoumeh; Iranipour, Rokhsareh; Oveisgharan, Shahram; Sarrafzadegan, Nizal; Appropriate cut-off values of waist circumference to predict cardiovascular outcomes: 7-year follow-up in an Iranian population.; Internal medicine (Tokyo, Japan); 2012; vol. 51 (no. 2); 139-46

Study Characteristics

Study type	Prospective cohort study
Study details	Study location Iran Setting

	The baseline survey was conducted in a representative population of adults who were living in urban and rural areas of Isfahan, Arak and Najafabad. Study dates from January 2 to September 28, 2001. Sources of funding The baseline survey as a part of Isfahan Healthy Heart Program (IHHP) was supported by a grant (No. 31309304) from the Iranian Budget and Planning Organization and the Ministry of Health. Isfahan Cardiovascular Research Centre, affiliated to Isfahan University of Medical Sciences, supported the biannual follow-ups Recruitment Participants were selected by multistage random sampling and were recruited to reflect the age, sex and urban/rural distribution of the community. Ethnicity Iranian
Inclusion criteria	Adults aged 35 years old or more, living in urban and rural areas from three counties in central Iran who had participated in the baseline
Exclusion criteria	Pregnant women and non-Iranian immigrants.
Number of participants	6,504
Length of follow-up	7 years
Loss to follow-up	Among baseline participants, 5,550 (85.3%) had follow-up date with median of 81 months. However, 4,625 (71%) participants remained in the study after 7 years of follow-up. There was no significant difference between available participants and loss-to-follow-up group in terms of hypercholesterolemia, MetS and its component except for central obesity (51% vs. 48% respectively, p=0.023). The participants who had a history of MI, stroke or heart failure at baseline were excluded from analysis (n=181).

Index test(s)	WC (cm)
Reference standard (s)	A person developing CVD during follow-up
Additional comments	The optimal cut-off values were defined as the point at which the value of "sensitivity+ specificity-1" was maximum (Youden index). This cut-off value corresponds to the point on the ROC curve which has the maximum vertical distance from the curve to the chance line and has also been defined as an accuracy indicator in clinical epidemiology

1 **Population characteristics**

2 **Study-level characteristics**

Characteristic	Study (N = 6504)
% Female Sample size	n = 3255
Women Mean (SD)	50.3 (11.3)
Men Mean (SD)	51.1 (11.9)

3 **Critical appraisal - GUT QUIPS checklist- PROGNOSIS ADULTS**

Section	Question	Answer
Study participation	Summary Study participation	Low risk of bias
Study Attrition	Study Attrition Summary	High risk of bias *((loss-to-follow-up) 4,625 (71%) participants remained in the study after 7 years of follow-up.)*

Section	Question	Answer
Prognostic factor measurement	Prognostic factor Measurement Summary	Low risk of bias
Outcome Measurement	Outcome Measurement Summary	Low risk of bias
Study Confounding	Study Confounding Summary	Low risk of bias
Statistical Analysis and Reporting	Statistical Analysis and Presentation Summary	Low risk of bias
Overall risk of bias and directness	Risk of Bias	High
Overall risk of bias and directness	Directness	Directly applicable

1 **Wang, 2018**

Bibliographic Reference	Wang, Qing; Wang, Zhuoqun; Yao, Wei; Wu, Xianming; Huang, Jingjing; Huang, Lei; Sun, Yuemin; Anthropometric Indices Predict the Development of Hypertension in Normotensive and Pre-Hypertensive Middle-Aged Women in Tianjin, China: A Prospective Cohort Study.; Medical science monitor : international medical journal of experimental and clinical research; 2018; vol. 24; 1871-1879

2 **Study Characteristics**

Study type	Prospective cohort study
Study details	Study location Tianjin, China,

	Setting Study dates May 2011 and June 2013. Sources of funding This study was funded by Tianjin City Health Bureau (Grant Number: 11KG133 Recruitment Cluster stratification sampling was used to recruit subjects in six districts of Tianjin between May 2011 and June 2013. Ethnicity Chinese ethnicity
Inclusion criteria	middle-aged (between 40–70 years) pre-hypertensive Chinese women.
Exclusion criteria	women with high blood pressure (systolic blood pressure ≥140 mmHg or diastolic blood pressure ≥90 mmHg), women who were being treated with anti-hypertensive drugs, who were in renal failure, or who had severe hepatic insufficiency, cancer, cerebrovascular disease, tuberculosis, autoimmune disease, systemic infections, any woman who was unable to cooperate in the study, or any woman with heart failure according to the New York Heart Association (NYHA) Class III–IV
Number of participants	812 urban females
Length of follow-up	2 years
Loss to follow-up	93 were lost during the two-year follow-up. The final sample size of the study cohort comprised 719 women for analysis.
Index test(s)	BMI (kg/m2) WC (cm)

	WHtR (unid) WHR (unid)
Reference standard (s)	A person developing hypertension during follow-up
Subgroup analyses	Group 1 Group 2, or the 'prehypertensive group'
Additional comments	Optimal cut-off values for the anthropometric measurements were determined using Youden's index. P<0.05 was considered as statistically significant.

1 **Population characteristics**

2 **Study-level characteristics**

Characteristic	Study (N = 813)
Sample size Sample size	n = 719
Normal blood pressure group An ideal, or normal, blood pressure was defined as a baseline SBP <120 mmHg and DBP <80 mm Sample size	n = 344 ; % = 47.8
The prehypertensive group pre-hypertension was defined as a baseline SBP of 120–139 mmHg, or a DBP of 80–89 mmHg Sample size	n = 375 ; % = 52.2
% Female Sample size	n = 719 ; % = 100

Characteristic	Study (N = 813)
Pre-hypertensive Group Mean (SD)	57.22 (6.52)
Normal blood pressure group Mean (SD)	54.83 (6.3)

1 **Critical appraisal - GUT QUIPS checklist- PROGNOSIS ADULTS**

Section	Question	Answer
Study participation	Summary Study participation	Moderate risk of bias *(an urban Chinese ethnic population of middle-aged women, aged between 40–70 years,)*
Study Attrition	Study Attrition Summary	Moderate risk of bias *(100 subjects lost to follow up)*
Prognostic factor measurement	Prognostic factor Measurement Summary	Low risk of bias
Outcome Measurement	Outcome Measurement Summary	Low risk of bias
Study Confounding	Study Confounding Summary	Low risk of bias
Statistical Analysis and Reporting	Statistical Analysis and Presentation Summary	Low risk of bias
Overall risk of bias and directness	Risk of Bias	High
Overall risk of bias and directness	Directness	Directly applicable

2

1 **Wannamethee, 2010**

Bibliographic Reference	Wannamethee, S G; Papacosta, O; Whincup, P H; Carson, C; Thomas, M C; Lawlor, D A; Ebrahim, S; Sattar, N; Assessing prediction of diabetes in older adults using different adiposity measures: a 7 year prospective study in 6,923 older men and women.; Diabetologia; 2010; vol. 53 (no. 5); 890-8

2 **Study Characteristics**

Study type	Prospective cohort study
Study details	Study location UK Setting general practices in 24 British towns and citieS Study dates 1978 to 1980 7,735 British men and In 1998–2000, all surviving men, now aged 60–79 years, were invited for a 20th year follow-up examination 1999–2001, a parallel study of 4,286 women Sources of funding The British Regional Heart Study is a British Heart Foundation (BHF) Research Group and is supported by a BHF Programme grant.

	The British Women's Heart and Health Study is jointly funded by the UK Department of Health and the BHF. O. Papacosta is supported by a project grant from Diabetes UK Ethnicity The study population was predominantly (>95%) described as white by examining nurses
Exclusion criteria	People with prevalent diabetes (defined as the presence of a diagnosis by a doctor of diabetes and/or a fasting glucose of ≥7 mmol/l) (n=481 men, n=377 women) and People whose diabetes status could not be determined People with missing BMI, waist and hip measurements (n=32 men; n=44 women).
Number of participants	A total of 3519 non-diabetic men and 3404 non-diabetic women
Length of follow-up	A mean follow-up period of 7 years (6–8 years).
Loss to follow-up	Losses to follow-up remained exceptionally low (<3%) in both cohorts. The analysis is based on follow-up from re-screening (1998–2000) to June 2006 in men and from 1999–2001 to September 2007 in women.
Index test(s)	BMI (kg/m2) WC (cm) WHtR (unid) WHR (unid)
Reference standard (s)	A person developing coronary heart disease during follow-up A person developing T2DM during follow-up
Additional comments	receiving-operating characteristic (ROC) curve analyses and the respective AUC [23] were used to compare the predictive power of baseline WC, WHR, and BMI on risk of type 2 diabetes in men and women.

1 **Critical appraisal - GUT QUIPS checklist- PROGNOSIS ADULTS**

Section	**Question**	**Answer**
Study participation	Summary Study participation	Low risk of bias
Study Attrition	Study Attrition Summary	Low risk of bias *(losses to follow-up remained exceptionally low (<3%))*
Prognostic factor measurement	Prognostic factor Measurement Summary	Low risk of bias
Outcome Measurement	Outcome Measurement Summary	Low risk of bias
Study Confounding	Study Confounding Summary	Low risk of bias
Statistical Analysis and Reporting	Statistical Analysis and Presentation Summary	High risk of bias *(selective reporting only reported WC and BMI Data)*
Overall risk of bias and directness	Risk of Bias	High
Overall risk of bias and directness	Directness	Directly applicable

2 **Welborn, 2007**

Bibliographic Reference	Welborn, T A; Dhaliwal, S S; Preferred clinical measures of central obesity for predicting mortality; European Journal of Clinical Nutrition; 2007; vol. 61 (no. 12); 1373-1379

3 **Study Characteristics**

Study type	Prospective cohort study
Study details	Study location Australia

	Setting Australian residents of capital cities from nine metropolitan centres . The city catchment areas were North Sydney, South Sydney, Melbourne, Brisbane, Adelaide, Perth, Hobart, Darwin and Canberra Study dates 1989 Sources of funding The initial study was supported by Healthway, the Western Australian Health Promotion Foundation, and this analysis was funded with the assistance of a grant-in-aid provided by Merck, Sharp and Dohme (Australia) Pty Ltd. Recruitment people aged 20–69 years, were selected from electoral rolls by systematic probability sampling, using sex and 5-year age groups. Ethnicity The respondents were mainly Europid (93%), with a small proportion of Asians and Africans (5%), as determined by stated place of birth
Inclusion criteria	Australian residents of capital cities from nine metropolitan centers, aged 20–69 years
Exclusion criteria	Not detailed
Number of participants	Of the 12,470 who confirmed contact, 9309 attended and completed the survey
Length of follow-up	11 Year mortality follow-up
Loss to follow-up	Of 15,164 people selected, 2694 were no longer at the address or were absent during the study or in prison or had died.
Index test(s)	BMI (kg/m2)

	WC (cm) WHtR (unid) WHR (unid)
Additional comments	To identify optimal cut-off values for predicting mortality, Youden index) was selected representing sensitivity/specificity -1.

Population characteristics

Study-level characteristics

Characteristic	**Study (N = 9206)**
% Female Sample size	n = 4698
Mean age (SD) Mean (SD)	43 (13)

Critical appraisal - GUT QUIPS checklist- PROGNOSIS ADULTS

Section	Question	Answer
Study participation	Summary Study participation	Low risk of bias
Study Attrition	Study Attrition Summary	Moderate risk of bias (loss to follow up: 75% response rate)
Prognostic factor measurement	Prognostic factor Measurement Summary	Moderate risk of bias (Cut-off not pre-specified)
Outcome Measurement	Outcome Measurement Summary	Low risk of bias

Study Confounding	Study Confounding Summary	Low risk of bias
Statistical Analysis and Reporting	Statistical Analysis and Presentation Summary	Low risk of bias
Overall risk of bias and directness	Risk of Bias	High (Study attrition and cut-off not pre-specified)
Overall risk of bias and directness	Directness	Directly applicable

1 **Xia, 2018**

Bibliographic Reference	Xia, Ming-Feng; Lin, Huan-Dong; Chen, Ling-Yan; Wu, Li; Ma, Hui; Li, Qian; Aleteng, Qiqige; Chen, Ying; Sun, Yi-Xuan; Hu, Yu; Pan, Bai-Shen; Li, Xiao-Ying; Gao, Xin; Association of visceral adiposity and its longitudinal increase with the risk of diabetes in Chinese adults: A prospective cohort study.; Diabetes/metabolism research and reviews; 2018; vol. 34 (no. 7); e3048

2 **Study Characteristics**

Study type	Prospective cohort study
Study details	Study location China Setting Shanghai Changfeng Study Study dates June 2009 to December 2012, and follow-up examinations were performed from November 2014 to March 2017

	Sources of funding This work was supported by the National Key Basic Research Program of China (no. 2012CB524906 to X. Gao), National Natural Science Foundation of China Ethnicity The population in the study were assumed to be at least 80% of Chinese ethnicity
Inclusion criteria	People aged over 45 years, people with normal basal plasma glucose levels
Exclusion criteria	People with diabetes and with prediabetes at the baseline examination
Number of participants	A total of 6595 subjects
Length of follow-up	4.4 years of follow-up,
Loss to follow-up	not detailed
Index test(s)	BMI (kg/m2) WC (cm)
Reference standard (s)	A person developing T2DM during follow-up
Additional comments	The optimal cut-off values were obtained from the Youden index (maximum [sensitivity + specificity-1]).

1 **Population characteristics**

2 **Study-level characteristics**

Characteristic	**Study (N = 2558)**
% Female Custom value	1571

Characteristic	Study (N = 2558)
Mean age (SD) Non diabetes and New-Onset Prediabetes Range	55 to 66
Mean age (SD) Non diabetes and New-Onset Prediabetes Median (IQR)	62 (56 to 70)

1 **Critical appraisal - GUT QUIPS checklist- PROGNOSIS ADULTS**

Section	Question	Answer
Study participation	Summary Study participation	Low risk of bias
Study Attrition	Study Attrition Summary	Moderate risk of bias (loss to follow up (70.6% Completed the study))
Prognostic factor measurement	Prognostic factor Measurement Summary	Moderate risk of bias (Cut-off not pre-specified)
Outcome Measurement	Outcome Measurement Summary	Low risk of bias
Study Confounding	Study Confounding Summary	Low risk of bias
Statistical Analysis and Reporting	Statistical Analysis and Presentation Summary	Low risk of bias
Overall risk of bias and directness	Risk of Bias	High (Cut-off not pre-specified and study attrition)
Overall risk of bias and directness	Directness	Directly applicable

1

2 **Xu, 2014**

Bibliographic Reference	Xu, Juan; Xu, Tian; Bu, Xiaoqing; Peng, Hao; Li, Hongmei; Zhang, Mingzhi; Zhang, Yonghong; The predictive value of waist-to-height ratio for ischemic stroke in a population-based prospective cohort study among Mongolian men in China.; PloS one; 2014; vol. 9 (no. 10); e110245

3 **Study Characteristics**

Study type	Prospective cohort study
Study details	Study location Two townships including 32 villages in Kezuohou Banner and Naiman Banner in Inner Mongolia, China Study dates Recruitment from May 2002 to June 2003. Follow-up continued until July 2012. Sources of funding The study was supported by National Natural Science Foundation of China (Grant Nos. 81172761 and 30972531) and a Project of the Priority Academic Program Development of Jiangsu Higher Education Institutions. Recruitment A cluster sampling method was adopted in the study Ethnicity The majority of local residents were Mongolians who had lived there for many generations. The ethnicity of those included in this study were not detailed but >80% assumed to be of Chinese ethnicity for this analysis.
Inclusion criteria	Men aged 20 years and older free of cardiovascular disease

Exclusion criteria	People for whom the study did not have blood samples or anthropometric indices
Number of participants	N=1064
Length of follow-up	Mean 9.2 years
Loss to follow-up	3 lost to follow giving a follow-up rate of over 99%
Index test(s)	BMI Standing height was measured with a fixed stadiometer calibrated in centimetres and body weight was measured in kilograms by using a balance-beam scale with participants wearing light clothing and no shoes. BMI was calculated as the ratio of weight in kilograms to height in meters squared. WHtR WC was measured 1 cm above the umbilicus. WC
Reference standard (s)	A person having an ischemic stroke during follow-up Since 2004, household surveys of the participants were conducted every 2 years to determine new ischemic stroke cases. Trained staff interviewed either the participants or their relatives, if participants were dead or unable to communicate, and completed a medical status questionnaire. At last, if the subjects reported that an ischemic stroke occurred during the period since the last survey, the staff reviewed hospital records, including outpatient or admission records, the discharge summary. Only the subjects who were diagnosed with ischemic stroke by head computed tomography or MRI scan at the hospital were considered to have the outcome of interest in this study.
Additional comments	The discriminatory value of the three anthropometric indices for predicting ischemic stroke by computing Receiver Operating Characteristic (ROC) curves and comparing the areas under ROC curves (AUCs) with the Z-statistic

Population characteristics

Study-level characteristics

Characteristic	Study (N = 1034)
% Female Custom value	0%

1 **Critical appraisal - GUT QUIPS checklist- PROGNOSIS ADULTS**

Section	Question	Answer
Study participation	Summary Study participation	Low risk of bias
Study Attrition	Study Attrition Summary	Low risk of bias
Prognostic factor measurement	Prognostic factor Measurement Summary	Low risk of bias
Outcome Measurement	Outcome Measurement Summary	Low risk of bias
Study Confounding	Study Confounding Summary	Low risk of bias
Statistical Analysis and Reporting	Statistical Analysis and Presentation Summary	Low risk of bias
Overall risk of bias and directness	Risk of Bias	Low
Overall risk of bias and directness	Directness	Directly applicable

2 ## Yang, 2018

Bibliographic Reference	Yang, Jing; Wang, Fei; Wang, Jing; Han, Xu; Hu, Hua; Yu, Caizheng; Yuan, Jing; Yao, Ping; Miao, Xiaoping; Wei, Sheng; Wang, Youjie; Chen, Weihong; Liang, Yuan; Guo, Huan; Zhang, Xiaomin; Zheng, Dan; Tang, Yuhan; Yang, Handong; He, Meian; Using different anthropometric indices to assess prediction ability of type 2 diabetes in elderly population: a 5 year prospective study.; BMC geriatrics; 2018; vol. 18 (no. 1); 218

Study Characteristics

Study type	Prospective cohort study
Study details	Study location China Setting Dongfeng-Tongji cohort Dongfeng Motor Corporation. Study dates 2008-2013 Sources of funding This work was supported by the grants from the National Natural Science Foundation (grants NSFC-81473051 and 81522040) and the Program for HUST Academic Frontier Youth Team. Ethnicity The population in the study were assumed to be at least 80% of Chinese ethnicity
Inclusion criteria	People 60 years old> People with no T2D or CVD at baseline
Exclusion criteria	People with age below 60 years old (n = 7932), prevalent diabetes (n = 4344), coronary heart disease (n = 2607), stroke (n = 437) or cancer (n = 555) at baseline
Number of participants	A total of 5998 men and 3964 women were eligible for the present study.

Length of follow-up	mean 4.6 years of follow-up
Loss to follow-up	missing information on BMI (n = 292), WC (n = 56), triglyceride (TG, n = 766) or high-density lipoprotein cholesterol (HDL-c, n = 58).
Index test(s)	BMI (kg/m2) WC (cm) WHtR (unid)
Reference standard (s)	A person developing T2DM during follow-up
Additional comments	Receiver operating characteristic (ROC) analysis was used to compare discrimination ability and determine optimal cut-off value. Sensitivity and specificity were calculated based on cut-off values, which were estimated using the maximized Youden index.

1 **Population characteristics**

2 **Study-level characteristics**

Characteristic	**Study (N = 9962)**
% Female Sample size	n = 3964
Mean age (SD) Mean (SD)	66.81 (5.55)

3 **Critical appraisal - GUT QUIPS checklist- PROGNOSIS ADULTS**

Section	Question	Answer
Study participation	Summary Study participation	Low risk of bias

Study Attrition	Study Attrition Summary	Low risk of bias
Prognostic factor measurement	Prognostic factor Measurement Summary	Moderate risk of bias (Cut-off not pre-specified)
Outcome Measurement	Outcome Measurement Summary	Low risk of bias
Study Confounding	Study Confounding Summary	Low risk of bias
Statistical Analysis and Reporting	Statistical Analysis and Presentation Summary	Low risk of bias
Overall risk of bias and directness	Risk of Bias	Moderate (Cut-off not pre-specified)
Overall risk of bias and directness	Directness	Directly applicable

1 **Yu, 2020**

Bibliographic Reference	Yu, Peng; Huang, Teng; Hu, Senlin; Yu, Xuefeng; Predictive value of relative fat mass algorithm for incident hypertension: a 6-year prospective study in Chinese population.; BMJ open; 2020; vol. 10 (no. 10); e038420

2 **Study Characteristics**

Study type	Prospective cohort study
Study details	Study location China Setting Nine provinces (Hei Long Jiang, Liao Ning, Jiang Su, Shan Dong, He Nan, Hu Bei, Hu Nan, Guang Xi and Gui Zhou)

	Study dates 2009=2015 Sources of funding This research was funded by grants from the National Natural Science Foundation of China (81570740) and National Key R&D Program of China (2016YFC0901203) Ethnicity Asian, the population in the study were assumed to be at least 80% of Chinese ethnicity
Inclusion criteria	people aged more than 18 years by using the data form the 2009 and 2015 CHNS survey. Subjects who participated in both the 2009 and 2015 survey were enrolled in this study, those who did not have hypertension in 2009
Exclusion criteria	People aged less than 18 years or pregnant, People who were hypertensive at baseline, People who had history of myocardial infarction or stroke, chronic kidney disease (estimated glomerular filtration rate (eGFR) 60mL/min/1.73m2), serve hepatic dysfunction (alanine aminotransfease (ALT) ≥120IU/L),people who lack data about smoking, drinking, and people without outcome and anthropometric measurement data at baseline
Number of participants	3406 participants were included
Length of follow-up	6 years
Loss to follow-up	missing data on biomarkers (n=443)
Index test(s)	BMI (kg/m2) WC (cm) WHtR (unid)
Reference standard (s)	A person developing hypertension during follow-up

Additional comments	Receiver operating characteristic (ROC) curve analyses were conducted to compare the predictive power of RFM with traditional indices including BMI, WC and WHtR. In ROC analysis, we defined the appropriate cut-off point of each anthropometric index for the prediction of incident hypertension, by using these indices as test variable and hypertension in 2015 as state variable; the optimal cut-off values were determined by the maximising the Youden index

Population characteristics

Study-level characteristics

Characteristic	**Study (N = 3406)**
% Female Sample size	n = 1849
Mean age (SD) Median (IQR)	45 (37 to 54)

Critical appraisal - GUT QUIPS checklist- PROGNOSIS ADULTS

Section	Question	Answer
Study participation	Summary Study participation	Low risk of bias
Study Attrition	Study Attrition Summary	Low risk of bias
Prognostic factor measurement	Prognostic factor Measurement Summary	Moderate risk of bias (Cut-offs not pre-specified)
Outcome Measurement	Outcome Measurement Summary	Low risk of bias
Study Confounding	Study Confounding Summary	Low risk of bias
Statistical Analysis and Reporting	Statistical Analysis and Presentation Summary	Low risk of bias

Overall risk of bias and directness	Risk of Bias	Moderate (Cut-offs not pre-specified)
Overall risk of bias and directness	Directness	Directly applicable

1 **Zafari, 2018**

Bibliographic Reference	Zafari, Neda; Lotfaliany, Mojtaba; Mansournia, Mohammad Ali; Khalili, Davood; Azizi, Fereidoun; Hadaegh, Farzad; Optimal cut-points of different anthropometric indices and their joint effect in prediction of type 2 diabetes: results of a cohort study.; BMC public health; 2018; vol. 18 (no. 1); 691

2 **Study Characteristics**

Study type	Prospective cohort study
Study details	Study location Middle East, Iran, Tehran Setting not detailed Study dates 8569 people from the baseline examination (1999–2001) and 2158 new participants recruited from the second phase (2001–2005)] one baseline (1999–2001) and 4 follow-up examinations at triennial intervals have been carried out until January 2015 Sources of funding This study was supported by Grant No.121 from the National Research Council of the Islamic Republic of Iran

	Ethnicity Iranian ethnicity, a large representative sample of Iranian adults
Inclusion criteria	Iranian adults, aged 20–60 years, free of T2D at baseline
Exclusion criteria	People who had cancer, end-stage renal disease or cirrhosis at baseline
Number of participants	10,727 in the study and 7017 participants included in analysis
Length of follow-up	A median follow-up (IQR) of 11.9 (4.6) years,
Loss to follow-up	no data on baseline variables (N = 1342) or not any follow-up data (N = 1562)
Index test(s)	BMI WC WHtR WHR
Reference standard (s)	A person developing T2DM during follow-up

Population characteristics

Study-level characteristics

Characteristic	**Study (N = 10727)**
% Female Custom value	4029
Mean age (SD) women & men	37.3 (10.4)

Characteristic	Study (N = 10727)
Mean (SD)	
Mean age (SD) women & men Mean (SE)	37.8 (10.2)

1 **Critical appraisal - GUT QUIPS checklist- PROGNOSIS ADULTS**

Section	Question	Answer
Study participation	Summary Study participation	Low risk of bias
Study Attrition	Study Attrition Summary	High risk of bias *(loss to follow up: no data on baseline variables (N = 1342) or not any follow-up data (N = 1562) were excluded from analysis)*
Prognostic factor measurement	Prognostic factor Measurement Summary	Low risk of bias
Outcome Measurement	Outcome Measurement Summary	Low risk of bias
Study Confounding	Study Confounding Summary	Low risk of bias
Statistical Analysis and Reporting	Statistical Analysis and Presentation Summary	Low risk of bias
Overall risk of bias and directness	Risk of Bias	High
Overall risk of bias and directness	Directness	Directly applicable

2

1 **Zafra-Tanaka, 2020**

Bibliographic Reference	Zafra-Tanaka, Jessica Hanae; Miranda, J Jaime; Gilman, Robert H; Checkley, William; Smeeth, Liam; Bernabe-Ortiz, Antonio; Obesity markers for the prediction of incident type 2 diabetes mellitus in resource-poor settings: The CRONICAS Cohort Study.; Diabetes research and clinical practice; 2020; vol. 170; 108494

2 **Study Characteristics**

Study type	Prospective cohort study
Study details	Study location Peru Setting The CRONICAS Cohort Study was conducted in four sites located at three regions of Peru: Lima, Tumbes, and Puno (rural and urban sites). Study dates 2010 Sources of funding This project was funded in whole with Federal funds from the United States National Heart, Lung, and Blood Institute, National Institutes of Health Jessica HanaeZafra-Tanaka received financial support from CRONICAS Center of Excellence in Chronic Diseases through a CRONICAS scholarship. Ethnicity

	We assume that 80% of the patients in the study were from Peru
Inclusion criteria	People aged 35 years or older, who were habitual residents in the regions studied
Exclusion criteria	People who could not give the informed consent due to cognitive impairment, pregnant women, people with physical disability in whom anthropometric measurements could not be taken, and people with active tuberculosis.
Number of participants	2510
Length of follow-up	30 month follow-up
Loss to follow-up	Death: 19 Participants not found/denied to participate: 419
Index test(s)	BMI (kg/m2) WC (cm) WHtR (unid) WHR (unid)
Reference standard (s)	A person developing T2DM during follow-up
Additional comments	The estimated the optimal cutoff point for each obesity marker used the Youden index method.

1 **Population characteristics**

2 **Study-level characteristics**

Characteristic	**Study (N = 2510)**
% Female Sample size	n = 1292 ; % = 51.2

Characteristic	Study (N = 2510)
Mean age (SD) Median (IQR)	54.1 (44.6 to 63.6)

1 **Critical appraisal - GUT QUIPS checklist- PROGNOSIS ADULTS**

Section	Question	Answer
Study participation	Summary Study participation	Low risk of bias
Study Attrition	Study Attrition Summary	Low risk of bias
Prognostic factor measurement	Prognostic factor Measurement Summary	Moderate risk of bias *(Cut-offs not pre-specified)*
Outcome Measurement	Outcome Measurement Summary	Low risk of bias
Study Confounding	Study Confounding Summary	Low risk of bias
Statistical Analysis and Reporting	Statistical Analysis and Presentation Summary	Low risk of bias
Overall risk of bias and directness	Risk of Bias	Moderate *(Cut-offs not pre-specified)*
Overall risk of bias and directness	Directness	Directly applicable

2

1 # Diagnostic accuracy studies

2 ## Alperet, 2016

Bibliographic Reference	Alperet, Derrick Johnston; Lim, Wei-Yen; Mok-Kwee Heng, Derrick; Ma, Stefan; van Dam, Rob M; Optimal anthropometric measures and thresholds to identify undiagnosed type 2 diabetes in three major Asian ethnic groups.; Obesity (Silver Spring, Md.); 2016; vol. 24 (no. 10); 2185-93

3 ### Study Characteristics

Study type	Cross-sectional study
Study details	Study location Singapore Setting National Health Survey (NHS) conducted in 1992, 1998, 2004, and 2010. The NHS is a cross-sectional study that includes interviews and physical measurements and is conducted every 6 years under the auspices of the Ministry of Health, Singapore. Sources of funding Lead author was supported by the National University of Singapore Graduate School for Integrative Sciences and Engineering PhD scholarship. Ethnicity Separate outcome data reported for ethnic groups (Chinese, Malay, and Asian-Indian)
Inclusion criteria	Singapore residents aged 18 to 69 years
Exclusion criteria	People who were not part of the three main ethnic groups in Singapore

	People who had been diagnosed with diabetes People who did not complete the health screening or had missing fasting or post-load glucose concentration People who had had missing anthropometric measurement data People who answered “Don’t know” or had missing data for “Has a doctor ever told you that you have diabetes?”
Number of participants	14815 - 2673 were of Indian ethnicity
Length of follow-up	None
Loss to follow-up	N/A
Index test(s)	Body Mass Index (BMI) Participants were instructed to only wear thin, light clothing when reporting for the health screening. Without footwear, weight was measured using an electronic weighing scale (SECA Model 780). A stadiometer, anchored on a solid backing board, was used to measure height and average height was calculated from two height measurements for each subject. Waist circumference (WC) Participants were instructed to only wear thin, light clothing when reporting for the health screening. Waist circumferences were measured over the subjects’ thin clothes using a tailor’s measuring tape. Waist circumference was measured midway between the lowest rib margin and the iliac crest. Waist-to-hip ratio (WHR) Participants were instructed to only wear thin, light clothing when reporting for the health screening. Waist circumferences were measured over the subjects’ thin clothes using a tailor’s measuring tape. Waist circumference was measured midway between the lowest rib margin and the iliac crest. Hip circumference was measured over the greater trochanters, perpendicular to the length axis of the body. Two waist and hip circumference

	measurements were obtained for each subject and the average was calculated Waist-to-height ratio (WHtR) Participants were instructed to only wear thin, light clothing when reporting for the health screening. A stadiometer, anchored on a solid backing board, was used to measure height and average height was calculated from two height measurements for each subject. Waist circumferences were measured over the subjects’ thin clothes using a tailor’s measuring tape. Waist circumference was measured midway between the lowest rib margin and the iliac crest. WHTR was calculated as waist circumference (in cm) divided by height (in cm).
Reference standard (s)	Type II diabetes WHO criteria were utilized to determine the diagnosis of diabetes,. Individuals with fasting plasma glucose levels of >/=7.0 mmol/L or a 2-h post-load glucose level of >/=11.1 mmol/L were classified as having diabetes. Participants who had either indicated “yes” to the question, “Has a doctor ever told you have diabetes?”, or to “Are you currently on regular medication from your doctor for diabetes?”, were classified as having diagnosed diabetes.
Subgroup analyses	Outcomes separated by gender
Additional comments	The optimal anthropometric thresholds to identify UDM were ascertained using the point of convergence between sensitivity and specificity (sensitivity=specificity)

Population characteristics

Study-level characteristics

Characteristic	**Study (n= 14815)**
% Female Custom value	53%
Mean age (SD) Median (IQR)	38 (29 to 48)

Critical appraisal - GUT QUADAS-2: DIAGNOSIS ADULTS

Section	Question	Answer
Patient selection: risk of bias	Could the selection of patients have introduced bias?	High
Patient selection: applicability	Are there concerns that included patients do not match the review question?	Low
Index tests: risk of bias	Could the conduct or interpretation of the index test have introduced bias?	High
Reference standard: risk of bias	Could the reference standard, its conduct, or its interpretation have introduced bias?	Low
Reference standard: applicability	Is there concern that the target condition as defined by the reference standard does not match the review question?	Low
Flow and timing: risk of bias	Could the patient flow have introduced bias?	Low
Overall risk of bias and directness	Risk of Bias	High (Due to patient selection and assignment of thresholds)
Overall risk of bias and directness	Directness	Directly applicable

1 **Awasthi, 2017**

Bibliographic Reference	Awasthi, A; Rao, C R; Hegde, D S; Rao N, K; Association between type 2 diabetes mellitus and anthropometric measurements - a case control study in South India.; Journal of preventive medicine and hygiene; 2017; vol. 58 (no. 1); e56-e62

2 **Study Characteristics**

Study type	Case–control studies
Study details	Study location South India Setting Tertiary care referral hospital Sources of funding Funding by Indian Council of Medical Research Short Term Studentship Program-2014 (STS-Reference ID 2014-02454). Ethnicity Ethnicity not stated but assumed to be >80% South Asian
Inclusion criteria	People ≥ 20 years old who were diagnosed with T2DM for at least 2 years
Exclusion criteria	People with severe co-morbidities such as stroke, chronic renal diseases and chronic lung diseases at the time of recruitment into the study Pregnant women
Number of participants	102
Length of follow-up	n/a

Loss to follow-up	n/a
Index test(s)	Body Mass Index (BMI) All the measurements were taken over light clothing. Weight was measured by mechanical weighing scale in kilograms to the nearest 0.5 kg, without footwear with the scale being placed on a firm flat surface. Height was measured by a measuring tape against a flat vertical surface and recorded in centimetres, to the nearest 0.1 cm. Waist-to-hip ratio (WHR) Waist circumference was measured by a measuring tape and recorded in centimetres, to the nearest 0.1 cm, at the mid-point between coastal margin and iliac crest. Hip circumference was measured by a measuring tape and recorded in centimetres, to the nearest 0.1 cm, at the level of maximum circumference of the ischial tuberosity of the participant. Waist-to-height ratio (WHtR) Waist circumference was measured by a measuring tape and recorded in centimetres, to the nearest 0.1 cm, at the mid-point between coastal margin and iliac crest. Height was measured by a measuring tape against a flat vertical surface and recorded in centimetres, to the nearest 0.1 cm.
Reference standard (s)	Type II diabetes
Subgroup analyses	Outcomes separated by gender
Additional comments	Optimal cut-offs offered but no explanation offered to how they were assessed as such

1 **Population characteristics**

2 **Study-level characteristics**

Characteristic	**Study (n= 102)**
% Female Custom value	50%

Characteristic	Study (n= 102)
Mean age (SD) Custom value	Controls tended to be younger than the intervention group

1 **Critical appraisal - GUT QUADAS-2: DIAGNOSIS ADULTS**

Section	Question	Answer
Patient selection: risk of bias	Could the selection of patients have introduced bias?	High
Patient selection: applicability	Are there concerns that included patients do not match the review question?	High
Index tests: risk of bias	Could the conduct or interpretation of the index test have introduced bias?	Low
Reference standard: risk of bias	Could the reference standard, its conduct, or its interpretation have introduced bias?	Low
Reference standard: applicability	Is there concern that the target condition as defined by the reference standard does not match the review question?	Low
Flow and timing: risk of bias	Could the patient flow have introduced bias?	Low
Overall risk of bias and directness	Risk of Bias	High
Overall risk of bias and directness	Directness	Directly applicable

2

1 **Bhowmik, 2013**

Bibliographic Reference	Bhowmik, Bishwajit; Munir, Sanjida B; Diep, Lien M; Siddiquee, Tasnima; Habib, Samira H; Samad, Mohammad A; Azad Khan, Abul Kalam; Hussain, Akhtar; Anthropometric indicators of obesity for identifying cardiometabolic risk factors in a rural Bangladeshi population.; Journal of diabetes investigation; 2013; vol. 4 (no. 4); 361-8

2 **Study Characteristics**

Study type	Cross-sectional study
Study details	Study location Urbanizing rural community ‘Chandra’, 40 km north of the capital city, Dhaka. A total of 10 villages were randomly selected from five areas with a population of approximately 20,000. Study dates Recruitment in March 2009 Sources of funding Diabetic Association of Bangladesh provided "local logistic support", and the University of Oslo provided financial support. Ethnicity Ethnicity not stated but >80% assumed to be of South Asian ethnicity
Inclusion criteria	People 20 years old and above
Exclusion criteria	Pregnant women History of myocardial infarction, renal disease, liver disease, tuberculosis, malignant diseases or any severe infection at the time of screening
Number of participants	2376

Length of follow-up	N/A
Loss to follow-up	N/A
Index test(s)	Body Mass Index (BMI) Anthropometric measurements were taken with the participants wearing light clothes and without shoes. Weight was taken to the nearest 0.1 kg by modern electronic digital LCD weighing machines. The scales were calibrated everyday against a standard (20 kg). Height was taken while the participants stood in erect posture, touching the occiput, back, hip and heels on a straight measuring wall, while the participants looked straight ahead. BMI was calculated as the weight (kg) divided by square of the height. Waist circumference (WC) Anthropometric measurements were taken with the participants wearing light clothes and without shoes. Waist circumference was measured by placing a tape horizontally midway between the lower border of the ribs and iliac crest on the mid-axillary line. Waist-to-hip ratio (WHR) Anthropometric measurements were taken with the participants wearing light clothes and without shoes. Waist circumference was measured by placing a tape horizontally midway between the lower border of the ribs and iliac crest on the mid-axillary line. Hip circumference was measured to the nearest centimetre at the greatest protrusion of the buttocks, just below the iliac crest. Waist-to-height ratio (WHtR) Anthropometric measurements were taken with the participants wearing light clothes and without shoes. Waist circumference was measured by placing a tape horizontally midway between the lower border of the ribs and iliac crest on the mid-axillary line.

Reference standard (s)	Type II diabetes Diabetes was defined as FPG >/=7.0 mmol/L and/or 2 h after 75-g oral glucose solution >/=11.1 mmol/L20. In addition, known diabetes was defined by the use insulin or oral antidiabetic medication(s) and self-reported DM Hypertension Individuals were considered to have hypertension if their average systolic blood pressure was >/=140 mmHg or diastolic blood pressure was >/=90 mmHg, or if they were receiving treatment for hypertension21. Dyslipidaemia Dyslipidaemia was defined as serum triglycerides >/=1.70 mmol/L and HDL-C < 1.04 mmol/L for men and <1.29 mmol/L for women.
Subgroup analyses	Outcomes separated by gender
Additional comments	Optimal cut-offs offered but no explanation offered to how they were assessed as such Metabolic syndrome was an outcome assessed but obesity was itself utilised in it's definition and it was not extracted.

1 ## Population characteristics

2 ### Study-level characteristics

Characteristic	Study (n= 2293)
% Female Custom value	63%
Mean age (SD) Mean (SD)	41.8 (*empty data*)

1 **Critical appraisal - GUT QUADAS-2: DIAGNOSIS ADULTS**

Section	Question	Answer
Patient selection: risk of bias	Could the selection of patients have introduced bias?	Low
Patient selection: applicability	Are there concerns that included patients do not match the review question?	Low
Index tests: risk of bias	Could the conduct or interpretation of the index test have introduced bias?	Low
Reference standard: risk of bias	Could the reference standard, its conduct, or its interpretation have introduced bias?	Low
Reference standard: applicability	Is there concern that the target condition as defined by the reference standard does not match the review question?	Low
Flow and timing: risk of bias	Could the patient flow have introduced bias?	Low
Overall risk of bias and directness	Risk of Bias	Moderate (Due to threshold not being prespecified and uncertainty how it was calculated.)
Overall risk of bias and directness	Directness	Directly applicable

2

1 **Diaz, 2007**

Bibliographic Reference	Diaz, V A; Mainous, A G 3rd; Baker, R; Carnemolla, M; Majeed, A; How does ethnicity affect the association between obesity and diabetes?.; Diabetic medicine : a journal of the British Diabetic Association; 2007; vol. 24 (no. 11); 1199-204

2 **Study Characteristics**

Study type	Cross-sectional study
Study details	Study location USA Setting Data from the 2003–2004 National Health and Nutrition Examination Survey (NHANES) was analysed. The NHANES is a product of the US National Center for Health Statistics. They also analysed data from the 2003 and 2004 Health Survey for England (HSE), Sources of funding Supported in part by a grant from the Robert Wood Johnson Foundation, grant 1R21 DK066066 from the National Institute of Diabetes and Digestive and Kidney Disease and grant D54HP00023 from the Health Resources and Services Administration. Ethnicity The NHANES survey included individuals who are categorised as Non-Hispanic Whites, Non-Hispanic Blacks and Mexican Americans, based on participant self-report. The Health Survey for England (HSE), a series of annual surveys commissioned by the Department of Health to monitor trends in the nation’s health. Participants were

	assigned as English Whites, English Blacks, Indian, Bangladeshi, Pakistani, or Chinese.
Inclusion criteria	People 20 years old and above
Number of participants	11624 people. Within that there were 793 US Black, 486 English Black, 535 Indian, 296, Pakistani, 152 Bangladeshi
Length of follow-up	N/A
Loss to follow-up	N/A
Index test(s)	Body Mass Index (BMI) Height was measured to the nearest millimetre with the head aligned in the Frankfort horizontal plane. BMI was calculated from measured weight and height (kg/m2). Waist circumference (WC) WC was taken after a normal expiration, and was also measured to the nearest millimetre Waist-to-hip ratio (WHR)
Reference standard (s)	Type II diabetes Individuals who reported being told by a health-care provider that they have diabetes outside of pregnancy were classified as having diabetes. Individuals who reported never having been told by a health-care provider that they have diabetes, but who had a glycated haemoglobin (HbA1c) > 6.1% were characterized as having undiagnosed diabetes.
Subgroup analyses	Outcomes separated by gender
Additional comments	The study assigned optimum cut points but it was unclear how they were calculated.

Population characteristics

1 **Study-level characteristics**

Characteristic	Study (n= 11624)
% Female Custom value	US Black: 50%, English Black: 44%, Indian: 49%, Pakistani: 46%, Bangladeshi: 51%
Mean age (SD) Custom value	Mean age: US Black: 46.2, English Black: 44.5, Indian: 44.8 Pakistani: 40.3, Bangladeshi: 38.4

2 **Critical appraisal - GUT QUADAS-2: DIAGNOSIS ADULTS**

Section	Question	Answer
Patient selection: risk of bias	Could the selection of patients have introduced bias?	Low
Patient selection: applicability	Are there concerns that included patients do not match the review question?	Low
Index tests: risk of bias	Could the conduct or interpretation of the index test have introduced bias?	Low
Reference standard: risk of bias	Could the reference standard, its conduct, or its interpretation have introduced bias?	Low
Reference standard: applicability	Is there concern that the target condition as defined by the reference standard does not match the review question?	Low
Flow and timing: risk of bias	Could the patient flow have introduced bias?	Low

Overall risk of bias and directness	Risk of Bias	Moderate (Due to threshold not being prespecified)
Overall risk of bias and directness	Directness	Directly applicable

1 **Foucan, 2002**

Bibliographic Reference	Foucan, Lydia; Hanley, Jim; Deloumeaux, Jacqueline; Suissa, Samy; Body mass index (BMI) and waist circumference (WC) as screening tools for cardiovascular risk factors in Guadeloupean women.; Journal of clinical epidemiology; 2002; vol. 55 (no. 10); 990-6

2 **Study Characteristics**

Study type	Cross-sectional study
Study details	Study location Guadeloupe: Health Center of Guadeloupe (FWI) Setting Consecutive people recruited to the study Study dates Data collected in 1999 Sources of funding Not detailed

	Ethnicity The study population was 86% of Black ethnicity
Inclusion criteria	Women 18-74 years old
Exclusion criteria	Incomplete data collected
Number of participants	5441 were recruited and 292 excluded
Length of follow-up	N/A
Loss to follow-up	N/A
Index test(s)	Body Mass Index (BMI) Height and weight were measured with participants standing without shoes and lightly clothed. The measurements were made by trained nurses and physicians. Waist circumference (WC) Waist circumference (WC) in centimetres was taken, with participants standing, above the iliac crests and below the lowest rib margin at minimal respiration. The measurements were made by trained nurses and physicians.
Reference standard (s)	Type II diabetes fasting blood glucose (FBG) >126 mg/dL (7.0 mmol/L), or use of a hypoglycaemic agent or use of a hypoglycaemic agent and insulin. Hypertension SBP >/= 140 or a DBP >/= 90 mmHg or current use of antihypertensive medication. Dyslipidaemia cholesterolemia >/= 240 mg/dL (6.1 mmol/L) or triglyceridemia >/= 200 mg/dL (2.3 mmol/L) or use of an antihyperlipidemic medications.

Subgroup analyses	Outcomes stratified by age. 18-39 and 40-74.
Additional comments	The cut points of the anthropometric variables that had the highest sensitivity and specificity were identified. This was done utilising a ROC curve

1

2 **Population characteristics**

3 **Study-level characteristics**

Characteristic	**Study (n= 5149)**
% Female Custom value	100%
Mean age (SD) Mean (SD)	40 (14.3)

4 **Critical appraisal - GUT QUADAS-2: DIAGNOSIS ADULTS**

Section	Question	Answer
Patient selection: risk of bias	Could the selection of patients have introduced bias?	Low
Patient selection: applicability	Are there concerns that included patients do not match the review question?	High (They were people who attended the health centre rather than general population)
Index tests: risk of bias	Could the conduct or interpretation of the index test have introduced bias?	High (Due to threshold not being prespecified)
Reference standard: risk of bias	Could the reference standard, its conduct, or its interpretation have introduced bias?	Low

Reference standard: applicability	Is there concern that the target condition as defined by the reference standard does not match the review question?	Low
Flow and timing: risk of bias	Could the patient flow have introduced bias?	Low
Overall risk of bias and directness	Risk of Bias	High (Due to recruitment and threshold not being prespecified)
Overall risk of bias and directness	Directness	Directly applicable

Gupta, 2012

Bibliographic Reference	Gupta, Shilpi; Kapoor, Satwanti; Optimal cut-off values of anthropometric markers to predict hypertension in North Indian population.; Journal of community health; 2012; vol. 37 (no. 2); 441-7

Study Characteristics

Study type	Cross-sectional study
Study details	Study location North India Setting Participants were interviewed through structured proforma. Anthropometric measurements including height, weight, skinfold thickness, waist and hip circumference and blood pressure measurements were obtained using standardized procedures Sources of funding

	Indian Council of Medical Research (ICMR) provided financial support for S Gupta. The Department of Anthropology, University of Delhi, India provided infrastructure for conducting the study. Ethnicity The population was of South Asian ethnicity for the purposes of this analysis Recruitment Multistage, stratified sampling method.
Inclusion criteria	People 30 years old and above
Exclusion criteria	None detailed
Number of participants	578 people (271 men and 307 women)
Length of follow-up	n/a
Loss to follow-up	n/a
Index test(s)	Body Mass Index (BMI) Measurements were conducted by trained personnel and all instruments were calibrated once weekly Body weight was measured by using spring balance to the nearest 500 gm, height using Martin’s Anthropometer to the nearest mm. Waist circumference (WC) Waist circumference measured with a non stretchable steel tape measure to the nearest 0.1 cm. Waist-to-hip ratio (WHR) Hip circumference measured with a non stretchable steel tape measure to the nearest 0.1 cm.

	Waist-to-height ratio (WHtR)
Reference standard (s)	Hypertension No criteria detailed
Subgroup analyses	Outcomes separated by gender
Additional comments	Optimal cut-off values were measured by calculating the sensitivity and specificity of the anthropometric measurements at various cut-off points.

1 ## Population characteristics

2 ### Study-level characteristics

Characteristic	**Study (n= 578)**
% Female Custom value	53%
Mean age (SD) Custom value	Men: 43 (5). Women: 39 (5)

3 ### Critical appraisal - GUT QUADAS-2: DIAGNOSIS ADULTS

Section	Question	Answer
Patient selection: risk of bias	Could the selection of patients have introduced bias?	Low
Patient selection: applicability	Are there concerns that included patients do not match the review question?	High

Index tests: risk of bias	Could the conduct or interpretation of the index test have introduced bias?	High (Due to threshold not being prespecified)
Reference standard: risk of bias	Could the reference standard, its conduct, or its interpretation have introduced bias?	Unclear
Reference standard: applicability	Is there concern that the target condition as defined by the reference standard does not match the review question?	High
Flow and timing: risk of bias	Could the patient flow have introduced bias?	Low
Overall risk of bias and directness	Risk of Bias	Moderate (Due to threshold not being prespecified)
Overall risk of bias and directness	Directness	Directly applicable

Gutema, 2020

Bibliographic Reference	Gutema, Befikadu Tariku; Chuka, Adefris; Ayele, Gistane; Megersa, Nega Degefa; Bekele, Muluken; Baharu, Alazar; Gurara, Mekdes Kondal; Predictive capacity of obesity indices for high blood pressure among southern Ethiopian adult population: a WHO STEPS survey.; BMC cardiovascular disorders; 2020; vol. 20 (no. 1); 421

Study Characteristics

Study type	Cross-sectional study
Study details	Study location

	Arba Minch, Zuria district, Southern Ethiopia Setting A community-based cross-sectional survey was conducted from April to June 2017. Ethnicity Ethnicity not formally stated but assumed to be >80% Black African / Caribbean for this analysis Recruitment A simple random sampling technique was implemented to select the study participants from the Arba Minch Health and Demographic Surveillance System (HDSS) database
Inclusion criteria	People 25 - 64 years old
Exclusion criteria	Pregnant people of people who have recently given birth
Number of participants	3345 (1673 men and 1672 women)
Length of follow-up	n/a
Loss to follow-up	n/a
Index test(s)	Body Mass Index (BMI) Body weight (to the nearest 0.5 kg) was taken with the participant in bare feet with light clothing using SECA digital scale (model number 877). Height (to the nearest 1 cm) was measured using a stadiometer with participants wearing no shoes and without headwear. Waist circumference (WC)

	Measured at the midpoint between the palpable rib and the iliac crest Waist-to-hip ratio (WHR) The greatest posterior protuberance of the buttocks with a constant tension tape was used while the subject stands with arms at the sides, feet positioned close together, and weight evenly distributed across the feet. Waist-to-height ratio (WHtR)
Reference standard (s)	Hypertension High blood pressure was considered for those with systolic blood pressure above 135 mmHg, diastolic blood pressure above 85 mmHg or if the participant reported that he/she is taking antihypertensive medications
Subgroup analyses	Outcomes separated by gender
Additional comments	The receiver operator characteristic (ROC) curve was generated to identify optimal cutoff values with the maximum Youden index (sensitivity plus specificity-1) for anthropometric indexes

1 **Population characteristics**

2 **Study-level characteristics**

Characteristic	**Study (n= 3345)**
% Female Custom value	50%
Mean age (SD) Standardised Mean (SD)	45 (11)

3 **Critical appraisal - GUT QUADAS-2: DIAGNOSIS ADULTS**

Section	Question	Answer

Patient selection: risk of bias	Could the selection of patients have introduced bias?	Low
Patient selection: applicability	Are there concerns that included patients do not match the review question?	Low
Index tests: risk of bias	Could the conduct or interpretation of the index test have introduced bias?	High (Due to threshold not being pre-specified)
Reference standard: risk of bias	Could the reference standard, its conduct, or its interpretation have introduced bias?	Low
Reference standard: applicability	Is there concern that the target condition as defined by the reference standard does not match the review question?	Low
Flow and timing: risk of bias	Could the patient flow have introduced bias?	Low
Overall risk of bias and directness	Risk of Bias	Moderate (Due to threshold not being pre-specified)
Overall risk of bias and directness	Directness	Directly applicable

Jayawardana, 2013

Bibliographic Reference	Jayawardana R; Ranasinghe P; Sheriff MH; Matthews DR; Katulanda P; Waist-to-height ratio: a better anthropometric marker of diabetes and cardio-metabolic risks in South Asian adults.; Diabetes research and clinical practice; 2013; vol. 99 (no. 3)

Study Characteristics

Study type	Cross-sectional study
Study details	Study location Sri Lanka Setting Sri Lanka Diabetes and cardiovascular Study – SLDCS Study dates Recruitment from 2005 - 2006 Sources of funding National Science Foundation of Sri Lanka, Oxford Centre for Diabetes Endocrinology and Metabolism, UK and the NIHR Biomedical Research Centre Program Ethnicity Majority of the study population were ‘Sinhalese’ in ethnicity (n = 3877, 86.4%),
Inclusion criteria	People >/=18 years old
Exclusion criteria	None detailed
Number of participants	4485
Length of follow-up	N/A
Loss to follow-up	N/A
Index test(s)	Body Mass Index (BMI)

	Height was measured using Harpenden stadiometers (Chasmors Ltd., London, UK) to the nearest 0.1 cm, as the maximum distance to the uppermost position on the head from heels, with the individual standing barefoot and in full inspiration. Body weight was measured using a SALTER 920 digital weighing scale (SALTER Ltd., Tonbridge, UK) to the nearest 0.1 kg after an overnight fast and with indoor light clothing. BMI was calculated as weight in kilograms divided by height squared in meters (kg m2). All anthropometric parameters were measured by trained nurses Waist circumference (WC) WC was measured midway between the iliac crest and the lower rib margin at the end of normal expiration. All anthropometric parameters were measured by trained nurses Waist-to-hip ratio (WHR) WC was measured midway between the iliac crest and the lower rib margin at the end of normal expiration and hip circumference was measured at the widest level over the greater trochanters using a plastic flexible tape to the nearest 0.1 cm. All anthropometric parameters were measured by trained nurses Waist-to-height ratio (WHtR) Height was measured using Harpenden stadiometers (Chasmors Ltd., London, UK) to the nearest 0.1 cm, as the maximum distance to the uppermost position on the head from heels, with the individual standing barefoot and in full inspiration. All anthropometric parameters were measured by trained nurses
Reference standard (s)	Type II diabetes Subjects were considered to have 'known diabetes' if they had been previously diagnosed at a government hospital or by a registered medical practitioner. New cases ('unknown diabetes') were diagnosed according to the American Diabetes Association and World Health Organization (WHO) criteria. Hypertension Hypertension was defined as systolic blood pressure > 130 mmHg and/or diastolic blood pressure > 85 mmHg and/or being on anti-hypertensive treatment.

	Metabolic syndrome A diagnosis of metabolic syndrome was defined as a subject presenting at least 3 of the 5 factors described by the Third Adult Treatment Panel (ATP III) of the National Cholesterol Education Program (NCEP). This included obesity as a measure and was not considered appropriate for this review
Subgroup analyses	Outcomes separated by gender
Additional comments	Majority of the study population were 'Sinhalese' in ethnicity (n = 3877, 86.4%),

1 **Population characteristics**

2 **Study-level characteristics**

Characteristic	**Study (n= 4485)**
Mean age (SD) Mean (SD)	46.1 (15.1)

3 **Critical appraisal - GUT QUADAS-2: DIAGNOSIS ADULTS**

Section	Question	Answer
Patient selection: risk of bias	Could the selection of patients have introduced bias?	Low
Patient selection: applicability	Are there concerns that included patients do not match the review question?	Low
Index tests: risk of bias	Could the conduct or interpretation of the index test have introduced bias?	Low
Reference standard: risk of bias	Could the reference standard, its conduct, or its interpretation have introduced bias?	Low
Reference standard: applicability	Is there concern that the target condition as defined by the reference standard does not match the review question?	Low

Flow and timing: risk of bias	Could the patient flow have introduced bias?	Low
Overall risk of bias and directness	Risk of Bias	Low
Overall risk of bias and directness	Directness	Directly applicable

1 **Kapoor, 2020**

Bibliographic Reference	Kapoor, N; Lotfaliany, M; Sathish, T; Thankappan, KR; Thomas, N; Furler, J; Oldenburg, B; Tapp, RJ; Obesity indicators that best predict type 2 diabetes in an Indian population: insights from the Kerala Diabetes Prevention Program; Journal of nutritional science; 2020; vol. 9; e15

2 **Study Characteristics**

Study type	Cross-sectional study
Study details	Study location Kerala Diabetes Prevention Program (K-DPP) in India Setting The data collectors were given adequate training prior to the commencement of the study on data collection and a refresher training was given by the help of a training manual developed in line with the WHO STEPS (Stepwise approach to surveillance) training manual Study dates Recruitment from 2011 to 2013

	Sources of funding The Kerala Diabetes Prevention Program (K-DPP) was funded by the National Health and Medical Research Council, Australia (project grant no. 1005324). N. Kapoor was supported by the ENCORE programme for his PhD, funded by the University of Melbourne. T. Sathish was supported by the ASCEND Program, funded by the Fogarty International Centre of the National Institutes of Health (NIH) under award no. D43TW008332. Ethnicity Ethnicity not formally stated but conclusions drawn on people of 'Indian' ethnicity. Therefore assumed to be >80% South Asian ethnicity for this review. Recruitment People recruited by a cluster random sampling method. The papers states: In this study we utilise the baseline screened participants of this trial for which in addition to clinical parameters they also had their body fat estimation and diabetes screening by methods outlined below(13). Though the initial trial was conducted only among individuals with high Indian Diabetes Risk Score (IDRS) (>60), subsequently the same data were collected in individuals with low IDRS (<60), 3 years after the initial trial.
Inclusion criteria	People 30-60 years old
Exclusion criteria	Pregnant women Those with a prior diagnosis of T2DM, myocardial infarction, stroke, arthritis, cancer, heart failure, epilepsy, dementia, or those currently using medications known to affect glucose metabolism (glucocorticoids, antipsychotic drugs and anti-retroviral drugs)
Number of participants	1709
Length of follow-up	n/a
Loss to follow-up	n/a
Index test(s)	Body Mass Index (BMI)

	Anthropometric measurements including height, weight, WC, hip circumference, WHR and WHtR were obtained using predefined standardised techniques Waist circumference (WC) Waist-to-hip ratio (WHR) Waist-to-height ratio (WHtR)
Reference standard (s)	Type II diabetes Diabetes was defined by the criteria given by the American Diabetes Association following a 2-h 75 g oral glucose tolerance test. Individuals with a fasting plasma glucose value ≥126 mg/dl (≥7·0 mmol/l) and/or 2-h plasma glucose value of ≥200 mg/dl (≥11·1 mmol/l) were diagnosed to have diabetes.
Subgroup analyses	Outcomes separated by gender
Additional comments	Optimal cut-offs were assigned utilising Youden's index

Population characteristics

Study-level characteristics

Characteristic	**Study (n= 1709)**
% Female Custom value	38%
Mean age (SD) Mean (SD)	46.4 (7.4)

Critical appraisal - GUT QUADAS-2: DIAGNOSIS ADULTS

Section	Question	Answer

Patient selection: risk of bias	Could the selection of patients have introduced bias?	Low
Patient selection: applicability	Are there concerns that included patients do not match the review question?	Low
Index tests: risk of bias	Could the conduct or interpretation of the index test have introduced bias?	High (Due to threshold not being pre-specified)
Reference standard: risk of bias	Could the reference standard, its conduct, or its interpretation have introduced bias?	Low
Reference standard: applicability	Is there concern that the target condition as defined by the reference standard does not match the review question?	Low
Flow and timing: risk of bias	Could the patient flow have introduced bias?	Low
Overall risk of bias and directness	Risk of Bias	Moderate (Due to threshold not being pre-specified.)
Overall risk of bias and directness	Directness	Directly applicable

1 **Katulanda, 2011**

Bibliographic Reference	Katulanda P; Jayawardena MA; Sheriff MH; Matthews DR; Derivation of anthropometric cut-off levels to define CVD risk in Sri Lankan adults.; The British journal of nutrition; 2011; vol. 105 (no. 7)

2 **Study Characteristics**

Study type	Cross-sectional study
Study details	Setting Data from the Sri Lanka Diabetes and Cardiovascular Study. Cross sectional population study conducted between August 2005 and September 2006. Sources of funding The National Science Foundation of Sri Lanka was the main source of funding for the Sri Lanka Diabetes and Cardiovascular Study. Additional support was provided from the Oxford Centre for Diabetes, Endocrinology and Metabolism, UK, and the National Institute for Health Research (NIHR) Biomedical Research Centre Programme. Ethnicity Ethnicity not stated but the people in the study were assumed to be >80% South Asian for this analysis Recruitment Multi-stage random cluster sampling method was used to select a sample of 5000 non-institutionalised adults from seven of the nine provinces in Sri Lanka.
Inclusion criteria	People >/=18 years old
Exclusion criteria	None detailed
Number of participants	4474
Length of follow-up	n/a
Loss to follow-up	n/a
Index test(s)	Body Mass Index (BMI) Anthropometric measurements were performed by trained nurses adhering to the WHO guidelines using calibrated equipment. Height was recorded as the maximum distance to the uppermost position on the head from the heel to the

	nearest 0·1 cm, with the individual standing barefoot and in full inspiration using Harpenden pocket stadiometers. Body weight was measured in indoor light clothing to the nearest 0·1 kg using a SALTER 920 digital weighing scale. Waist circumference (WC) Measured midway between the iliac crest and the lower rib margin at the end of normal expiration using a plastic flexible tape to the nearest 0·1 cm. Waist-to-hip ratio (WHR) Measured as the widest distance of the buttocks in the inter-trochanteric level to the nearest 0·1 cm.
Reference standard (s)	Hypertension Raised blood pressure: systolic blood pressure >/=130mmHg or diastolic blood pressure >/=85mmHg or treatment for previously diagnosed hypertension.
Subgroup analyses	Outcomes separated by gender
Additional comments	The individual anthropometric values with the highest combined sensitivity and specificity to define 'obesity related high CVD risk' were considered the optimal cut-off levels.

1 ## Population characteristics

2 ### Study-level characteristics

Characteristic	Study (n= 4474)
% Female Custom value	Not detailed
Mean age (SD) Custom value	Men: 46 (16). Women: 46 (15)

Critical appraisal - GUT QUADAS-2: DIAGNOSIS ADULTS

Section	Question	Answer
Patient selection: risk of bias	Could the selection of patients have introduced bias?	Low
Patient selection: applicability	Are there concerns that included patients do not match the review question?	Low
Index tests: risk of bias	Could the conduct or interpretation of the index test have introduced bias?	High (Due to threshold not being pre-specified.)
Reference standard: risk of bias	Could the reference standard, its conduct, or its interpretation have introduced bias?	Low
Reference standard: applicability	Is there concern that the target condition as defined by the reference standard does not match the review question?	Low
Flow and timing: risk of bias	Could the patient flow have introduced bias?	Low
Overall risk of bias and directness	Risk of Bias	Moderate (Due to threshold not being pre-specified.)
Overall risk of bias and directness	Directness	Directly applicable

Kenate, 2020

Bibliographic Reference	Kenate, Sileshi; Tesfaye, Temamen; Tesfaye, Yonas; Mogas, Solomon Berhanu; Dadi, Lelisa Sena; Kebede, Ayantu; Zawdie, Belay; Tamiru, Dessalegn; Tadesse, Mulualem; Gudina, Esayas Kebede; Validity of anthropometric cut-offs for early diagnosis of dyslipidemia among ethiopian adults; Diabetes, Metabolic Syndrome and Obesity: Targets and Therapy; 2020; vol. 13; 3831-3837

Study Characteristics

Study type	Cross-sectional study
Study details	Study location Community-based study was conducted in Jimma Town, southwest Ethiopia from June to July 2019. Setting Data were collected using WHO stepwise questionnaire and adapted to the local context. The survey tools included socio-demographic characteristics, anthropometric measurements and laboratory analyses of lipid profile. Sources of funding Jimma University facilitated this study. Ethnicity Ethnicity not stated but participants assumed to be >80% of Black African / Caribbean ethnicity for this analysis. Recruitment Six kebeles out of 17 were randomly selected. Study participants were selected from each kebele proportionally based on the number of households in each selected kebele using systematic sampling technique.
Inclusion criteria	Adults

Exclusion criteria	Adults who had physical deformity (kyphosis and scoliosis), pregnancy, known chronic illness and serious illness
Number of participants	977 were recruited and 915 responded
Length of follow-up	n/a
Loss to follow-up	n/a
Index test(s)	Body Mass Index (BMI) Data collectors were trained for four days before the actual data collection on interviewing approach, anthropometric measurement and data recording. Height of the study participants was measured to the nearest 0.1 cm using a stadiometer with the subjects positioned at the Frankfurt Plane and the four points (heel, calf, buttocks and shoulder) touching the vertical stand and their shoes taken off. Before starting the measurements, the stadiometer was checked using calibration rods. Weight was measured using digital weight scale to the nearest 0.1 kg with the subjects wearing light clothes and shoes taken off. The validity of the scale was checked using an object of a known weight of 1kg. Waist circumference (WC) Waist circumference was measured at midpoint between the inferior margin of the last rib and the iliac crest just at wider area using a stretch tape. Just before taking the measurement, participants were requested to stand with their feet together, place their arms at the side of their body with the palms of their hands facing inwards, and breathe out gently. Waist-to-hip ratio (WHR) Hip circumference was measured at the level of the greater trochanter of the femur with the subjects wearing pants.
Reference standard (s)	Dyslipidaemia TG≥150mg/dl
Subgroup analyses	Outcomes separated by gender
Additional comments	It was unclear how optimal cut-off points were identified

1 ## Population characteristics

2 ### Study-level characteristics

Characteristic	Study (n= 915)
% Female Custom value	48%
Mean age (SD) Custom value	35% were at least 30 years old

3 ### Critical appraisal - GUT QUADAS-2: DIAGNOSIS ADULTS

Section	Question	Answer
Patient selection: risk of bias	Could the selection of patients have introduced bias?	Low
Patient selection: applicability	Are there concerns that included patients do not match the review question?	Low
Index tests: risk of bias	Could the conduct or interpretation of the index test have introduced bias?	Low
Reference standard: risk of bias	Could the reference standard, its conduct, or its interpretation have introduced bias?	High
Reference standard: applicability	Is there concern that the target condition as defined by the reference standard does not match the review question?	High
Flow and timing: risk of bias	Could the patient flow have introduced bias?	Low

Overall risk of bias and directness	Risk of Bias	High (Due to the reporting of reference and not utilising prespecified cut-offs)
Overall risk of bias and directness	Directness	Directly applicable

1 **Mohan, 2007**

Bibliographic Reference	Mohan, Viswanathan; Deepa, Mohan; Farooq, Syed; Narayan, K M Venkat; Datta, Manjula; Deepa, Raj; Anthropometric cut points for identification of cardiometabolic risk factors in an urban Asian Indian population.; Metabolism: clinical and experimental; 2007; vol. 56 (no. 7); 961-8

2 **Study Characteristics**

Study type	Cross-sectional study
Study details	Setting Chennai Urban Rural Epidemiology Study (CURES): a cross-sectional study done on a representative population of Chennai. The sampling for CURES was based on the model of systematic random sampling, wherein, of the 155 wards, 46 wards were selected to represent all the 10 zones. The total sample size of 26,000 individuals was selected from these 46 wards Study dates Not detailed in this paper Sources of funding Chennai Willingdon Corporate Foundation, Chennai, provided financial support

	Ethnicity Ethnicity not formally stated but assumed to be >80% South Asian for this review
Inclusion criteria	People 20 years old and above
Exclusion criteria	None detailed
Number of participants	2350
Length of follow-up	n/a
Loss to follow-up	n/a
Index test(s)	Body Mass Index (BMI) Height was measured with a tape to the nearest centimetre. Subjects were requested to stand upright without shoes with their back against the wall, heels together, and eyes directed forward. Weight was measured with a traditional spring balance that was kept on a firm horizontal surface. Subjects were asked to wear light clothing, and weight was recorded to the nearest 0.5 kg. Waist circumference (WC) Waist circumference was measured by using a nonstretchable measuring tape. The subjects were asked to stand erect in a relaxed position with both feet together on a flat surface; one layer of clothing was accepted. Waist girth was measured as the smallest horizontal girth between the costal margins and the iliac crests at minimal respiration.
Reference standard (s)	Type II diabetes Diagnosis of diabetes was based on WHO consulting group criteria, ie, 2-hour postload (75 g glucose) plasma glucose of 200 mg/dL or greater (z11.1 mmol/L) or self reported diabetic subjects under treatment by a physician Hypertension

	Drug treatment for hypertension or if the blood pressure was greater than 140/ 90 mm Hg (Joint National Committee on Prevention, Detection, Evaluation and Treatment of High Blood Pressure criteria) Dyslipidaemia National Cholesterol Education Program guidelines were used for definition of dyslipidaemia.
Subgroup analyses	Outcomes separated by gender
Additional comments	The study stated: The BMI or WC with the shortest distance on the ROC curve was determined for each of the cardiometabolic risk factors.

1 **Population characteristics**

2 **Study-level characteristics**

Characteristic	**Study (n= 2350)**
% Female Custom value	Not detailed
Mean age (SD) Custom value	Not detailed

3 **Critical appraisal - GUT QUADAS-2: DIAGNOSIS ADULTS**

Section	Question	Answer
Patient selection: risk of bias	Could the selection of patients have introduced bias?	Low

Patient selection: applicability	Are there concerns that included patients do not match the review question?	High (Outcomes reported separately for men and women but numbers of men and women not stated)
Index tests: risk of bias	Could the conduct or interpretation of the index test have introduced bias?	High (Due to threshold not being pre-specified.)
Reference standard: risk of bias	Could the reference standard, its conduct, or its interpretation have introduced bias?	Low
Reference standard: applicability	Is there concern that the target condition as defined by the reference standard does not match the review question?	Low
Flow and timing: risk of bias	Could the patient flow have introduced bias?	Low
Overall risk of bias and directness	Risk of Bias	High (Due to threshold not being pre-specified and reporting of the people in the study)
Overall risk of bias and directness	Directness	Directly applicable

1 **Okoro, 2021**

Bibliographic Reference	Okoro, Tamaraemumoemi Emmanuella; Edafe, Emmanuel Auchi; Prevalence of obesity and predictive value of central obesity among medical doctors to diagnose hypertension; Journal of Clinical and Diagnostic Research; 2021; vol. 15 (no. 1); oc12-oc17

2 **Study Characteristics**

Study type	Cross-sectional study

Study details	Study location Bayelsa state, Nigeria. Study dates Data collection conducted between August 2018 and January 2019. Sources of funding Not stated though the Nigerian Medical Association, Bayelsa branch, the management of both the Niger Delta University Teaching Hospital, Okolobiri and Federal Medical Center Yenagoa, Bayelsa State were acknowledged. Ethnicity Ethnicity of the people in the study was not formally stated but assumed to be >80% Black African / Caribbean for this analysis Recruitment Two hundred and forty four apparently healthy physicians were recruited from all the medical doctors registered to practice medicine in Bayelsa state. Cluster sampling method used
Inclusion criteria	Medical doctors operating in Nigeria
Exclusion criteria	Pregnant women
Number of participants	240 (29.9% women)
Length of follow-up	n/a
Loss to follow-up	n/a
Index test(s)	Body Mass Index (BMI)

	Training for two days was given to researchers training lasting three hours each day, emphasising the objectives of the study and how to take the required measurements consistently. Height was measured with each participant standing feet together, without shoes, and with their backs to a rigid tape measure, head held high and looking straight on, at a spot on the opposite wall. A flat ruler was placed on the participant's head to flatten any hairs present and readings were taken off the tape to the nearest 0.1 centimetre, at the point where the flat ruler touched the rigid tape. A standardised weight scale was used to measure body weight in kilograms (to one decimal place) with the participants wearing only light clothing. Waist circumference (WC) A non-stretch linear tape was applied approximately midway between the lower margin of the last palpable rib and the top of the iliac crest for measurement of WC to the nearest 0.1 centimetres. Waist-to-hip ratio (WHR) Measured across the widest diameter of the hips over the greater trochanters, also to the nearest centimetre. Waist-to-height ratio (WHtR)
Reference standard (s)	Hypertension All participants with elevated BP (systolic BP reading ≥140 mmHg and/or diastolic BP reading ≥90 mmHg) and classified as obese by the anthropometric measures were deemed to be at risk of cardiovascular disease.
Additional comments	Standard cut-offs were utilised

Population characteristics

Study-level characteristics

Characteristic	Study (n= 240)
% Female Custom value	72 (30%)
Mean age (SD) Custom value	40% were under 30 years old

1 **Critical appraisal - GUT QUADAS-2: DIAGNOSIS ADULTS**

Section	Question	Answer
Patient selection: risk of bias	Could the selection of patients have introduced bias?	High
Patient selection: applicability	Are there concerns that included patients do not match the review question?	High
Index tests: risk of bias	Could the conduct or interpretation of the index test have introduced bias?	High
Reference standard: risk of bias	Could the reference standard, its conduct, or its interpretation have introduced bias?	Low
Reference standard: applicability	Is there concern that the target condition as defined by the reference standard does not match the review question?	Low
Flow and timing: risk of bias	Could the patient flow have introduced bias?	Low
Overall risk of bias and directness	Risk of Bias	High

Overall risk of bias and directness	Directness	Partially applicable (Not a population sample)

1 **Ononamadu, 2017**

Bibliographic Reference	Ononamadu, Chimaobi James; Ezekwesili, Chinwe Nonyelum; Onyeukwu, Onyemaechi Faith; Umeoguaju, Uchenna Francis; Ezeigwe, Obiajulu Christian; Ihegboro, Godwin Okwudiri; Comparative analysis of anthropometric indices of obesity as correlates and potential predictors of risk for hypertension and prehypertension in a population in Nigeria.; Cardiovascular journal of Africa; 2017; vol. 28 (no. 2); 92-99

2 **Study Characteristics**

Study type	Cross-sectional study
Study details	Study location Anambra state, south-eastern Nigeria Study dates 2012 - 2013 Sources of funding Not detailed Ethnicity Ethnicity not formally stated but assumed to be >80% Black African / Caribbean for this analysis Recruitment

	912 persons (436 male and 476 female) drawn randomly from three major cities (Awka, Onitsha and Nnewi). A stratified random sampling technique was employed. The cities were stratified by location (rural versus urban areas) to ensure good representation. The survey was made church based. The churches constituted the primary units from which individuals or participants were randomly sampled; 10 churches from each city.
Inclusion criteria	People 17-79 years old
Exclusion criteria	None detailed
Number of participants	912 of 1000 who were registered.
Length of follow-up	n/a
Loss to follow-up	88 lost to follow up on the day of testing and administration of the questionnaire
Index test(s)	Body Mass Index (BMI) Anthropometric data, which included weight, height, and waist and hip circumferences were obtained by "well-trained personnel." Weight was measured to the nearest 0.5 kg using a weighing scale with the participant removing his/her footwear. Height was measured to the nearest 0.5 cm using a local stadiometer fixed to a wall. Waist circumference (WC) Measured at the level of the iliac crests, using a flexible tape and passing it along the umbilical level of the unclothed abdomen. Waist-to-hip ratio (WHR) Measured around the widest portion of the buttocks, with the tape parallel to the floor. Waist-to-height ratio (WHtR)
Reference standard (s)	Hypertension Hypertension was defined using the WHO/ISH criteria of SBP ≥ 140 mmHg and/or DBP ≥ 90 mmHg, or clinical diagnosis of hypertension, or prescription of any hypertensive drug.

Subgroup analyses	Outcomes separated by gender
Additional comments	ROC curves were utilised as the approach to define the optimised cut-offs

Population characteristics

Study-level characteristics

Characteristic	Study (n= 912)
% Female Custom value	476 (52%)
Mean age (SD) Custom value	Over 50% of the participants were 21-40 years old

Critical appraisal - GUT QUADAS-2: DIAGNOSIS ADULTS

Section	Question	Answer
Patient selection: risk of bias	Could the selection of patients have introduced bias?	Low
Patient selection: applicability	Are there concerns that included patients do not match the review question?	High (Recruitment might not have led to a population sample)
Index tests: risk of bias	Could the conduct or interpretation of the index test have introduced bias?	High (Due to threshold not being pre-specified.)
Reference standard: risk of bias	Could the reference standard, its conduct, or its interpretation have introduced bias?	High

Reference standard: applicability	Is there concern that the target condition as defined by the reference standard does not match the review question?	Low
Flow and timing: risk of bias	Could the patient flow have introduced bias?	Low
Overall risk of bias and directness	Risk of Bias	High (Due to recruitment and test threshold not being pre-specified.)
Overall risk of bias and directness	Directness	Directly applicable

1 **Paccaud, 2000**

Bibliographic Reference	Paccaud, F; Schluter-Fasmeyer, V; Wietlisbach, V; Bovet, P; Dyslipidemia and abdominal obesity: an assessment in three general populations.; Journal of clinical epidemiology; 2000; vol. 53 (no. 4); 393-400

2 **Study Characteristics**

Study type	Cross-sectional study
Study details	Study location Data collected as part of the MONICA project (MONItoring trends and determinants in CArdiovascular disease) in Switzerland in 1992-3 was used in this analysis. Also data from the Seychelles Heart Study from 1994 was utilised. Both were population surveys. Sources of funding Funding for this project was not stated.

	Ethnicity The participants were stated to be mainly of Black descent and therefore they were assumed to be >80% Black African / Caribbean for this analysis
Inclusion criteria	People from the Seychelles were 25-64 years old
Exclusion criteria	None detailed
Number of participants	806 (385 men and 421 women) from the Seychelles
Length of follow-up	n/a
Loss to follow-up	n/a
Index test(s)	Body Mass Index (BMI) Waist circumference (WC) Waist-to-hip ratio (WHR)
Reference standard (s)	Dyslipidaemia The indicator of dyslipidaemia was the TC/HDL-C ratio. The cutoff point was defined for a TC/HDL-C >5
Subgroup analyses	Outcomes separated by gender
Additional comments	Published cut-off values were assessed

1 ## Population characteristics

2 ### Study-level characteristics

Characteristic	Study (n= 806)
% Female Custom value	52%

Characteristic	Study (n= 806)
Mean age (SD) Custom value	Mean age not stated

1 **Critical appraisal - GUT QUADAS-2: DIAGNOSIS ADULTS**

Section	Question	Answer
Patient selection: risk of bias	Could the selection of patients have introduced bias?	Low
Patient selection: applicability	Are there concerns that included patients do not match the review question?	Low
Index tests: risk of bias	Could the conduct or interpretation of the index test have introduced bias?	Low
Reference standard: risk of bias	Could the reference standard, its conduct, or its interpretation have introduced bias?	Low
Reference standard: applicability	Is there concern that the target condition as defined by the reference standard does not match the review question?	Low
Flow and timing: risk of bias	Could the patient flow have introduced bias?	Low
Overall risk of bias and directness	Risk of Bias	Low
Overall risk of bias and directness	Directness	Directly applicable

2

1 **Patel, 2017**

Bibliographic Reference	Patel, Shivani A; Deepa, Mohan; Shivashankar, Roopa; Ali, Mohammed K; Kapoor, Deksha; Gupta, Ruby; Lall, Dorothy; Tandon, Nikhil; Mohan, Viswanathan; Kadir, M Masood; Fatmi, Zafar; Prabhakaran, Dorairaj; Narayan, K M Venkat; Comparison of multiple obesity indices for cardiovascular disease risk classification in South Asian adults: The CARRS Study.; PloS one; 2017; vol. 12 (no. 4); e0174251

2 **Study Characteristics**

Study type	Cross-sectional study
Study details	Setting Center for Cardio-metabolic Risk Reduction in South Asia (CARRS) Surveillance Study. Multi-centre, community-based cohort study designed to estimate the prevalence incidence of cardio-metabolic risk factors and diseases in Chennai, India, New Delhi, India and Karachi, Pakistan. Data collection was conducted by trained field researchers. Study dates In 2010-2011, 16,288 adults ages 20 years and older were enrolled in CARRS (response rates: 94.7% for questionnaire and 84.3% for bio-specimens Sources of funding The CARRS Study was funded in part by the National Heart, Lung, and Blood Institute of the National Institutes of Health, Department of Health and Human Services (contract no. HHSN268200900026C) and the United Health Group (Minneapolis, MN, USA). RS is supported by a Wellcome Trust Capacity Strengthening Strategic Award Extension phase to the Public Health Foundation of India and a consortium of UK universities (WT084754/Z/08/A). Ethnicity Ethnicity not formally stated but the study members were assumed to be >80% South Asian ethnicity for this analysis

Inclusion criteria	People 20 years old and above
Exclusion criteria	People over 60 years old Due to the potential loss of muscle mass related to age in older adults
Number of participants	8892 (3772 men and 5120 Women)
Length of follow-up	n/a
Loss to follow-up	n/a
Index test(s)	Body Mass Index (BMI) Height, weight, and waist data were measured by trained field staff at the home of participants. Waist-to-hip ratio (WHR) Waist-to-height ratio (WHtR)
Reference standard (s)	Type II diabetes Diabetes was defined as fasting blood glucose </= 126 mg/dl or HbA1c >/= 6.5% or taking glucose lowering medication. Hypertension Hypertension was based on the average of up to three blood pressure readings and defined as systolic blood pressure >/= 140 or diastolic blood pressure >/= 90 mmHg or taking blood pressure lowering medication.
Subgroup analyses	Outcomes separated by gender

Population characteristics

Study-level characteristics

Characteristic	Study (n= 8892)
% Female Custom value	58%
Mean age (SD) Custom value	Men: 39.6 (11.1). Women: 38.6 (10.6)

Critical appraisal - GUT QUADAS-2: DIAGNOSIS ADULTS

Section	Question	Answer
Patient selection: risk of bias	Could the selection of patients have introduced bias?	Low
Patient selection: applicability	Are there concerns that included patients do not match the review question?	Low
Index tests: risk of bias	Could the conduct or interpretation of the index test have introduced bias?	Low
Reference standard: risk of bias	Could the reference standard, its conduct, or its interpretation have introduced bias?	Low
Reference standard: applicability	Is there concern that the target condition as defined by the reference standard does not match the review question?	Low
Flow and timing: risk of bias	Could the patient flow have introduced bias?	Low
Overall risk of bias and directness	Risk of Bias	Low
Overall risk of bias and directness	Directness	Directly applicable

1 **Siddiquee, 2015**

Bibliographic Reference	Siddiquee, Tasnima; Bhowmik, Bishwajit; Karmaker, Rajat Kanti; Chowdhury, Abhijit; Mahtab, Hajera; Azad Khan, A K; Hussain, Akhtar; Association of general and central obesity with diabetes and prediabetes in rural Bangladeshi population.; Diabetes & metabolic syndrome; 2015; vol. 9 (no. 4); 247-51

2 **Study Characteristics**

Study type	Cross-sectional study
Study details	Study location A rural community called Chandra, 40 km north of Dhaka, Bangladesh Study dates Conducted in 2009 Sources of funding Funding not stated but the Diabetic Association of Bangladesh was thanked for its cooperation and support. Ethnicity Ethnicity was not formally stated but it was assumed to be >80% South Asian for this analysis Recruitment Approximately 20,000 inhabitants aged >/=20 years were listed from the 10 selected villages out of 25 villages. The study included both gender, age >/=20 years, willing to participate and being able to communicate. For this study, 3000 people were randomly selected and among them 2376 (79.2%) participated
Inclusion criteria	People 20 years old and above
Exclusion criteria	Pregnant women

	People with myocardial infarction, liver disease, renal disease, tuberculosis, malignant disease and any severe disease at the time of screening
Number of participants	2376
Length of follow-up	n/a
Loss to follow-up	n/a
Index test(s)	Body Mass Index (BMI) Anthropometric measurements including height, weight, hip and waist circumference (WC) were taken with the subjects wearing light clothes and without shoes. Weight and height were recorded to the nearest 0.1 kg and 0.1 cm. Waist circumference (WC) WC was measured by placing a tape horizontally midway between the lower border of the ribs and upper border of iliac crest on the midaxillary line. Waist-to-hip ratio (WHR) Hip circumference was measured to the nearest centimetre at the greatest protrusion of the buttocks.
Reference standard (s)	Type II diabetes T2DM was defined as FPG >/=7.0 mmol/l and/or 2hPG >/=11.1 mmol/l, self-reported T2DM, or use of diabetes medication

1 ## Population characteristics

2 ### Study-level characteristics

Characteristic	Study (n= 2293)
% Female Custom value	63%

Characteristic	**Study (n= 2293)**
Mean age (SD) Mean (95% CI)	41.8 (41.2 to 42.4)

Critical appraisal - GUT QUADAS-2: DIAGNOSIS ADULTS

Section	Question	Answer
Patient selection: risk of bias	Could the selection of patients have introduced bias?	Low
Patient selection: applicability	Are there concerns that included patients do not match the review question?	Low
Index tests: risk of bias	Could the conduct or interpretation of the index test have introduced bias?	Low
Reference standard: risk of bias	Could the reference standard, its conduct, or its interpretation have introduced bias?	Low
Reference standard: applicability	Is there concern that the target condition as defined by the reference standard does not match the review question?	Low
Flow and timing: risk of bias	Could the patient flow have introduced bias?	Low
Overall risk of bias and directness	Risk of Bias	Low
Overall risk of bias and directness	Directness	Directly applicable

Sinaga, 2018

Bibliographic Reference	Sinaga, M; Worku, M; Yemane, T; Tegene, E; Wakayo, T; Girma, T; Lindstrom, D; Belachew, T; Optimal cut-off for obesity and markers of metabolic syndrome for Ethiopian adults; Nutrition journal; 2018; vol. 17 (no. 1); 109

Study Characteristics

Study type	Cross-sectional study
Study details	Study location Jimma University in Ethiopia Study dates The study was conducted from February to April 2015. Sources of funding Institute of Health, Jimma University Ethnicity This participants of this study have been included as Black African / Caribbean ethnicity for this review Recruitment All administrative and academic staff of Jimma University who were actively working at a time of the study were included in the study..A gender stratified simple random sampling was used to select the study participants using proportional to size (PPS) allocation
Inclusion criteria	Adults who work for Jimma University

Exclusion criteria	Pregnant women Adults who had physical deformity (kyphosis and scoliosis), pregnancy, known chronic illness and serious illness
Number of participants	704 (397 women and 307 men)
Length of follow-up	n/a
Loss to follow-up	n/a
Index test(s)	Body Mass Index (BMI) The data were collected by five clinical nurses who were recruited based on their qualification and prior experience of data collection. Height of the study participants was measured to the nearest 0.1 cm using a stadimeter with the subjects positioned at the Frankfurt Plane and the four points(heel, calf, buttocks and shoulder) touching the vertical stand and their shoes taken off. Weight was measured using an electric powered digital scale connected to the plethysmograph to the nearest 0.1 kg with the subjects wearing light closes and shoes taken off. Waist circumference (WC) Waist circumference was measured at the midway between the lowest costal margin at the midclavicular line and the anterior superior iliac spine using fixed tension tape. Waist-to-hip ratio (WHR) Hip circumference was measured at the level of the greater trochanter of the femur with the subjects wearing a pant. Waist-to-height ratio (WHtR)
Reference standard (s)	Hypertension BP(≥130/85 mmHg)
Subgroup analyses	Outcomes separated by gender

Additional comments	The optimal cut-off values were defined as a point on the curve where Youden's index (defined as: sensitivity + specificity – 1), is maximum

1 **Population characteristics**

2 **Study-level characteristics**

Characteristic	**Study (n= 704)**
% Female Custom value	56%

3 **Critical appraisal - GUT QUADAS-2: DIAGNOSIS ADULTS**

Section	Question	Answer
Patient selection: risk of bias	Could the selection of patients have introduced bias?	High
Patient selection: applicability	Are there concerns that included patients do not match the review question?	High (Employees of the university rather than a representative population sample.)
Index tests: risk of bias	Could the conduct or interpretation of the index test have introduced bias?	High (Thresholds used were not pre-specified.)
Reference standard: risk of bias	Could the reference standard, its conduct, or its interpretation have introduced bias?	Low
Reference standard: applicability	Is there concern that the target condition as defined by the reference standard does not match the review question?	Low
Flow and timing: risk of bias	Could the patient flow have introduced bias?	Low

Overall risk of bias and directness	Risk of Bias	Moderate (Thresholds used were not pre-specified.)
Overall risk of bias and directness	Directness	Partially applicable (Not a population sample)

1 **Skogberg, 2018**

Bibliographic Reference	Skogberg 2018; Laatikainen, Tiina; Lundqvist, Annamari; Lilja, Eero; Harkanen, Tommi; Koponen, Paivikki; Which anthropometric measures best indicate type 2 diabetes among Russian, Somali and Kurdish origin migrants in Finland? A cross-sectional study.; BMJ open; 2018; vol. 8 (no. 5); e019166

2 **Study Characteristics**

Study type	Cross-sectional study
Study details	Study location Finland. Setting Data from the Migrant Health and Wellbeing Survey (Maamu), conducted between 2010 and 2012 in six cities in Finland Sources of funding This work was funded by the Doctoral Programme in Population Health, University of Helsinki, Finland. Ethnicity

	The study was designed to address variations in ethnicity linked to measures that indicated a person has type II diabetes. Analysis was separated into people with Finnish heritage, Russian heritage, Somali heritage, and Kurdish heritage. For this review data will be extracted on those with Somali heritage and it will be analysed as Black African / Caribbean ethnicity. Recruitment Country of birth (Russia/Former Soviet Union, Somalia and Iran/Iraq), mother tongue (Russian/Finnish and Sorani dialect of Kurdish) and residence in Finland for at least one year. Participants were invited for a structured face-to-face interview and a standardised health examination, conducted by trained fieldwork personnel.
Inclusion criteria	People 18-64 years old
Exclusion criteria	People who had been diagnosed with diabetes
Number of participants	917 migrant heritage and 887 Finns.
Length of follow-up	n/a
Loss to follow-up	n/a
Index test(s)	Body Mass Index (BMI) The health examination included standardised measurements of weight and height as well as waist and hip circumferences according to the European Health Examination Survey standards. Weight was measured wearing light clothing and no shoes with a balanced beam scale (Seca 709) in the Maamu Survey and as a part of the bioimpedance body composition analysis (Seca 514) in the Health 2011 Survey. In both studies, height was measured without shoes with a stand-alone stadiometer (Seca 213). Waist circumference (WC) WC was measured with a soft measuring tape half-way between the lowest rib and top of iliac crest on bare skin or wearing light clothing. Waist-to-hip ratio (WHR)

	WC was measured with a soft measuring tape half-way between the lowest rib and top of iliac crest on bare skin or wearing light clothing. Hip circumference was not measured in the Health 2011 Survey and is available for Maamu Survey participants only. Weight and WC were not measured if the participant was over 20 weeks pregnant. Waist-to-height ratio (WHtR)
Reference standard (s)	Type II diabetes Type 2 diabetes was determined based on: (1) interview data on self-reported previous diagnosis by a physician, (2) self-reported medication use, (3) register-based diabetes defined by information on special medication reimbursement rights and/or inpatient or outpatient hospital care for diabetes and/or (4) HbA1c levels ≥6.5% (140 mg/dL).

1 **Population characteristics**

2 **Study-level characteristics**

Characteristic	**Study (n=226)**
% Female Custom value	140 (62%)
Mean age (SD) Custom value	35% women and 31% men over 44 years old

3 **Critical appraisal - GUT QUADAS-2: DIAGNOSIS ADULTS**

Section	Question	Answer
Patient selection: risk of bias	Could the selection of patients have introduced bias?	Low
Patient selection: applicability	Are there concerns that included patients do not match the review question?	Low
Index tests: risk of bias	Could the conduct or interpretation of the index test have introduced bias?	Low

Reference standard: risk of bias	Could the reference standard, its conduct, or its interpretation have introduced bias?	Low
Reference standard: applicability	Is there concern that the target condition as defined by the reference standard does not match the review question?	Low
Flow and timing: risk of bias	Could the patient flow have introduced bias?	Low
Overall risk of bias and directness	Risk of Bias	Low
Overall risk of bias and directness	Directness	Directly applicable

1 **Snehalatha, 2003**

Bibliographic Reference	Snehalatha, Chamukuttan; Viswanathan, Vijay; Ramachandran, Ambady; Cutoff values for normal anthropometric variables in asian Indian adults.; Diabetes care; 2003; vol. 26 (no. 5); 1380-4

2 **Study Characteristics**

Study type	Cross-sectional study
Study details	Study location 6 cities in India Setting Diabetes Epidemiology Study Group in India (DESI) Study dates

	Recruitment in 2000 Sources of funding Novo Nordisk Education Foundation provided financial support. Ethnicity Ethnicity not stated but the population in the study was assumed to be >80% South Asian for this analysis Recruitment A multiple stratified sampling procedure was used for sample selection.
Inclusion criteria	People 20 years old and above
Exclusion criteria	People who had been diagnosed with diabetes
Number of participants	10025 (4711 men and 5314 women)
Length of follow-up	n/a
Loss to follow-up	n/a
Index test(s)	Body Mass Index (BMI) Waist circumference (WC) Waist-to-hip ratio (WHR)
Reference standard (s)	Type II diabetes All study subjects had measurements of fasting blood glucose and 2-h blood glucose (2hBG; values taken 2 h after a 75-g glucose load) by capillary blood glucose measurements using a glucometer. Diabetes was diagnosed if the fasting blood glucose was >/=126 mg/dl and/or the 2hBG was >/=200 mg/dl
Subgroup analyses	Outcomes separated by gender

Additional comments	Optimal values were extrapolated from the ROC curves.

Population characteristics

Study-level characteristics

Characteristic	Study (n= 10025)
% Female Custom value	5314 (53%)
Mean age (SD) Mean (SD)	40.4 (14.2)

Critical appraisal - GUT QUADAS-2: DIAGNOSIS ADULTS

Section	Question	Answer
Patient selection: risk of bias	Could the selection of patients have introduced bias?	Low
Patient selection: applicability	Are there concerns that included patients do not match the review question?	Low
Index tests: risk of bias	Could the conduct or interpretation of the index test have introduced bias?	High (It was unclear who carried out the assessments and how they were conducted. Test thresholds not pre-specified.)
Reference standard: risk of bias	Could the reference standard, its conduct, or its interpretation have introduced bias?	Low

Reference standard: applicability	Is there concern that the target condition as defined by the reference standard does not match the review question?	Low
Flow and timing: risk of bias	Could the patient flow have introduced bias?	Low
Overall risk of bias and directness	Risk of Bias	Moderate (It was unclear who carried out the assessments and how they were conducted. Test thresholds not pre-specified.)
Overall risk of bias and directness	Directness	Directly applicable

1 **Yoon, 2016**

Bibliographic Reference	Yoon 2016; Choi, Han Seok; Kim, Jin Kuk; Kim, Yu Il; Oh, Sang Woo; Differences in the associations of anthropometric measures with insulin resistance and type 2 diabetes mellitus between Korean and US populations: Comparisons of representative nationwide sample data.; Obesity research & clinical practice; 2016; vol. 10 (no. 6); 642-651

2 **Study Characteristics**

Study type	Cross-sectional study
Study details	Study location Korea and USA Setting Cross-sectional analysis using 2007—2010 Korea National Health and Nutrition Examination Survey (KNHANES) (n = 18,845) and the USA (n = 4657) National Health and Nutrition Examination Survey (NHANES) 2007—2010. The NHANES is a nationally representative survey conducted by the National Center for Health Statistics (NCHS), part of the Centers for

	Disease Control and Prevention. Survey participants from the US noninstitutionalised civilian population were selected using a stratified multistage probability sample design. Sources of funding Supported by a grant from Research year of Inje University in 2014—2015 (20140191). Ethnicity The analysis was stratified by ethnicity: Korean, White, Black, and Hispanic. For this review the outcomes in the Black group are presented under the Black African / Caribbean group.
Inclusion criteria	People 20 years old and above
Exclusion criteria	Pregnant women Incomplete data collected People diagnosed with type 1 diabetes or taking anti-diabetic medications
Number of participants	18845 people from Korea. From the USA, 2347 White people, 845 Black, and 1456 Hispanic
Length of follow-up	n/a
Loss to follow-up	n/a
Index test(s)	Body Mass Index (BMI) Height was measured to the nearest 0.1 cm on a stadiometer with the participants standing barefoot. Body weight was measured to the nearest 0.1 kg on a balanced scale while the participants wore a lightweight gown or underwear. Waist circumference (WC) WC was measured at the area between the rib cage and the iliac crest in KNHANES and at the horizontal plane just above the uppermost lateral border of the right iliac crest in the NHANES to the nearest of 0.1 cm.

Reference standard (s)	Type II diabetes No description of how it was assessed provided

Population characteristics

Study-level characteristics

Characteristic	**Study (n= 854)**
% Female Custom value	55.6%
Mean age (SD) Standardised Mean (SD)	42.8 (15)

Critical appraisal - GUT QUADAS-2: DIAGNOSIS ADULTS

Section	Question	Answer
Patient selection: risk of bias	Could the selection of patients have introduced bias?	Low
Patient selection: applicability	Are there concerns that included patients do not match the review question?	Low
Index tests: risk of bias	Could the conduct or interpretation of the index test have introduced bias?	Low
Reference standard: risk of bias	Could the reference standard, its conduct, or its interpretation have introduced bias?	High
Reference standard: applicability	Is there concern that the target condition as defined by the reference standard does not match the review question?	High
Flow and timing: risk of bias	Could the patient flow have introduced bias?	Low

Overall risk of bias and directness	Risk of Bias	Moderate
Overall risk of bias and directness	Directness	Directly applicable

Appendix G – Forest plots

Area under the curve (C-statistics)

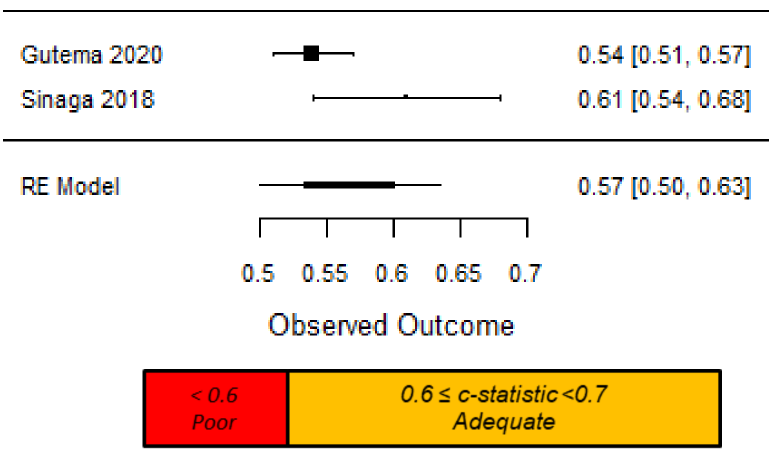
Diagnostic accuracy

Black African/ Caribbean population

Hypertension

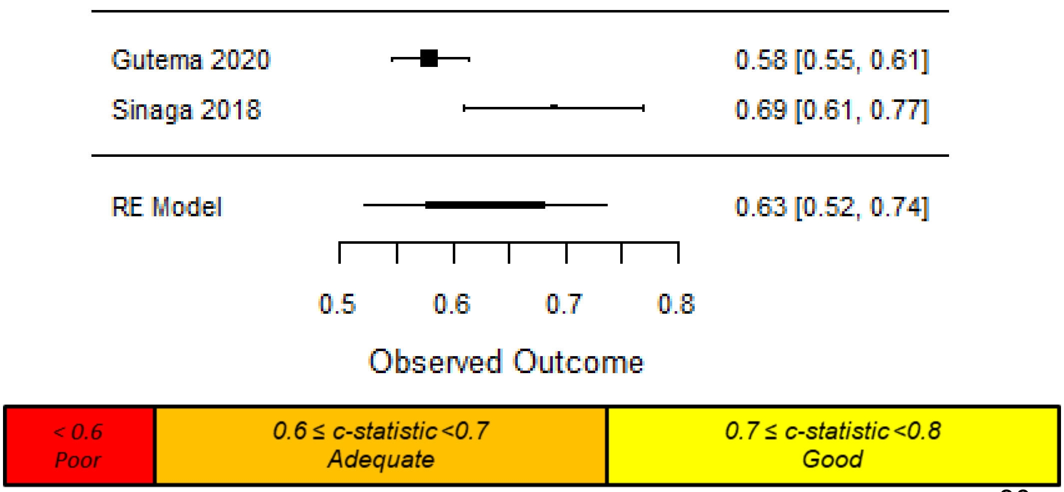
BMI

Females



I^2 (total heterogeneity / total variability): 69.19%

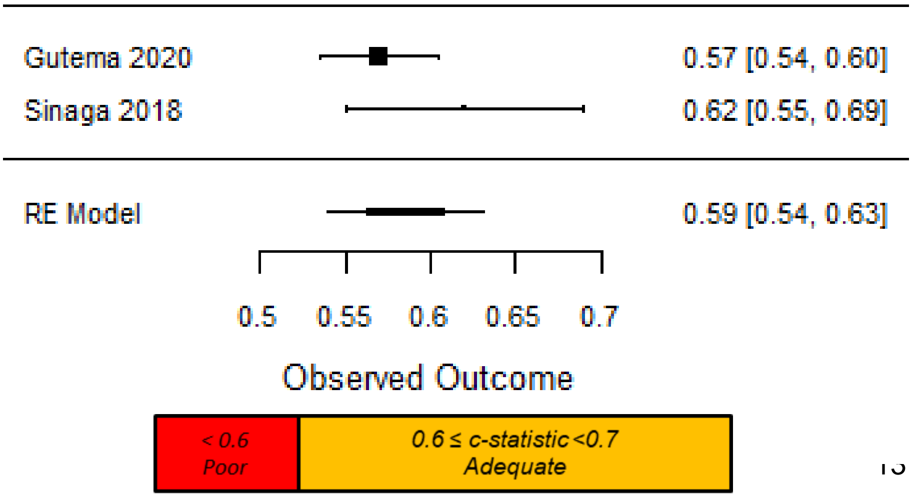
Males



I^2 (total heterogeneity / total variability): 83.60%

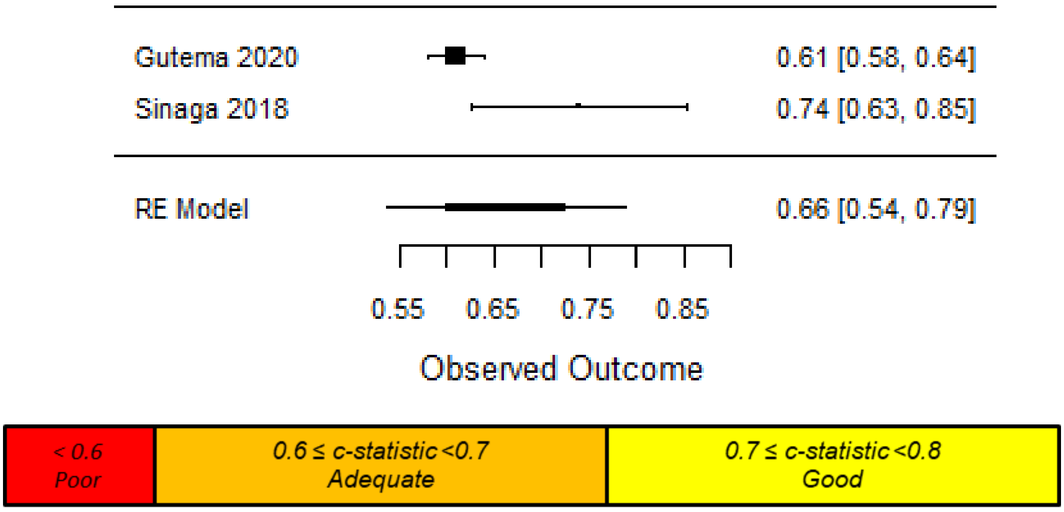
Waist circumference

Females



I^2 (total heterogeneity / total variability): 36.22%

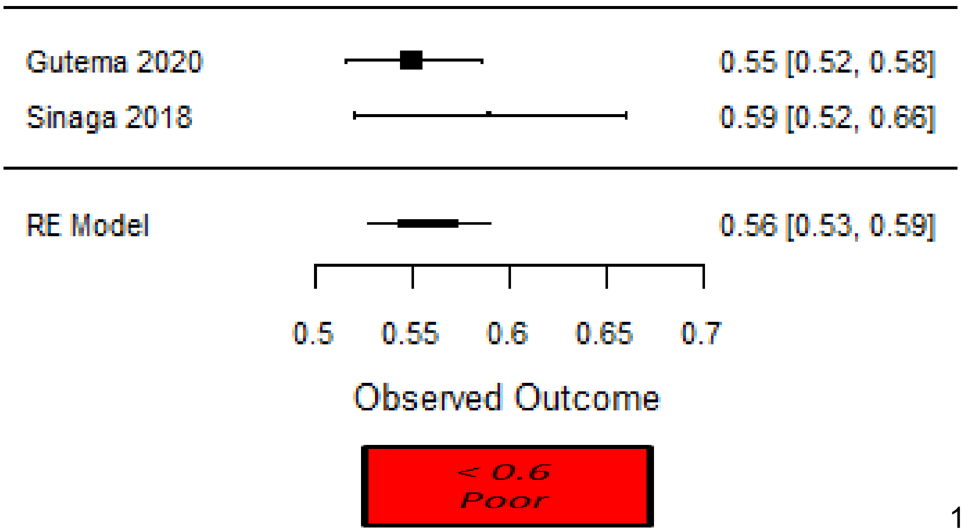
Males



I^2 (total heterogeneity / total variability): 78.24%

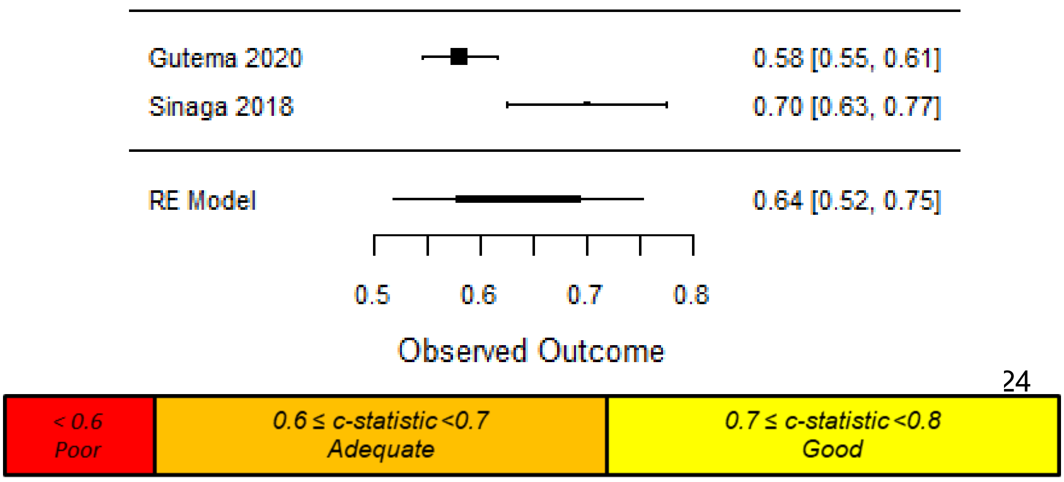
Waist to hip ratio

Females



I^2 (total heterogeneity / total variability): 0.35%

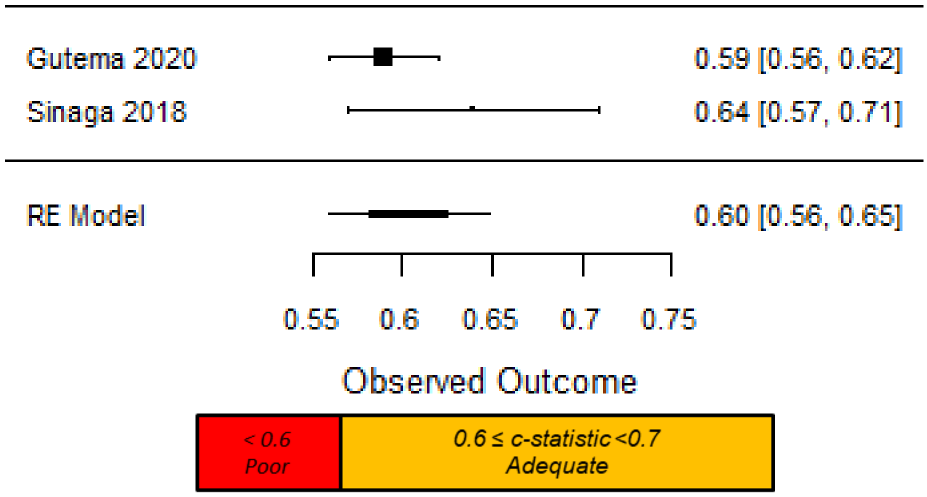
Males



I^2 (total heterogeneity / total variability): 87.62%

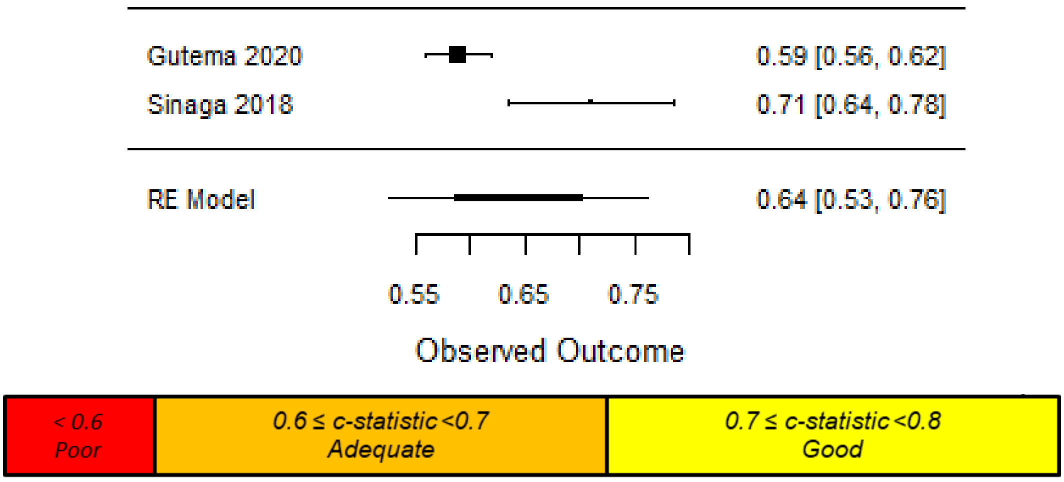
Waist-to-height ratio

Females



I^2 (total heterogeneity / total variability): 39.61%

Males



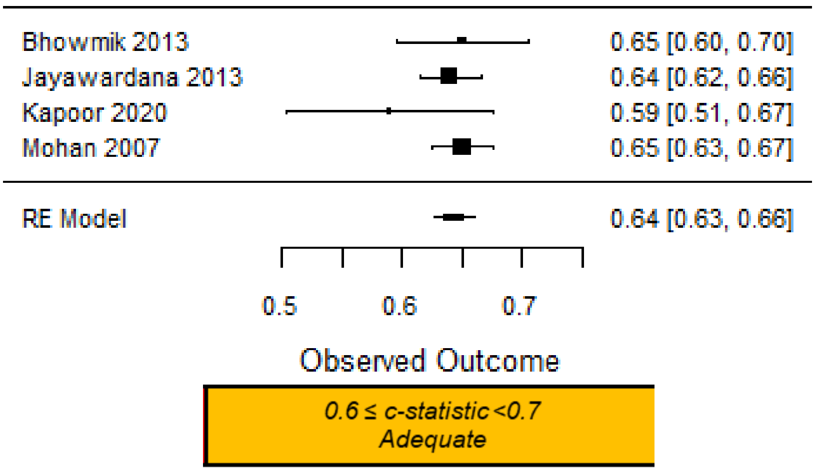
I^2 (total heterogeneity / total variability): 88.20%

South Asian population

Type 2 Diabetes

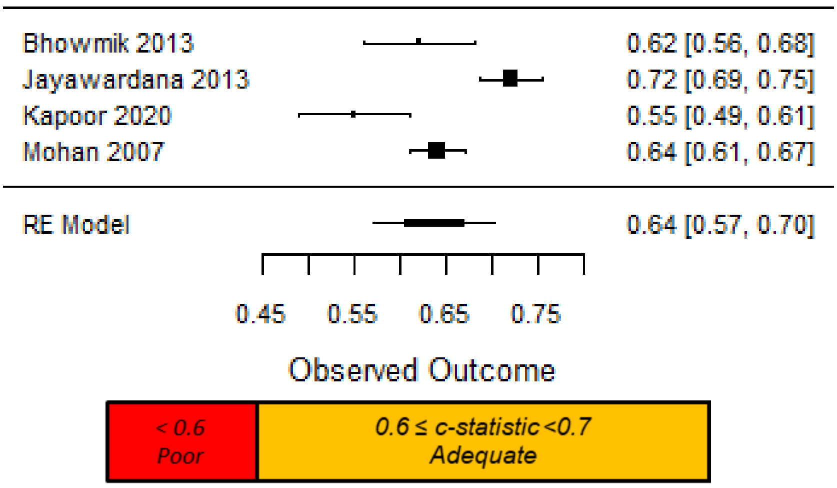
BMI

Females



I^2 (total heterogeneity / total variability): 0.0%

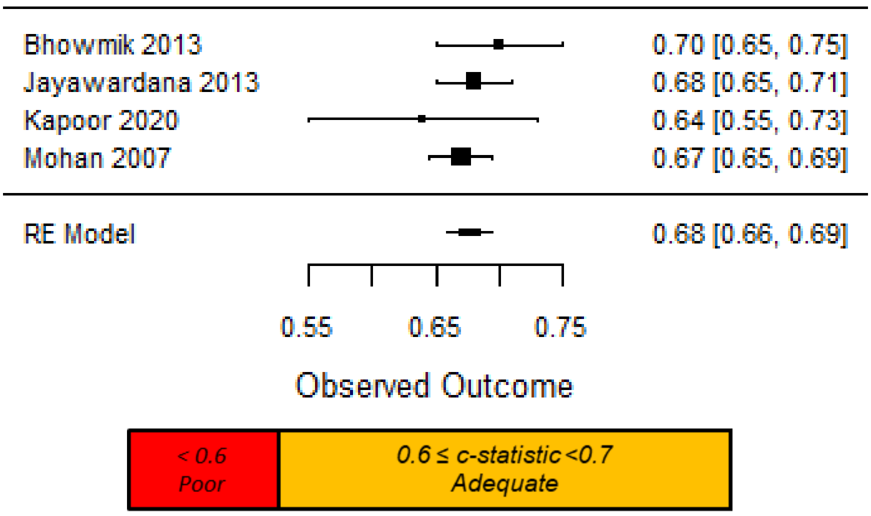
Males



I^2 (total heterogeneity / total variability): 89.0%

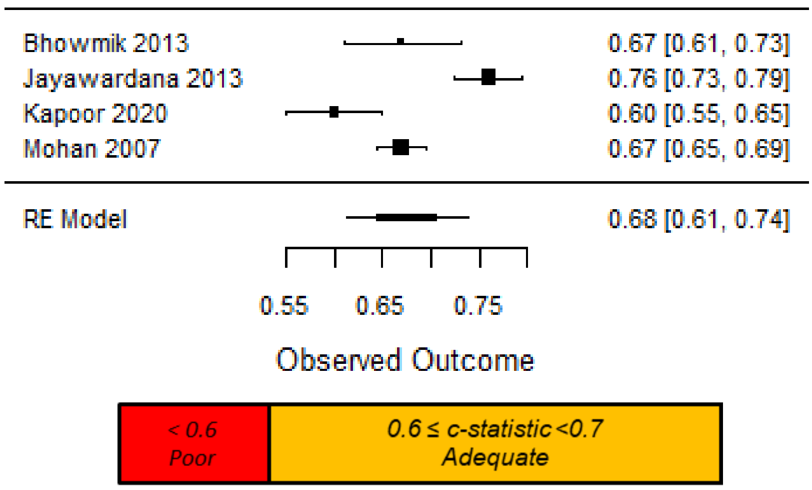
Waist circumference

Females



I^2 (total heterogeneity / total variability): 0.0%

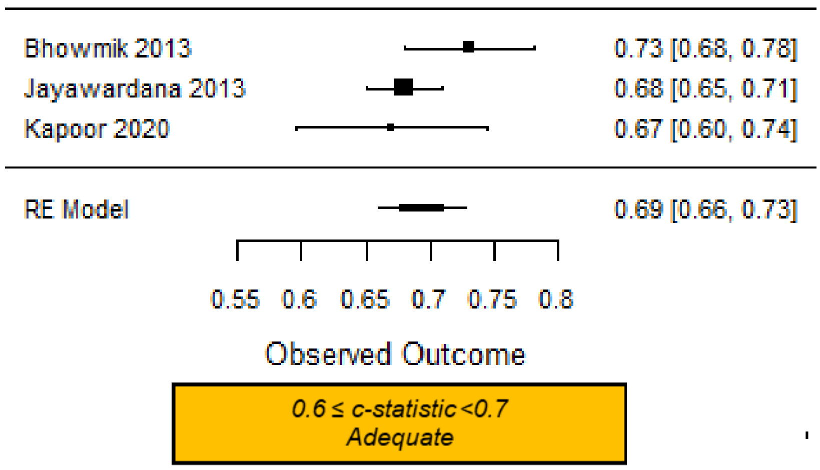
Males



I^2 (total heterogeneity / total variability): 90.12%

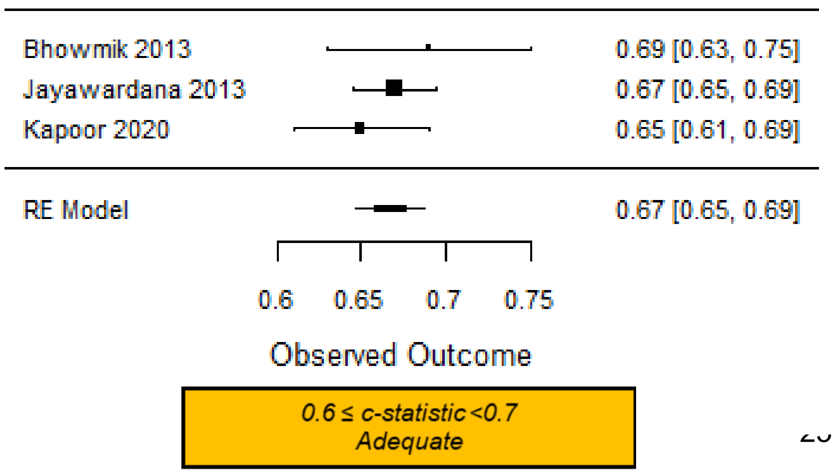
Waist to hip

Females



I^2 (total heterogeneity / total variability): 36.60%

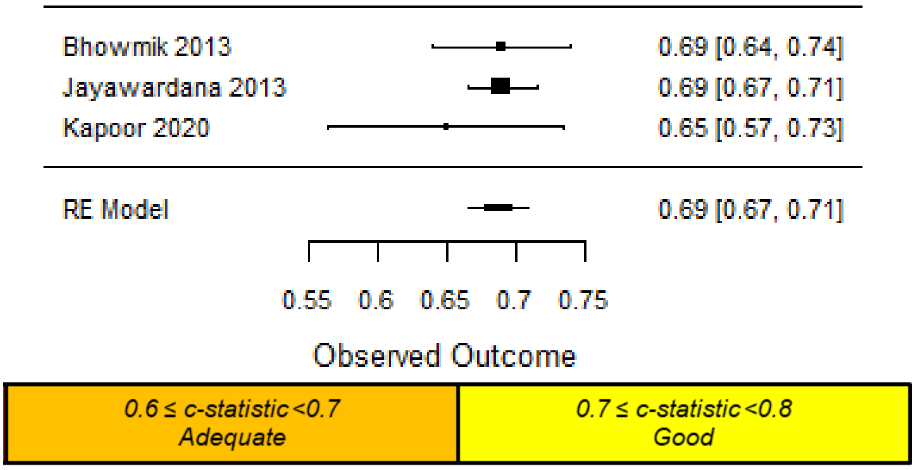
Males



I^2 (total heterogeneity / total variability): 0.0%

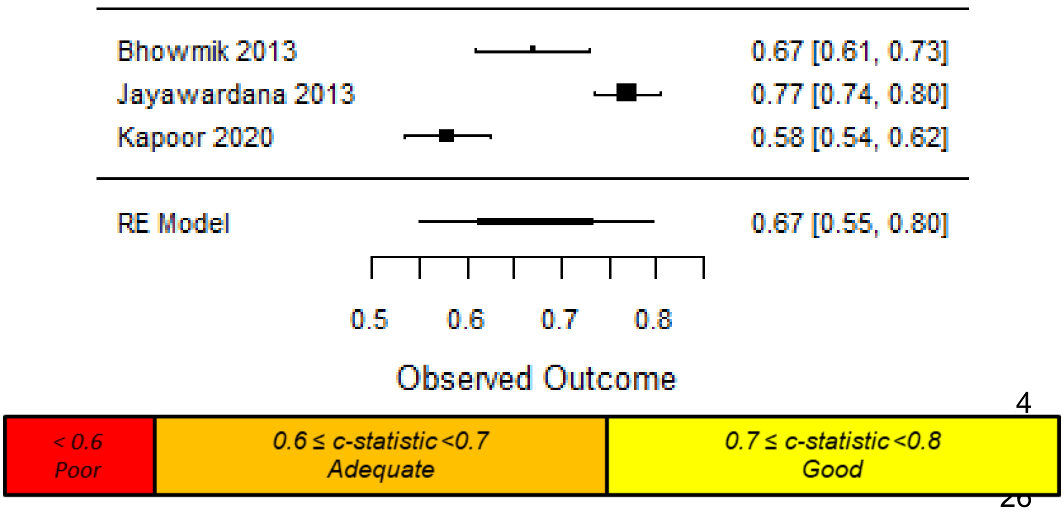
Waist-to-height

Females



I^2 (total heterogeneity / total variability): 0.0%

Males

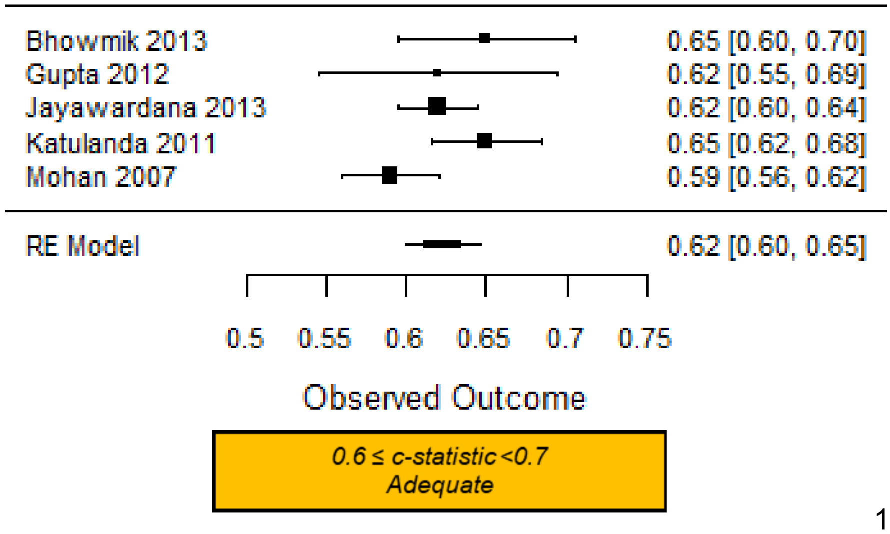


I^2 (total heterogeneity / total variability): 95.39%

Hypertension

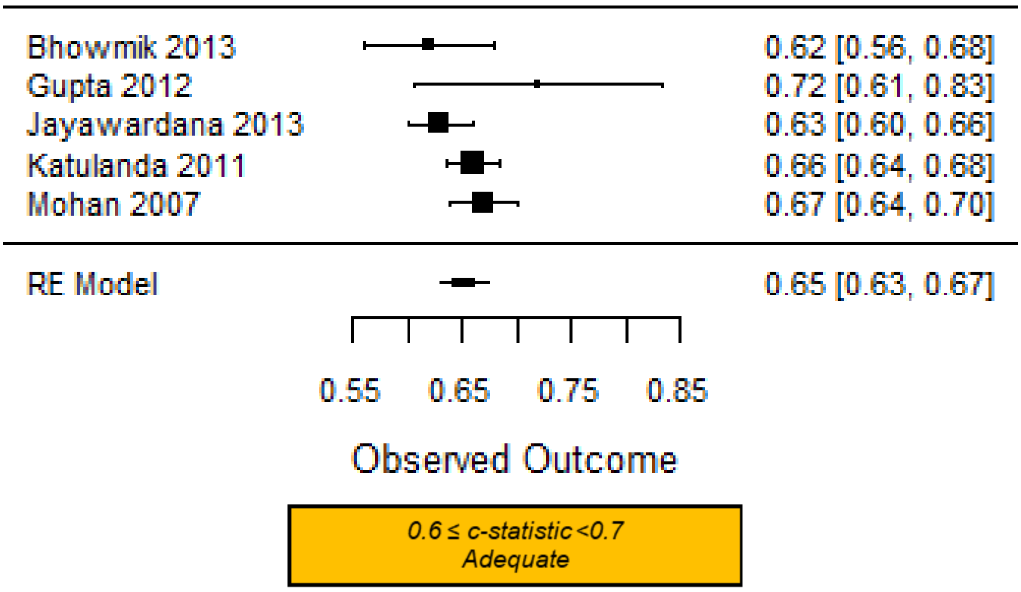
BMI

Females



I^2 (total heterogeneity / total variability): 48.76%

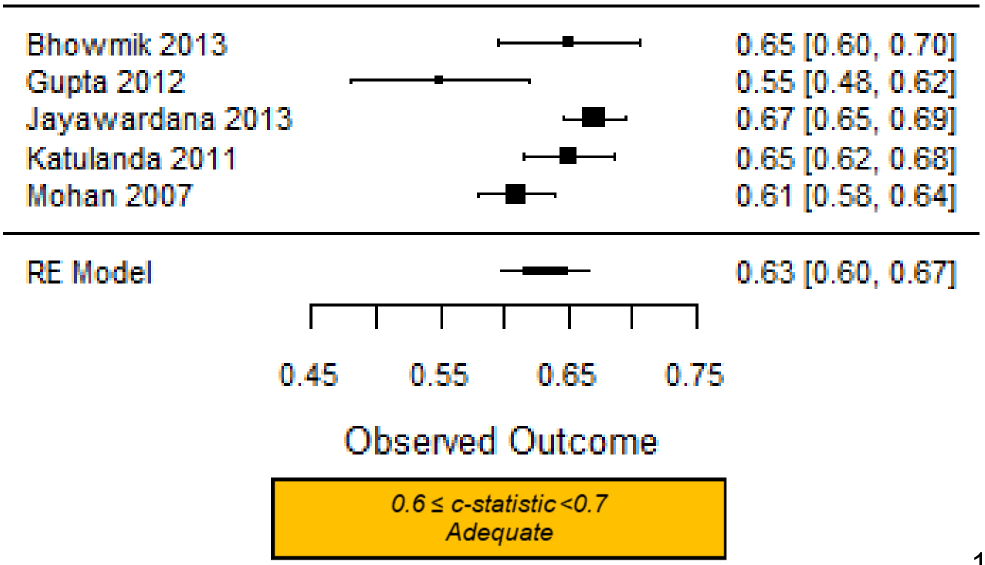
Males



I^2 (total heterogeneity / total variability): 36.09%

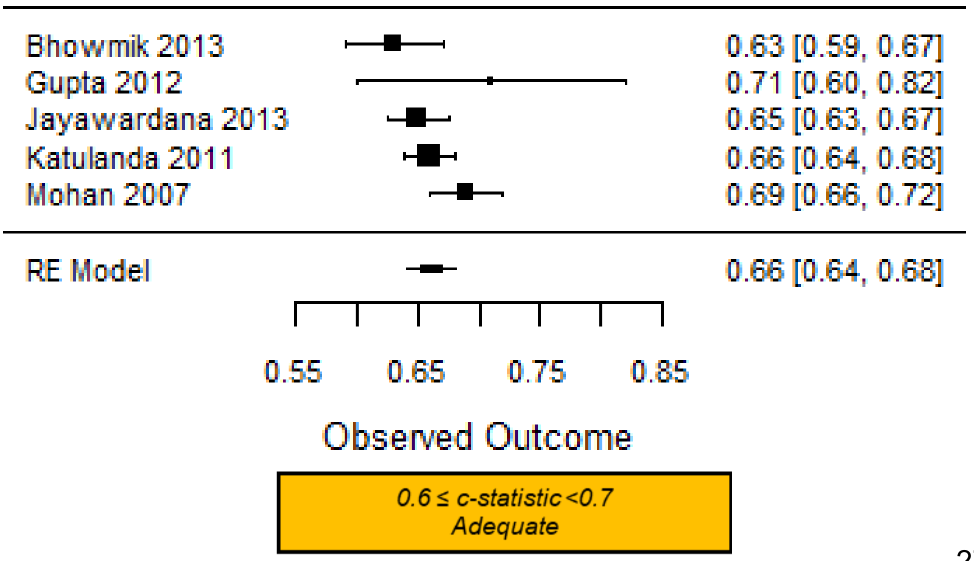
Waist circumference

Females



I^2 (total heterogeneity / total variability): 75.17%

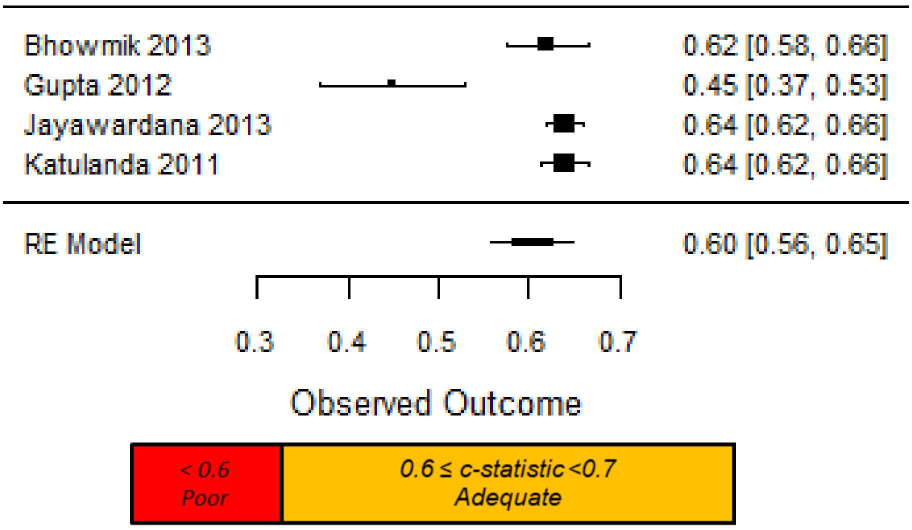
Males



I^2 (total heterogeneity / total variability): 45.99%

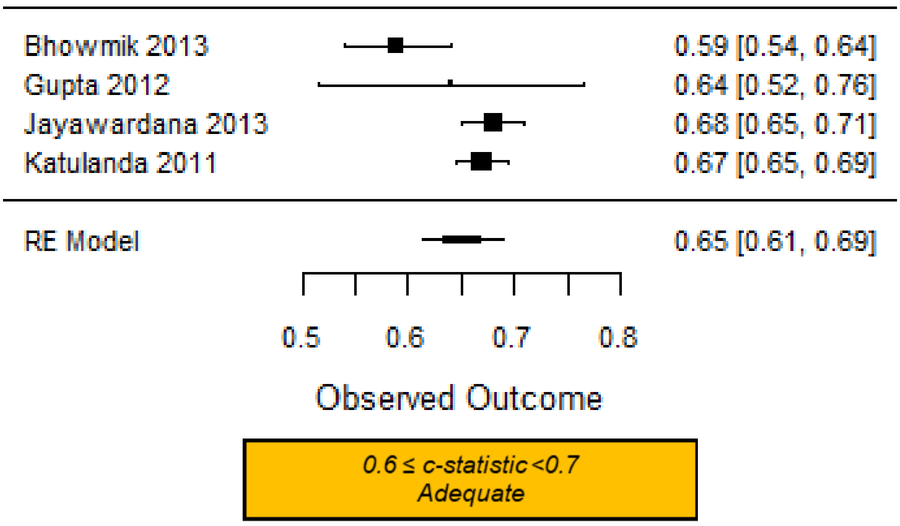
Waist to hip

Females



I^2 (total heterogeneity / total variability): 85.82%

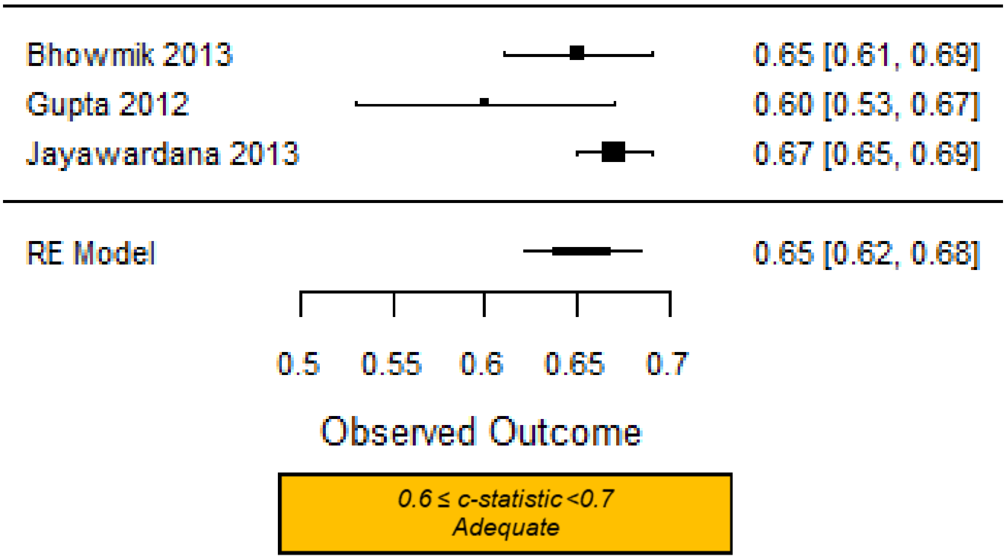
Males



I^2 (total heterogeneity / total variability): 69.55%

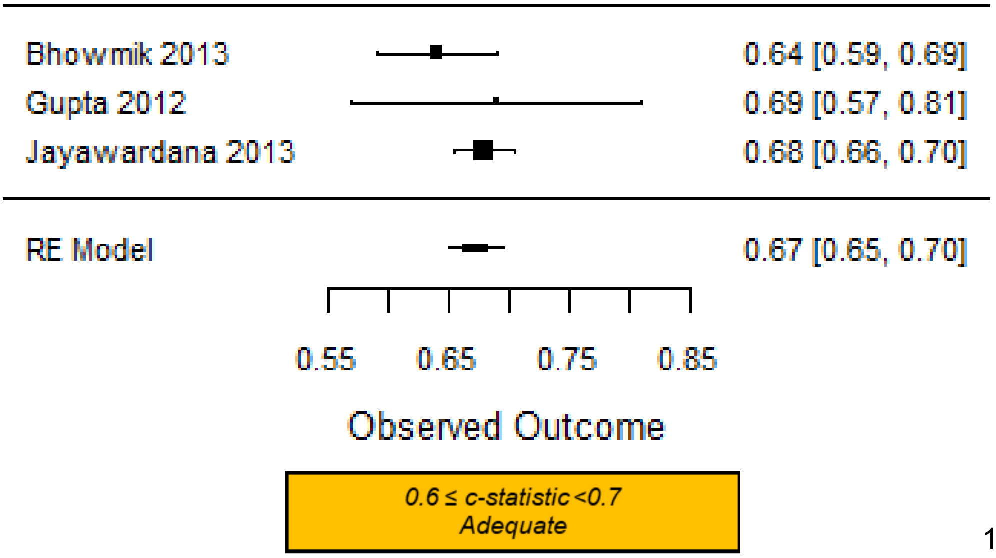
Waist-to-height

Females



I^2 (total heterogeneity / total variability): 49.67%

Males



I^2 (total heterogeneity / total variability): 2.46%

Appendix H – GRADE tables

Sensitivity, specificity, likelihood ratios

Prognostic accuracy

Chinese population

Type 2 diabetes

BMI

No. of studies	Study design	Sample size	Sensitivity (95%CI)	Specificity (95%CI)	Effect size (95%CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
Men and Women at cut off 24.4 kg/m^2 (ROC AUC: 0.631)										
Xia 2018	Prospective	2558	0.571 (0.532,0.608)	0.610 (0.588,0.632)	LR+ 1.463 (1.341,1.597)	Very serious[1]	Not serious	N/A[2]	Not serious	Low
					LR- 0.704 (0.640,0.775)				Not serious	Low
Men at cut off 25.78 kg/m^2 (YI: 0.255)										
Yang 2018	Prospective	5998	0.542 (0.491,0.593)	0.713 (0.701,0.725)	LR+ 1.890 (1.704,2.096)	Serious[4]	Not serious	N/A[2]	Serious[3]	Low
					LR- 0.642 (0.573,0.718)				Not serious	Low
Women at cut off 24.86 kg/m^2 (YI: 0.237)										
Yang 2018	Prospective	3964	0.655 (0.593,0.711)	0.582 (0.565,0.598)	LR+ 1.566 (1.419,1.728)	Serious[4]	Not serious	N/A[2]	Not serious	Low
					LR- 0.594 (0.499,0.706)				Serious [3]	Low

[1] Downgraded by 2 increments because the majority of the evidence was at very high risk of bias
[2] Inconsistency not applicable as evidence from a single study.
[3] Downgraded 1 increment as 95% confidence interval of likelihood ratio crosses one end of a defined MID interval (0.5, 2)
[4] Downgraded by 1 increment because the majority of the evidence was at high risk of bias
ROC AUC: Receiver Operating Characteristic: Area Under the Curve
YI: Youden's index

1 *Waist circumference*

No. of studies	Study design	Sample size	Sensitivity (95%CI)	Specificity (95%CI)	Effect size (95%CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
Men and women at cut off 82.8 cm (ROC AUC: 0.646)										
Xia 2018	Prospective	2558	0.620 (0.582, 0.657	0.600 (0.578, 0.622)	LR+ 1.551 (1.429,1.683)	Very serious[3]	Not serious	N/A[2]	Not serious	Low
					LR- 0.633 (0.570,0.703)				Not serious	Low
Men at cut off 84.9 cm (YI: 0.203)										
Yang 2018	Prospective	5998	0.671(0.621 ,0.718)	0.532 (0.519, 0.546)	LR+ 1.435 (1.328,1.550)	Serious[1]	Not serious	N/A[2]	Not serious	Moderate
					LR- 0.618 (0.532,0.717)				Not serious	Moderate
Women at cut off 81.1 cm (YI: 0.180)										
Yang 2018	Prospective	3964	0.659(0.598 ,0.715)	0.521 (0.504, 0.538)	LR+1.375 (1.249,1.514)	Serious[1]	Not serious	N/A[2]	Not serious	Moderate
					LR- 0.655 (0.550,0.781)				Not serious	Moderate

[1] Downgraded by 1 increment because the majority of the evidence was at high risk of bias
[2] Inconsistency not applicable as evidence from a single study.
[3] Downgraded by 2 increments because the majority of the evidence was at very high risk of bias
ROC AUC: Receiver Operating Characteristic: Area Under the Curve
YI: Youden's index

2 *Waist-to-height ratio*

No. of studies	Study design	Sample size	Sensitivity (95%CI)	Specificity (95%CI)	Effect size (95%CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
Men at cut off 0.512 (YI: 0.199)										
Yang 2018	Prospective	5998	0.644 (0.593, 0.691)	0.555 (0.542, 0.568)	LR+ 1.447 (1.333,1.571)	Serious[3]	Not serious	N/A[1]	Not serious	Moderate
					LR- 0.642 (0.558,0.738)				Not serious	Moderate
Women at cut off 0.514 (YI: 0.183)										
Yang 2018	Prospective	3964	0.727 (0.668, 0.779)	0.456 (0.439, 0.472)	LR+ 1.336 (1.231,1.450)	Serious[3]	Not serious	N/A[1]	Not serious	Moderate
					LR- 0.599 (0.488, 0.736)				Serious[2]	Low

[1] Inconsistency not applicable as evidence from a single study.
[2] Downgraded 1 increment as 95% confidence interval of likelihood ratio crosses one end of a defined MID interval (0.5, 2)
[3] Downgraded by 1 increment because the majority of the evidence was at high risk of bias
YI: Youden's index

1 ***Hypertension***

2 *BMI*

No. of studies	Study design	Sample size	Sensitivity (95%CI)	Specificity (95%CI)	Effect size (95%CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
Men at cut off 22.655 kg/m^2 (YI: 0.17)										
Chen 2018	Prospective	3866	0.692(0.658, 0.723)	0.481(0.464,0.499)	LR+1.333(1.258,1.413)	Very serious [1]	Not serious	N/A[2]	Not serious	Low
					LR-0.641 (0.573,0.717)				Not serious	Low
Men at cut off 23.74 kg/m^2 (YI: 0.15)										
Yu 2020	Prospective	1557	0.479(0.432, 0.528)	0.670(0.642,0.696)	LR+ 1.451 (1.274,1.652)	Serious [4]	Not serious	N/A[2]	Not serious	Moderate
					LR- 0.777 (0.703,0.860)				Not serious	Moderate
Women at cut off 23.8 kg/m^2 (YI: 0.16)										
Chen 2018	Prospective	6039	0.650(0.622, 0.677)	0.513 (0.499,0.527)	LR+ 1.334 (1.267,1.404)	Very serious [1]	Not serious	N/A[2]	Not serious	Low
					LR- 0.683 (0.628,0.743)				Not serious	Low
Women at cut off 25.4 kg/m^2 - Normal Group 1										
Wang 2018	Prospective	344	0.387 (0.235,0.565)	0.185 (0.146,0.232)	LR+ 3.308 (2.299,4.758)	Very serious [1]	Not serious	N/A[2]	Not serious	Low
					LR- 0.475 (0.304,0.742)				Serious[3]	Very low
Women at cut off 26.2 kg/m^2 - Prehypertensive Group 2										
Wang 2018	Prospective	375	0.446 (0.360,0.536)	0.272 (0.221,0.330)	LR+ 2.038 (1.576,2.636)	Very serious [1]	Not serious	N/A[2]	Serious[3]	Very low
					LR- 0.613 (0.496,0.758)				Serious[3]	Very low
Women at cut off 23.83 kg/m^2 (YI: 0.2)										
Yu 2020	Prospective	1849	0.530 (0.482,0.577)	0.670 (0.645,0.694)	LR+ 1.606 (1.429,1.804)	Serious [4]	Not serious	N/A[2]	Not serious	Moderate
					LR- 0.702 (0.630,0.782)				Not serious	Moderate

[1] Downgraded by 2 increments because the majority of the evidence was at very high risk of bias
[2] Inconsistency not applicable as evidence from a single study.
[3] Downgraded 1 increment as 95% confidence interval of likelihood ratio crosses one end of a defined MID interval (0.5, 2)
[4] Downgraded by 1 increment because the majority of the evidence was at high risk of bias
YI: Youden's index

1 *Waist circumference*

No. of studies	Study design	Sample size	Sensitivity (95%CI)	Specificity (95%CI)	Effect size (95%CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
Men at cut off 82.7 cm (YI: 0.15)										
Chen 2018	Prospective	3866	0.564 (0.529,0.599)	0.589 (0.572,0.606)	LR+ 1.374 (1.275,1.481)	Very serious [1]	Not serious	N/A[2]	Not serious	Low
					LR- 0.739 (0.679,0.805)				Not serious	Low
Men at cut off 82.95 cm (YI: 0.14)										
Yu 2020	Prospective	1557	0.581 (0.533,0.628)	0.560 (0.531,0.589)	LR+ 1.322 (1.190,1.468)	Serious [5]	Not serious	N/A[2]	Not serious	Moderate
					LR- 0.748 (0.660,0.847)				Not serious	Moderate
Women at cut off 82.17 cm (YI: 0.18)										
Chen 2018	Prospective	6039	0.551(0.521, 0.579)	0.629 (0.615,0.642)	LR+ 1.484 (1.392,1.582)	Very serious [1]	Not serious	N/A[2]	Not serious	Low
					LR- 0.715 (0.668,0.765)				Not serious	Low
Women at cut off 84.5 cm – people with normal blood pressure (YI: 0.309)										
Wang 2018	Prospective	344	0.581(0.404, 0.739)	0.272(0.225, 0.324)	LR+ 1.544(0.982,2.427)	Very serious [1]	Not serious	N/A[2]	Very serious[4]	Very low
					LR- 0.797 (0.587,1.083)				Serious[6]	Very low
Women at cut off 91.5 cm – people who are prehypertensive (YI: 0.318)										
Wang 2018	Prospective	375	0.405 (0.321,0.495)	0.193 (0.149,0.246)	LR+ 3.084 (2.305,4.128)	Very serious [1]	Not serious	N/A[2]	Not serious	Low
					LR- 0.502 (0.401,0.628)				Serious[3]	Very Low
Women at cut off 77.15 cm (YI: 0.22)										
Yu 2020	Prospective	1849	0.760 (0.717,0.798)	0.460 (0.434,0.486)	LR+ 1.408 (1.310,1.513)	Serious [5]	Not serious	N/A[2]	Not serious	Moderate
					LR- 0.521 (0.436,0.624)				Serious[3]	Low

[1] Downgraded by 2 increments because the majority of the evidence was at very high risk of bias
[2] Inconsistency not applicable as evidence from a single study.
[3] Downgraded 1 increment as 95% confidence interval of likelihood ratio crosses one end of a defined MID interval (0.5, 2)
[4] Downgrade 2 increments as 95% confidence interval of likelihood ratio crosses one end of a defined MID interval (0.5, 2) and the line of no effect
[5] Downgraded by 1 increment because the majority of the evidence was at high risk of bias
[6] Downgraded 1 increment as 95% confidence interval of likelihood ratio crosses the line of no effect
YI: Youden's index

Waist-to-hip ratio

No. of studies	Study design	Sample size	Sensitivity (95%CI)	Specificity (95%CI)	Effect size (95%CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
Women at cut off 0.859 - Normal Group 1 (YI: 0.318)										
Wang 2018	Prospective	344	0.548 (0.374,0.711)	0.230 (0.187,0.280)	LR+ 1.963 (1.267,3.041)	Very serious[1]	Not serious	N/A[2]	Serious[3]	Very low
					LR- 0.712 (0.515,0.986)				Not serious	Low
Women at cut off 0.862- Prehypertensive Group 2 (YI: 0.201)										
Wang 2018	Prospective	375	0.479 (0.392,0.568)	0.291 (0.239,0.350)	LR+ 1.787 (1.382,2.311)	Very serious[1]	Not serious	N/A[2]	Serious[3]	Very low
					LR- 0.676 (0.553,0.828)				Not serious	Low

[1] Downgraded by 2 increments because the majority of the evidence was at very high risk of bias
[2] Inconsistency not applicable as evidence from a single study.
[3] Downgraded 1 increment as 95% confidence interval of likelihood ratio crosses one end of a defined MID interval (0.5, 2)
YI: Youden's index

Waist-to-height ratio

No. of studies	Study design	Sample size	Sensitivity (95%CI)	Specificity (95%CI)	Effect size (95%CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
Men at cut off 0.49 (YI: 0.18)										
Chen 2018	Prospective	3866	0.640 (0.605,0.673)	0.542 (0.525,0.560)	LR+ 1.398 (1.310,1.493)	Very serious [1]	Not serious	N/A[2]	Not serious	Low
					LR- 0.664 (0.601,0.734)				Not serious	Low
Men at cut off 0.51 (YI: 0.16)										
Yu 2020	Prospective	1557	0.511 (0.463,0.559)	0.650 (0.622,0.677)	LR+ 1.461 (1.292,1.653)	Serious[5]	Not serious	N/A[2]	Not serious	Moderate
					LR- 0.752 (0.676,0.837)				Not serious	Moderate
Women at cut off 0.52 (YI: 0.19)										
Chen 2018	Prospective	6039	0.669 (0.641,0.696)	0.521 (0.507,0.535)	LR+ 1.399 (1.330,1.471)	Very serious [1]	Not serious	N/A[2]	Not serious	Low
					LR- 0.634 (0.581,0.692)				Not serious	Low
Women at cut off 0.516- Normal Group 1 (YI: 0.39)										
Wang 2018	Prospective	344	0.710 (0.530,0.841)	0.319 (0.270,0.373)	LR+ 1.043 (0.822,1.323)	Very serious [1]	Not serious	N/A[2]	Serious[3]	Very low
					LR- 0.909 (0.512,1.613)				Serious[3]	Very low
Women at cut off 0.55- Prehypertensive Group 2 (YI: 0.188)										
Wang 2018	Prospective	375			LR+ 1.071 (0.823,1.393)			N/A[2]	Serious[3]	Very low

No. of studies	Study design	Sample size	Sensitivity (95%CI)	Specificity (95%CI)	Effect size (95%CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
			0.587 (0.497,0.671)	0.386 (0.328,0.447)	LR- 0.955 (0.799,1.142)	Very serious [1]	Not serious		Serious[3]	Very low
Women at cut off 0.5 (YI: 0.22)										
Yu 2020	Prospective	1849	0.751 (0.707,0.790)	0.470 (0.444,0.496)	LR+ 1.416 (1.315,1.524)	Serious[5]	Not serious	N/A[2]	Not serious	Moderate
					LR- 0.531 (0.446,0.632)				Serious[4]	Low
[1] Downgraded by 2 increments because the majority of the evidence was at very high risk of bias [2] Inconsistency not applicable as evidence from a single study. [3] Downgraded 1 increment as 95% confidence interval of likelihood ratio crosses the line of no effect [4] Downgrade one level as 95% confidence interval of likelihood ratio crosses one end of a defined MID interval (0.5, 2) [5] Downgraded by 1 increment because the majority of the evidence was at high risk of bias YI: Youden's index										

Other Asian populations

Type 2 diabetes

BMI

No. of studies	Study design	Sample size	Sensitivity (95%CI)	Specificity (95%CI)	Effect size (95%CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
Men and women at cut off 24 kg/m^2 (ROC AUC: 0.685)										
Oda 2013	Prospective	2034	0.625 (0.449,0.773)	0.734 (0.714,0.753)	LR+1.605 (1.489,1.730)	Very Serious[1]	Not serious	N/A[2]	Not serious	Low
					LR- 0.468 (0.390,0.560)				Serious[3]	Very low
Men at cut off 26.1 kg/m^2 (ROC AUC: 0.66)										
Son 2016	Prospective	2078	0.506 (0.403,0.608)	0.759 (0.740,0.777)	LR+ 2.100 (1.685,2.616)	Very Serious[1]	Not serious	N/A[2]	Serious[3]	Very low
					LR- 0.651 (0.527,0.805)				Not serious	Low
Women at cut off 23 kg/m^2 (ROC AUC: 0.725)										
Son 2016	Prospective	822	0.667 (0.376,0.869)	0.698 (0.665,0.728)	LR+ 2.204 (1.458,3.333)	Very Serious[1]	Not serious	N/A[2]	Serious[3]	Very low
					LR- 0.478 (0.214,1.065)				Serious[4]	Very low

No. of studies	Study design	Sample size	Sensitivity (95%CI)	Specificity (95%CI)	Effect size (95%CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
[1] Downgraded by 2 increments because the majority of the evidence was at very high risk of bias [2] Inconsistency not applicable as evidence from a single study. [3] Downgraded 1 increment as 95% confidence interval of likelihood ratio crosses one end of a defined MID interval (0.5, 2) [4] Downgraded 1 increment as 95% confidence interval of likelihood ratio crosses the line of no effect ROC AUC: Receiver Operating Characteristic: Area Under the Curve										

Waist circumference

No. of studies	Study design	Sample size	Sensitivity (95%CI)	Specificity (95%CI)	Effect size (95%CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
Men at cut off 86.5 cm (ROC AUC: 0.668)										
Son 2016	Prospective	2078	0.674 (0.570,0.763)	0.631 (0.610,0.652)	LR+ 1.827 (1.564,2.134)	Very Serious[1]	Not serious	N/A[2]	Serious[3]	Very low
					LR- 0.516 (0.382,0.698)				Serious[3]	Very low
Women at cut off 71.8 cm (ROC AUC: 0.691)										
Son 2016	Prospective	822	0.833 (0.523,0.958)	0.510 (0.475,0.544)	LR+ 1.700 (1.308.2.211)	Very Serious[1]	Not serious	N/A[2]	Serious[3]	Very low
					LR-0.327 (0.092,1.160)				Serious[4]	Very low
[1] Downgraded by 2 increments because the majority of the evidence was at very high risk of bias [2] Inconsistency not applicable as evidence from a single study. [3] Downgraded 1 increment as 95% confidence interval of likelihood ratio crosses one end of a defined MID interval (0.5, 2) [4] Downgraded 1 increment as 95% confidence interval of likelihood ratio crosses the line of no effect ROC AUC: Receiver Operating Characteristic: Area Under the Curve										

Waist-to-height ratio

No. of studies	Study design	Sample size	Sensitivity (95%CI)	Specificity (95%CI)	Effect size (95%CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
Men at cut off 0.51 (ROC AUC: 0.697)										
Son 2016	Prospective	2078	0.506 (0.403,0.608)	0.759 (0.740,0.777)	LR+ 2.100 (1.685,2.616)	Very Serious[1]	Not serious	N/A[2]	Serious[3]	Very low
					LR- 0.651 (0.527,0.805)				Not serious	Low

No. of studies	Study design	Sample size	Sensitivity (95%CI)	Specificity (95%CI)	Effect size (95%CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
Women at cut off 0.43 (ROC AUC: 0.679)										
Son 2016	Prospective	822	0.962 (0.597,0.998)	0.380 (0.348,0.414)	LR+1.552 (1.375,1.752)	Very Serious[1]	Not serious	N/A[2]	Not serious	Low
					LR-0.101 (0.007,1.534)				Very serious[4]	Very low

[1] Downgraded by 2 increments because the majority of the evidence was at very high risk of bias.
[2] Inconsistency not applicable as evidence from a single study.
[3] Downgraded 1 increment as 95% confidence interval of likelihood ratio crosses one end of a defined MID interval (0.5, 2)
[4] Downgraded 2 increment as 95% confidence interval of likelihood ratio crosses one end of a defined MID interval (0.5, 2) and the line of no effect
ROC AUC: Receiver Operating Characteristic: Area Under the Curve

Hypertension

BMI

No. of studies	Study design	Sample size	Sensitivity (95%CI)	Specificity (95%CI)	Effect size (95%CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
Men at cut off 23.59 kg/m² (YI: 0.14)										
Lee 2015	Prospective	2128	0.661 (0.613,0.707)	0.474 (0.451,0.498)	LR+ 1.258 (1.156,1.369)	Serious[1]	Not serious	N/A[2]	Not serious	Moderate
					LR- 0.714 (0.616,0.828)				Not serious	Moderate
Women at cut off 25.63 kg/m² (YI: 0.14)										
Lee 2015	Prospective	2326	0.428 (0.379,0.479)	0.712 (0.692,0.732)	LR+ 1.486 (1.296,1.703)	Serious[1]	Not serious	N/A[2]	Not serious	Moderate
					LR- 0.804 (0.733,0.881)				Not serious	Moderate

[1] Downgraded by 1 increment because the majority of the evidence was at high risk of bias.
[2] Inconsistency not applicable as evidence from a single study.
YI: Youden's index

Waist circumference

No. of studies	Study design	Sample size	Sensitivity (95%CI)	Specificity (95%CI)	Effect size (95%CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
Men at cut off 83.88 cm (YI: 0.18)										
	Prospective	2128	0.599	0.579	LR+ 1.423 (1.289,1.571)	Serious[1]	Not serious	N/A[2]	Not serious	Moderate

No. of studies	Study design	Sample size	Sensitivity (95%CI)	Specificity (95%CI)	Effect size (95%CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
Men at cut off 83.88 cm (YI: 0.18)										
Lee 2015			(0.549,0.647)	(0.556,0.602)	LR- 0.692 (0.609,0.788)				Not serious	Moderate
Women at cut off 80.37 cm (YI: 0.26)										
Lee 2015	Prospective	2326	0.660 (0.611,0.707)	0.605 (0.583,0.626)	LR+ 1.670 (1.525,1.829)	Serious[1]	Not serious	N/A[2]	Not serious	Moderate
					LR- 0.562 (0.486,0.650)				Serious[3]	Low

[1] Downgraded by 1increment because the majority of the evidence was at high risk of bias.
[2] Inconsistency not applicable as evidence from a single study.
[3] Downgraded 1 increment as 95% confidence interval of likelihood ratio crosses one end of a defined MID interval (0.5, 2)
YI: Youden's index

Waist-to-hip ratio

No. of studies	Study design	Sample size	Sensitivity (95%CI)	Specificity (95%CI)	Effect size (95%CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
Men at cut off 0.88 (YI: 0.26)										
Lee 2015	Prospective	2128	0.697 (0.675,0.718)	0.678 (0.653,0.703)	LR+1.73 (1.561,1.929)	Serious[1]	Not serious	N/A[2]	Not serious	Moderate
					LR-0.65 (0.590,0.718)				Not serious	Moderate
Women at cut off 0.86 (YI: 0.29)										
Lee 2015	Prospective	2326	0.711 (0.663, 0.755)	0.577 (0.555¸0.599)	LR+ 1.682 (1.549,1.828)	Serious[1]	Not serious	N/A[2]	Not serious	Moderate
					LR-0.500 (0.425,0.589)				Serious[3]	Low

[1] Downgraded by 1 increment because the majority of the evidence was at high risk of bias.
[2] Inconsistency not applicable as evidence from a single study.
[3] Downgraded 1 increment as 95% confidence interval of likelihood ratio crosses one end of a defined MID interval (0.5, 2)
YI: Youden's index

Waist-to-height ratio

No. of studies	Study design	Sample size	Sensitivity (95%CI)	Specificity (95%CI)	Effect size (95%CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
Men at cut off 0.49 (YI: 0.18)										
Lee 2015	Prospective	2128	0.692 (0.644,0.736)	0.489 (0.466,0.513)	LR+1.354 (1.249,1.469)	Serious[1]	Not serious	N/A[2]	Not serious	Moderate
					LR-0.630 (0.538,0.737)				Not serious	Moderate
Women at cut off 0.51 (YI: 0.28)										
Lee 2015	Prospective	2326	0.751 (0.705,0.793)	0.532 (0.510,0.554)	LR+ 1.605 (1.489,1.730)	Serious[1]	Not serious	N/A[2]	Not serious	Moderate
					LR- 0.468 (0.390,0.560)				Serious[3]	Low

[1] Downgraded by 1 increment because the majority of the evidence was at high risk of bias.
[2] Inconsistency not applicable as evidence from a single study.
[3] Downgraded 1 increment as 95% confidence interval of likelihood ratio crosses one end of a defined MID interval (0.5, 2)
YI: Youden's index

White population

Type 2 diabetes

BMI

No. of studies	Study design	Sample size	Sensitivity (95%CI)	Specificity (95%CI)	Effect size (95%CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
Men at cut off 25 kg/m^2 (ROC AUC: 0.726)										
Wannamethee 2010	Prospective	3519	0.891 (0.830,0.932)	0.334 (0.315,0.354)	LR+1.338 (1.255,1.426)	Very Serious[1]	Not serious	N/A[2]	Not serious	Low
					LR-0.326 (0.205,0.520)				Serious[3]	Very low
Men at cut off 26 kg/m^2 (ROC AUC: 0.726)										
Wannamethee 2010	Prospective	3519	0.842 (0.771,0.893)	0.445 (0.422,0.468)	LR+1.517 (1.396,1.648)	Very Serious[1]	Not serious	N/A[2]	Not serious	Low
					LR-0.356 (0.242,0.524)				Serious[3]	Very low
Men at cut off 27 kg/m^2 (ROC AUC: 0.726)										
Wannamethee 2010	Prospective	3519	0.748 (0.664,0.817)	0.588 (0.562,0.614)	LR+1.815 (1.609,2.047)	Very Serious[1]	Not serious	N/A[2]	Serious[3]	Very low
					LR-0.429 (0.315,0.583)				Serious[3]	Very low
Men at cut off 28 kg/m^2 (ROC AUC: 0.726)										
	Prospective	3519	0.596		LR+1.983 (1.644,2.392)			N/A[2]	Serious[3]	Very low

No. of studies	Study design	Sample size	Sensitivity (95%CI)	Specificity (95%CI)	Effect size (95%CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
Wannamethee 2010			(0.497,0.688)	0.699 (0.670,0.727)	LR-0.578 (0.453,0.736)	Very Serious[1]	Not serious		Serious[3]	Very low
Men at cut off 29 kg/m^2 (ROC AUC: 0.726)										
Wannamethee 2010	Prospective	3519	0.539 (0.436,0.640)	0.787 (0.756, 0.816)	LR+2.536 (1.998,3.219)	Very Serious[1]	Not serious	N/A[2]	Serious[3]	Very low
					LR-0.585 (0.466,0.735)				Serious[3]	Very low
Men at cut off 30 kg/m^2 (ROC AUC: 0.726)										
Wannamethee 2010	Prospective	3519	0.437 (0.327,0.553)	0.866 (0.831,0.895)	LR+3.260 (2.288,4.644)	Very Serious[1]	Not serious	N/A[2]	Not serious	Low
					LR-0.651 (0.528,0.801)				Not serious	Low
Women at cut off 25 kg/m^2 (ROC AUC: 0.733)										
Wannamethee 2010	Prospective	3404	0.895 (0.824,0.939)	0.342 (0.322,0.362)	LR+1.359 (1.268,1.458)	Very Serious[1]	Not serious	N/A[2]	Not serious	Low
					LR-0.308 (0.180,0.528)				Serious[3]	Very low
Women at cut off 26 kg/m^2 (ROC AUC: 0.733)										
Wannamethee 2010	Prospective	3404	0.832 (0.749,0.891)	0.448 (0.425,0.471)	LR+1.506 (1.370,1.656)	Very Serious[1]	Not serious	N/A[2]	Not serious	Low
					LR- 0.376 (0.246,0.574)				Serious[3]	Very low
Women at cut off 27 kg/m^2 (ROC AUC: 0.733)										
Wannamethee 2010	Prospective	3404	0.778 (0.685,0.849)	0.547 (0.522,0.572)	LR+1.718 (1.525,1.935)	Very Serious[1]	Not serious	N/A[2]	Not serious	Low
					LR-0.406 (0.280,0.589)				Serious [3]	Very low
Women at cut off 28 kg/m^2 (ROC AUC: 0.733)										
Wannamethee 2010	Prospective	3404	0.717 (0.617,0.800)	0.634 (0.607,0.661)	LR+1.962 (1.692,2.276)	Very Serious[1]	Not serious	N/A[2]	Serious[3]	Very low
					LR-0.445 (0.321,0.619)				Serious[3]	Very low
Women at cut off 29 kg/m^2 (ROC AUC: 0.733)										
Wannamethee 2010	Prospective	3404	0.655 (0.547,0.748)	0.713 (0.683,0.741)	LR+2.280 (1.894,2.743)	Very Serious[1]	Not serious	N/A[2]	Serious[3]	Very low
					LR-0.484 (0.360,0.652)				Serious [3]	Very low
Women at cut off 30 kg/m^2 (ROC AUC: 0.733)										
Wannamethee 2010	Prospective	3404	0.615(0.503,0 .716)	0.777 (0.745,0.805)	LR+2.754 (2.207,3.436)	Very Serious [1]	Not serious	N/A[2]	Not serious	Low
					LR-0.495 (0.373,0.658)				Serious[3]	Very low

[1] Downgraded by 2 increments because the majority of the evidence was at very high risk of bias
[2] Inconsistency not applicable as evidence from a single study.
[3] Downgraded 1 increment as 95% confidence interval of likelihood ratio crosses one end of a defined MID interval (0.5, 2)
ROC AUC: Receiver Operating Characteristic: Area Under the Curve

1 *Waist circumference*

No. of studies	Study design	Sample size	Sensitivity (95%CI)	Specificity (95%CI)	Effect size (95%CI)	Risk of bias	Indirect ness	Inconsist ency	Imprecision	Quality
Men at cut off 100 cm (ROC AUC: 0.78)										
Wannamethee 2010	Prospective	3519	0.642 (0.546,0.727)	0.673 (0.645,0.700)	LR+1.964 (1.664,2.318)	Very Serious[1]	Not serious	N/A[2]	Serious[3]	Very low
					LR-0.532 (0.411,0.689)				Serious[3]	Very low
Women at cut off 92 cm (ROC AUC: 0.713)										
Wannamethee 2010	Prospective	3519	0.697 (0.594,0.783)	0.755 (0.724,0.784)	LR+ 2.847 (2.370,3.420)	Very Serious[1]	Not serious	N/A[2]	Not serious	Low
					LR- 0.402 (0.292,0.552)				Serious[3]	Very low

[1] Downgraded by 2 increments because the majority of the evidence was at very high risk of bias
[2] Inconsistency not applicable as evidence from a single study.
[3] Downgraded 1 increment as 95% confidence interval of likelihood ratio crosses one end of a defined MID interval (0.5, 2)
ROC AUC: Receiver Operating Characteristic: Area Under the Curve

2 ***Hypertension***

3 *Waist circumference*

No. of studies	Study design	Sample size	Sensitivity (95%CI)	Specificity (95%CI)	Effect size (95%CI)	Risk of bias	Indirect ness	Inconsiste ncy	Imprecision	Quality
Men at cut off 87 cm (ROC AUC: 0.56)										
Gus 2009	Prospective	255	0.542 (0.415,0.664)	0.561 (0.491,0.629)	LR+ 1.236 (0.932,1.640)	Very serious[1]	Not serious	N/A[2]	Serious[3]	Very low
					LR- 0.815 (0.602,1.105)				Serious[3]	Very low
Women at cut off 80 cm (ROC AUC: 0.7)										
Gus 2009	Prospective	334	0.691 (0.572,0.789)	0.670 (0.613,0.723)	LR+ 2.096 (1.663,2.642)	Very serious[1]	Not serious	N/A[2]	Serious[4]	Very low
					LR- 0.461 (0.320,0.664)				Serious[4]	Very low

[1] Downgraded by 2 increments because the majority of the evidence was at very high risk of bias.
[2] Inconsistency not applicable as evidence from a single study.
[3] Downgraded 1 increment as 95% confidence interval of likelihood ratio crosses the line of no effect
[4] Downgrade 1 level as 95% confidence interval of likelihood ratio crosses one end of a defined MID interval (0.5, 2)
ROC AUC: Receiver Operating Characteristic: Area Under the Curve

All- cause mortality

BMI

No. of studies	Study design	Sample size	Sensitivity (95%CI)	Specificity (95%CI)	Effect size (95%CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
Men and women at cut off - 25th cut-off percentile (ROC AUC: 0.512)										
Schneider 2010	Prospective	10652	0.521 (0.482,0.560)	0.551 (0.541,0.561)	LR+ 1.160 (1.073,1.255)	Very serious[1]	Not serious	N/A[2]	Not serious	Low
					LR- 0.869 (0.799,0.945)				Not serious	Low
Men at cut off 27.4 kg/m^2 (YI: 0.19)										
Welborn 2007	Prospective	4508	0.439 (0.383,0.497)	0.630 (0.615,0.644)	LR+1.188 (1.037,1.361)	Very serious[1]	Not serious	N/A[2]	Not serious	Low
					LR-0.890 (0.801,0.988)				Not serious	Low
Women at cut off 27.4 kg/m^2 (YI: 0.19)										
Welborn 2007	Prospective	4698	0.619 (0.545,0.688)	0.580 (0.565,0.594)	LR+1.474 (1.307,1.664)	Very serious[1]	Not serious	N/A[2]	Not serious	Low
					LR-0.656 (0.543,0.794)				Not serious	Low

[1] Downgraded by 2 increments because the majority of the evidence was at very high risk of bias
[2] Inconsistency not applicable as evidence from a single study
ROC AUC: Receiver Operating Characteristic: Area Under the Curve
YI: Youden's index

Waist circumference

No. of studies	Study design	Sample size	Sensitivity (95%CI)	Specificity (95%CI)	Effect size (95%CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
Men and women - 53rd cut-off percentile (ROC AUC: 0.508)										
Schneider 2010	Prospective	10652	0.498 (0.459,0.538)	0.531 (0.521,0.541)	LR+ 1.063 (0.979,1.153)	Very serious[1]	Not serious	N/A[2]	Serious[3]	Very low
					LR- 0.945 (0.872,1.024)				Serious[3]	Very low
Men at cut off 92 cm (YI: 0.2)										
Welborn 2007	Prospective	4508	0.592 (0.534,0.647)	0.610 (0.595,0.625)	LR+1.518 (1.369,1.682)	Very serious[1]	Not serious	N/A[2]	Not serious	Low
					LR-0.669 (0.581,0.770)				Not serious	Low
Women at cut off 80 cm (YI: 0.28)										
Welborn2007	Prospective	4698	0.589 (0.514,0.659)	0.690 (0.676,0.703)	LR+1.899 (1.665,2.165)	Very serious[1]	Not serious	N/A[2]	Serious[4]	Very low
					LR-0.596 (0.499,0.713)				Serious[4]	Very low

[1] Downgraded by 2 increments because the majority of the evidence was at very high risk of bias
[2] Inconsistency not applicable as evidence from a single study.

No. of studies	Study design	Sample size	Sensitivity (95%CI)	Specificity (95%CI)	Effect size (95%CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
[3] Downgraded 1 increment as 95% confidence interval of likelihood ratio crosses the line of no effect [4] Downgraded 1 increment as 95% confidence interval of likelihood ratio crosses one end of a defined MID interval (0.5, 2) ROC AUC: Receiver Operating Characteristic: Area Under the Curve YI: Youden's index										

1 *Waist-to-hip ratio*

No. of studies	Study design	Sample size	Sensitivity (95%CI)	Specificity (95%CI)	Effect size (95%CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
Men and Women= 28th cut-off percentile (ROC AUC: 0.512)										
Schneider 2010	Prospective	10652	0.768 (0.733,0.799)	0.276 (0.267,0.285)	LR+ 1.060 (1.014,1.109)	Very serious[1]	Not serious	N/A[2]	Not serious	Low
					LR- 0.841 (0.727,0.974)				Not serious	Low
Men at cut off 0.93 (YI: 0.23)										
Welborn 2007	Prospective	4508	0.519 (0.461,0.576)	0.710 (0.696,0.723)	LR+ 1.789 (1.586,2.018)	Very serious[1]	Not serious	N/A[2]	Serious[3]	Very low
					LR -0.678 (0.600,0.765)				Not serious	Low
Women at cut off 0.79 (YI: 0.26)										
Welborn 2007	Prospective	4698	0.549 (0.474,0.621)	0.710 (0.697,0.723)	LR+1.891 (1.641,2.180)	Very serious[1]	Not serious	N/A[2]	Serious[3]	Very low
					LR- 0.636 (0.539,0.749)				Not serious	Low
[1] Downgraded by 2 increments because the majority of the evidence was at very high risk of bias [2] Inconsistency not applicable as evidence from a single study. [3] Downgraded 1 increment as 95% confidence interval of likelihood ratio crosses one end of a defined MID interval (0.5, 2) ROC AUC: Receiver Operating Characteristic: Area Under the Curve YI: Youden's index										

2 *Waist-to-height ratio*

No. of studies	Study design	Sample size	Sensitivity (95%CI)	Specificity (95%CI)	Effect size (95%CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
Men and women – 74th cut-off percentile (ROC AUC: 0.531)										
Schneider 2010	Prospective	10652	0.335 (0.299,0.374)	0.738 (0.729,0.747)	LR+ 1.281 (1.141,1.438)	Very serious[1]	Not serious	N/A[2]	Not serious	Low
					LR- 0.900 (0.850,0.953)				Not serious	Low
Men at cut off 0.53 (YI: 0.24)										

No. of studies	Study design	Sample size	Sensitivity (95%CI)	Specificity (95%CI)	Effect size (95%CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
Welborn 2007	Prospective	4508	0.630 (0.573,0.684)	0.610 (0.595,0.625)	LR+1.615 (1.467,1.778)	Very serious[1]	Not serious	N/A[2]	Not serious	Low
					LR- 0.607 (0.521,0.707)				Not serious	Low
Women at cut off 0.48 (YI: 0.31)										
Welborn 2007	Prospective	4698	0.680 (0.607,0.745)	0.630 (0.616,0.644)	LR+1.837 (1.648,2.048)	Very serious[1]	Not serious	N/A[2]	Serious[3]	Very low
					LR- 0.508 (0.409,0.631)				Serious[3]	Very low

[1] Downgraded by 2 increments because the majority of the evidence was at very high risk of bias
[2] Inconsistency not applicable as evidence from a single study.
[3] Downgraded 1 increment as 95% confidence interval of likelihood ratio crosses one end of a defined MID interval (0.5, 2)
ROC AUC: Receiver Operating Characteristic: Area Under the Curve
YI: Youden's index

1 **Other ethnicities – Iranian population**

2 ***Type 2 diabetes***

3 *BMI*

No. of studies	Study design	Sample size	Sensitivity (95%CI)	Specificity (95%CI)	Effect size (95%CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
Men at cut off 26.49 kg/m^2 (ROC AUC: 0.68)										
Zafari 2018	Prospective	2419	0.679 (0.618,0.735)	0.614 (0.593,0.634)	LR+ 1.759 (1.589,1.947)	Very serious[1]	Not serious	N/A[2]	Not serious	Low
					LR- 0.523 (0.434,0.630)				Serious[3]	Very low
Women at cut off 29.27 kg/m^2 (ROC AUC: 0.72)										
Zafari 2018	Prospective	3319	0.603 (0.547,0.657)	0.724 (0.708,0.740)	LR+ 2.187 (1.962,2.437)	Very serious[1]	Not serious	N/A[2]	Serious[3]	Very low
					LR- 0.548 (0.476,0.631)				Serious[3]	Very low

[1] Downgraded by 2 increments because the majority of the evidence was at very high risk of bias
[2] Inconsistency not applicable as evidence from a single study
2 Downgraded 1 increment as 95% confidence interval of likelihood ratio crosses one end of a defined MID interval (0.5, 2)
ROC AUC: Receiver Operating Characteristic: Area Under the Curve

Waist circumference

No. of studies	Study design	Sample size	Sensitivity (95%CI)	Specificity (95%CI)	Effect size (95%CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
Men at cut off 87 cm (ROC AUC: 0.68)										
Zafari 2018	Prospective	1415	0.812 (0.763, 0.852)	0.455 (0.434, 0.476)	LR+ 1.490 (1.392,1.594)	Very serious[1]	Not serious	N/A[2]	Not serious	Low
					LR- 0.414 (0.325, 0.528)				Serious[3]	Very low
Women at cut off 91 cm (ROC AUC: 0.74)										
Zafari 2018	Prospective	1166	0.665 (0.612, 0.713)	0.704 (0.688, 0.720)	LR+ 2.247 (2.044, 2.469)	Very serious[1]	Not serious	N/A[2]	Not serious	Low
					LR- 0.476 (0.409, 0.555)				Serious[3]	Very low

[1] Downgraded by 2 increments because the majority of the evidence was at very high risk of bias
[2] Inconsistency not applicable as evidence from a single study
[3] Downgraded 1 increment as 95% confidence interval of likelihood ratio crosses one end of a defined MID interval (0.5, 2)
ROC AUC: Receiver Operating Characteristic: Area Under the Curve

Waist-to-hip ratio

No. of studies	Study design	Sample size	Sensitivity (95%CI)	Specificity (95%CI)	Effect size (95%CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
Men at cut off 0.92 (ROC AUC: 0.69)										
Zafari 2018	Prospective	1415	0.720 (0.660,0.772)	0.555 (0.534,0.576)	LR+ 1.617 (1.476,1.771)	Very serious[1]	Not serious	N/A[2]	Not serious	Low
					LR- 0.505 (0.412,0.620)				Serious[3]	Very low
Women at cut off 0.83 (ROC AUC: 0.71)										
Zafari 2018	Prospective	1166	0.729 (0.68, 0.773)	0.591 (0.573,0.609)	LR+ 1.783 (1.651,1.924)	Very serious[1]	Not serious	N/A[2]	Not serious	Low
					LR- 0.458 (0.386,0.545)				Serious[3]	Very low

[1] Downgraded by 2 increments because the majority of the evidence was at very high risk of bias
[2] Inconsistency not applicable as evidence from a single study
[3] Downgraded 1 increment as 95% confidence interval of likelihood ratio crosses one end of a defined MID interval (0.5, 2)
ROC AUC: Receiver Operating Characteristic: Area Under the Curve

1 *Waist-to-height ratio*

No. of studies	Study design	Sample size	Sensitivity (95%CI)	Specificity (95%CI)	Effect size (95%CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
Men at cut off 0.56 (ROC AUC: 0.75)										
Zafari 2018	Prospective	1415	0.625 (0.560, 0.686)	0.650 (0.630, 0.670)	LR+ 1.786 (1.590, 2.007)	Very serious[1]	Not serious	N/A[2]	Serious[3]	Very low
					LR- 0.577 (0.486, 0.685)				Serious[3]	Very low
Women at cut off 0.56 (ROC AUC: 0.75)										
Zafari 2018	Prospective	1166	0.735(0.687, 0.778)	0.648 (0.631, 0.665)	LR+ 2.089 (1.931,2.260)	Very serious[1]	Not serious	N/A[2]	Serious [3]	Very low
					LR- 0.409 (0.344,0.486)				Not serious	Low

[1] Downgraded by 2 increments because the majority of the evidence was at very high risk of bias
[2] Inconsistency not applicable as evidence from a single study
[3] Downgraded 1 increment as 95% confidence interval of likelihood ratio crosses one end of a defined MID interval (0.5, 2)
ROC AUC: Receiver Operating Characteristic: Area Under the Curve

2 Other ethnicities – Peruvian population

3 *Type 2 diabetes*

4 *BMI*

No. of studies	Study design	Sample size	Sensitivity (95%CI)	Specificity (95%CI)	Effect size (95%CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
Men at cut off 27.8 kg/m^2 (ROC AUC: 0.67)										
Zafra-Tanaka 2020	Prospective	1230	0.762 (0.642,0.851)	0.590 (0.562,0.617)	LR+ 1.858 (1.594,2.166)	Serious[1]	Not serious	N/A[2]	Serious[3]	Low
					LR- 0.404 (0.259,0.629)				Serious[3]	Low
Women at cut off 28.9 kg/m^2 (ROC AUC: 0.69)										
Zafra-Tanaka 2020	Prospective	1292	0.638 (0.508,0.751)	0.640 (0.612,0.667)	LR+ 1.772 (1.438,2.182)	Serious[1]	Not serious	N/A[2]	Serious[3]	Low
					LR- 0.566 (0.401,0.798)				Serious[3]	Low

[1] Downgraded by 1 increment because the majority of the evidence was at high risk of bias
[2] Inconsistency not applicable as evidence from a single study.
[3] Downgraded 1 increment as 95% confidence interval of likelihood ratio crosses one end of a defined MID interval (0.5, 2)
ROC AUC: Receiver Operating Characteristic: Area Under the Curve

1 *Waist circumference*

No. of studies	Study design	Sample size	Sensitivity (95%CI)	Specificity (95%CI)	Effect size (95%CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
Men at cut off 93.2 cm (ROC AUC: 0.66)										
Zafra-Tanaka 2020	Prospective	1230	0.714 (0.591,0.812)	0.610 (0.583,0.637)	LR+ 1.833 (1.544,2.175)	Serious[1]	Not serious	N/A[2]	Serious[3]	Low
					LR- 0.468 (0.316,0.694)				Serious[3]	Low
Women at cut off 93.5 cm (ROC AUC: 0.71)										
Zafra-Tanaka 2020	Prospective	1292	0.746 (0.620,0.841)	0.540 (0.511,0.568)	LR+ 1.622 (1.380,1.906)	Serious[1]	Not serious	N/A[2]	Not serious	Moderate
					LR- 0.471 (0.303,0.731)				Serious[3]	Low

[1] Downgraded by 1 increment because the majority of the evidence was at high risk of bias
[2] Inconsistency not applicable as evidence from a single study.
[3] Downgraded 1 increment as 95% confidence interval of likelihood ratio crosses one end of a defined MID interval (0.5, 2)
ROC AUC: Receiver Operating Characteristic: Area Under the Curve

2 *Waist-to-height ratio*

No. of studies	Study design	Sample size	Sensitivity (95%CI)	Specificity (95%CI)	Effect size (95%CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
Men at cut off 0.61 (ROC AUC: 0.71)										
Zafra-Tanaka 2020	Prospective	1230	0.825 (0.712,0.901)	0.645 (0.616,0.674)	LR+ 2.327 (2.022,2.677)	Serious[1]	Not serious	N/A[2]	Not serious	Moderate
					LR- 0.271 (0.158,0.464)				Not serious	Moderate
Women at cut off 0.57 (ROC AUC: 0.65)										
Zafra-Tanaka 2020	Prospective	1292	0.776 (0.651,0.865)	0.550 (0.522,0.579)	LR+ 1.725 (1.482,2.009)	Serious[1]	Not serious	N/A[2]	Serious[3]	Low
					LR- 0.407 (0.252,0.659)				Serious[3]	Low

[1] Downgraded by 1 increment because the majority of the evidence was at high risk of bias
[2] Inconsistency not applicable as evidence from a single study.
[3] Downgraded 1 increment as 95% confidence interval of likelihood ratio crosses one end of a defined MID interval (0.5, 2)
ROC AUC: Receiver Operating Characteristic: Area Under the Curve

Waist-to-hip ratio

No. of studies	Study design	Sample size	Sensitivity (95%CI)	Specificity (95%CI)	Effect size (95%CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
Men at cut off 0.97 (ROC AUC: 0.62)										
Zafra-Tanaka 2020	Prospective	1230	0.476 (0.357,0.598)	0.700 (0.674,0.725)	LR+ 1.586 (1.207,2.083)	Serious[1]	Not serious	N/A[2]	Serious[3]	Low
					LR- 0.749 (0.590,0.950)				Not serious	Moderate
Women at cut off 0.94 (ROC AUC: 0.59)										
Zafra-Tanaka 2020	Prospective	1292	0.741 (0.614,0.838)	0.470 (0.442,0.499)	LR+ 1.399 (1.191,1.644)	Serious[1]	Not serious	N/A[2]	Not serious	Moderate
					LR- 0.550 (0.354,0.854)				Serious[3]	Low
[1] Downgraded by 1 increment because the majority of the evidence was at high risk of bias [2] Inconsistency not applicable as evidence from a single study. [3] Downgraded 1 increment as 95% confidence interval of likelihood ratio crosses one end of a defined MID interval (0.5, 2) ROC AUC: Receiver Operating Characteristic: Area Under the Curve										

Other ethnicities – Brazilian population

Hypertension

BMI

No. of studies	Study design	Sample size	Sensitivity (95%CI)	Specificity (95%CI)	Effect size (95%CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
Men at cut off 24.80 kg/m^2 (ROC AUC: 0.57)										
Rezende 2018	Prospective	152	0.514 (0.401,0.625)	0.500 (0.391,0.609)	LR+ 1.027 (0.750,1.406)	Very serious[1]	Not serious	N/A[2]	Serious[3]	Very low
					LR- 0.973 (0.705,1.343)				Serious[3]	Very low
Women at cut off 23.82 kg/m^2 (ROC AUC: 0.61)										
Rezende 2018	Prospective	319	0.639 (0.554,0.716)	0.629 (0.557,0.695)	LR+ 1.723 (1.374,2.161)	Very serious[1]	Not serious	N/A[2]	Serious[4]	Very low
					LR- 0.574 (0.446,0.738)				Serious[4]	Very low
[1] Downgraded by 2 increments because the majority of the evidence was at very high risk of bias [2] Inconsistency not applicable as evidence from a single study.										

No. of studies	Study design	Sample size	Sensitivity (95%CI)	Specificity (95%CI)	Effect size (95%CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
[3] Downgraded 1 increment as 95% confidence interval of likelihood ratio crosses the line of no effect										
[4] Downgraded 1 increment as 95% confidence interval of likelihood ratio crosses one end of a defined MID interval (0.5, 2)										
ROC AUC: Receiver Operating Characteristic: Area Under the Curve										

1 *Waist circumference*

No. of studies	Study design	Sample size	Sensitivity (95%CI)	Specificity (95%CI)	Effect size (95%CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
Men at cut off 81.50 cm (ROC AUC: 0.62)										
Rezende 2018	Prospective	152	0.635 (0.520,0.736)	0.564 (0.453,0.669)	LR+ 1.457 (1.073,1.978)	Very serious[1]	Not serious	N/A[2]	Not serious	Low
					LR- 0.647 (0.452,0.926)				Serious[3]	Very low
Women at cut off 85.30 cm (ROC AUC: 0.63)										
Rezende 2018	Prospective	319	0.632 (0.547,0.709)	0.667 (0.596,0.731)	LR+ 1.895 (1.489,2.411)	Very serious[1]	Not serious	N/A[2]	Serious[3]	Very low
					LR- 0.553 (0.433,0.706)				Serious[3]	Very low
[1] Downgraded by 2 increments because the majority of the evidence was at very high risk of bias										
[2] Inconsistency not applicable as evidence from a single study.										
[3] Downgraded 1 increment as 95% confidence interval of likelihood ratio crosses one end of a defined MID interval (0.5, 2)										
ROC AUC: Receiver Operating Characteristic: Area Under the Curve										

2 *Waist-to-height ratio*

No. of studies	Study design	Sample size	Sensitivity (95%CI)	Specificity (95%CI)	Effect size (95%CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
Men at cut off 0.61 (ROC AUC: 0.59)										
Rezende 2018	Prospective	152	0.595 (0.480,0.700)	0.564 (0.453,0.669)	LR+ 1.364 (0.996,1.869)	Very serious[1]	Not serious	N/A[2]	Serious[3]	Very low
					LR- 0.719 (0.513,1.008)				Serious[3]	Very low
Women at cut off 0.57 (ROC AUC: 0.62)										
Rezende 2018	Prospective	319	0.662 (0.577,0.737)	0.645 (0.574,0.711)	LR+ 1.865 (1.483,2.344)	Very serious[1]	Not serious	N/A[2]	Serious[4]	Very low
					LR- 0.524 (0.404,0.680)				Serious[4]	Very low
[1] Downgraded by 2 increments because the majority of the evidence was at very high risk of bias										
[2] Inconsistency not applicable as evidence from a single study.										
[3] Downgraded 1 increment as 95% confidence interval of likelihood ratio crosses the line of no effect										
[4] Downgraded 1 increment as 95% confidence interval of likelihood ratio crosses one end of a defined MID interval (0.5, 2)										

No. of studies	Study design	Sample size	Sensitivity (95%CI)	Specificity (95%CI)	Effect size (95%CI)	Risk of bias	Indirect ness	Inconsi stency	Imprecision	Quality
ROC AUC: Receiver Operating Characteristic: Area Under the Curve										

Diagnostic accuracy

South Asian population

Type 2 diabetes

BMI

No. of studies	Study design	Sample size	Sensitivity (95%CI)	Specificity (95%CI)	Effect size (95%CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
Men at cut-off 25.4 kg/m^2 (YI 0.23)										
Alperet 2016	Cross-sectional	6944	0.615 (0.571,0.657)	0.616 (0.604,0.628)	LR+ 1.602 (1.484,1.728)	Very serious[1]	Not serious	N/A[2]	Not serious	Low
					LR- 0.548 (0.476,0.631)				Serious[3]	Very low
Men at cut off [4] 22.07 kg/m^2										
Awasthi 2017	Case control	51	0.760 (0.558,0.888)	0.660 (0.463,0.814)	LR+ 2.235 (1.253,3.989)	Very serious[1]	Not serious	N/A[2]	Serious[3]	Very low
					LR- 0.364 (0.172,0.770)				Serious[3]	Very low
Men at cut off 21.2 kg/m^2 (ROC AUC: 0.62)										
Bhowmik 2013	Cross-sectional	842	0.825 (0.724,0.895)	0.412 (0.378,0.447)	LR+ 1.403 (1.246,1.580)	Serious[5]	Not serious	N/A[2]	Not serious	Moderate
					LR- 0.425 (0.260,0.695)				Serious[3]	Low
Women at cut-off 26.3 kg/m^2 (YI: 0.205)										
Alperet 2016	Cross-sectional	7871	0.606 (0.563,0.647)	0.600 (0.589,0.611)	LR+ 1.515 (1.406,1.632)	Very serious[1]	Not serious	N/A[2]	Not serious	Low
					LR- 0.657 (0.590,0.731)				Not serious	Low
Women at cut-off [4] 22.28 kg/m^2										
Awasthi 2017	Case control	51	0.800 (0.605,0.913)	0.680 (0.478,0.831)	LR+ 2.500 (1.368,4.568)	Very serious[1]	Not serious	N/A[2]	Serious[3]	Very low
					LR- 0.294 (0.130,0.664)				Serious[3]	Very low
Women at cut-off 21.8 kg/m^2 (ROC AUC: 0.65)										
Bhowmik 2013	Cross-sectional	1451	0.772 (0.682,0.843)	0.465 (0.438,0.492)	LR+ 1.443 (1.285,1.620)	Serious[5]	Not serious	N/A[2]	Not serious	Moderate
					LR- 0.490 (0.343,0.702)				Serious[3]	Low

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[2] Inconsistency not applicable as evidence from a single study
[3] Downgraded 1 increment as 95% confidence interval of likelihood ratio crosses one end of a defined MID interval (0.5, 2)
[4] Unclear how optimised cut-off was calculated
[5] Downgraded by 1 increment because the majority of the evidence was at high risk of bias
YI – Youden's index
ROC AUC: Receiver Operating Characteristic: Area Under the Curve

1 *Waist circumference*

No. of studies	Study design	Sample size	Sensitivity (95%CI)	Specificity (95%CI)	Effect size (95%CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
Men at cut-off 91.3 cm (YI: 0.308)										
Alperet 2016	Cross-sectional	6944	0.646 (0.603,0.687)	0.661 (0.649,0.672)	LR+ 1.906 (1.770,2.051)	Very serious[1]	Not serious	N/A[2]	Serious[3]	Very low
					LR- 0.536 (0.475,0.604)				Serious[3]	Very low
Men at cut off [4] 91.25 cm										
Awasthi 2017	Case control	51	0.760 (0.558,0.888)	0.740 (0.542,0.872)	LR+ 2.923 (1.474,5.798)	Very serious[1]	Not serious	N/A[2]	Serious[3]	Very low
					LR- 0.324 (0.156,0.676)				Serious[3]	Very low
Men at cut off 82 cm (ROC AUC: 0.67)										
Bhowmik 2013	Cross-sectional	842	0.825 (0.724,0.895)	0.412 (0.378,0.447)	LR+ 1.646 (1.422,1.905)	Serious[5]	Not serious	N/A[2]	Not serious	Moderate
					LR- 0.443 (0.296,0.665)				Serious[3]	Low
Women at cut-off 85.2 cm (YI: 0.294)										
Alperet 2016	Cross-sectional	7871	0.642 (0.600,0.682)	0.651 (0.640,0.662)	LR+ 1.840 (1.713,1.975)	Very serious[1]	Not serious	N/A[2]	Not serious	Low
					LR- 0.550 (0.490,0.617)				Serious[3]	Very low
Women at cut off [4] 83.5 cm										
Awasthi 2017	Case control	51	0.730 (0.532,0.865)	0.600 (0.403,0.770)	LR+ 1.825 (1.070,3.113)	Very serious[1]	Not serious	N/A[2]	Serious[3]	Very low
					LR- 0.450 (0.222,0.914)				Serious[3]	Very low
Women at cut off 82 cm (ROC AUC: 0.7)										
Bhowmik 2013	Cross-sectional	1451	0.673 (0.577,0.756)	0.625 (0.599,0.650)	LR+ 1.795 (1.544,2.086)	Serious[5]	Not serious	N/A[2]	Serious[3]	Very low
					LR- 0.523 (0.396,0.691)				Serious[3]	Very low

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[3] Downgraded 1 increment as 95% confidence interval of likelihood ratio crosses one end of a defined MID interval (0.5, 2)
[4] Unclear how optimised cut-off was calculated
[5] Downgraded by 1 increment because the majority of the evidence was at high risk of bias
YI – Youden's index
ROC AUC: Receiver Operating Characteristic: Area Under the Curve

2

Waist- to -hip

No. of studies	Study design	Sample size	Sensitivity (95%CI)	Specificity (95%CI)	Effect size (95%CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
Men at cut-off 0.93 (YI: 0.367)										
Alperet 2016	Cross-sectional	6944	0.654 (0.611,0.695)	0.713 (0.702,0.724)	LR+ 2.279 (2.115,2.456)	Very serious[1]	Not serious	N/A[2]	Not serious	Low
					LR- 0.485 (0.429,0.548)				Serious[3]	Very low
Men at cut-off [4] 0.95										
Awasthi 2017	Case control	51	0.720 (0.518,0.860)	0.540 (0.352,0.717)	LR+ 1.565 (0.966,2.537)	Very serious[1]	Not serious	N/A[2]	Very serious[6]	Very low
					LR- 0.519 (0.252,1.067)				Serious[7]	Very low
Men at cut-off 0.93 (ROC AUC: 0.69)										
Bhowmik 2013	Cross-sectional	842	0.688 (0.577,0.781)	0.609 (0.574,0.643)	LR+ 1.760 (1.478,2.095)	Serious[5]	Not serious	N/A[2]	Serious[3]	Low
					LR- 0.512 (0.366,0.717)				Serious[3]	Low
Women at cut-off 0.84 (YI: 0.296)										
Alperet 2016	Cross-sectional	7871	0.642 (0.600,0.682)	0.654 (0.643,0.665)	LR+ 1.855 (1.728,1.993)	Very serious[1]	Not serious	N/A[2]	Not serious	Low
					LR- 0.547 (0.488,0.615)				Serious[3]	Very low
Women at cut off 0.94[4]										
Awasthi 2017	Case control	51	0.460 (0.283,0.648)	0.480 (0.296,0.669)	LR+ 1.125 (0.655,1.932)	Very serious[1]	Not serious	N/A[2]	Serious[7]	Very low
					LR- 0.885 (0.505,1.551)				Serious[7]	Very low
Women at cut off 0.87 (ROC AUC: 0.73)										
Bhowmik 2013	Cross-sectional	1451	0.842 (0.759,0.900)	0.545 (0.518,0.571)	LR+ 1.851 (1.672,2.049)	Serious[5]	Not serious	N/A[2]	Serious[3]	Low
					LR- 0.290 (0.186,0.453)				Not serious	Moderate

[1] Downgraded by 2 increments because the majority of the evidence was at very high risk of bias
[2] Inconsistency not applicable as evidence from a single study
[3] Downgraded 1 increment as 95% confidence interval of likelihood ratio crosses one end of a defined MID interval (0.5, 2)
[4] Unclear how optimised cut-off was calculated
[5] Downgraded by 1 increment because the majority of the evidence was at high risk of bias
[6] Downgraded 2 increments as 95% confidence interval of likelihood ratio crosses one ends of a defined MID interval (0.5, 2) and the line of no effect
[7] Downgraded 1 increment as 95% confidence interval of likelihood ratio crosses the line of no effect
YI – Youden's index
ROC AUC: Receiver Operating Characteristic: Area Under the Curve

Waist-to-height

No. of studies	Study design	Sample size	Sensitivity (95%CI)	Specificity (95%CI)	Effect size (95%CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
Men at cut-off 0.54 (YI: 0.325)										
Alperet 2016	Cross-sectional	6944	0.685 (0.643,0.724)	0.640 (0.628,0.652)	LR+ 1.903 (1.778,2.037)	Very serious[1]	Not serious	N/A[2]	Serious[3]	Very low
					LR- 0.492 (0.432,0.561)				Serious[3]	Very low
Men at cut off 0.54[4]										
Awasthi 2017	Case control	51	0.760 (0.558,0.888)	0.620 (0.425,0.783)	LR+ 2.000 (1.168,3.426)	Very serious[1]	Not serious	N/A[2]	Serious[3]	Very low
					LR- 0.387 (0.181,0.827)				Serious[3]	Very low
Men at cut off 0.53 (ROC AUC: 0.67)										
Bhowmik 2013	Cross-sectional	842	0.638 (0.525,0.737)	0.664 (0.630,0.697)	LR+ 1.899 (1.562,2.309)	Serious[5]	Not serious	N/A[2]	Serious[3]	Low
					LR- 0.545 (0.404,0.736)				Serious[3]	Low
Women at cut-off 0.5 (YI: 0.475)										
Alperet 2016	Cross-sectional	7871	0.751 (0.712,0.786)	0.724 (0.714,0.734)	LR+ 2.721 (2.558,2.894)	Very serious[1]	Not serious	N/A[2]	Not serious	Low
					LR- 0.344 (0.296,0.399)				Not serious	Low
Women at cut off 0.54[4]										
Awasthi 2017	Case control	51	0.730 (0.532,0.865)	0.560 (0.366,0.737)	LR+ 1.659 (1.006,2.736)	Very serious[1]	Not serious	N/A[2]	Serious[3]	Very low
					LR- 0.482 (0.234,0.992)				Serious[3]	Very low
Women at cut off 0.54 (ROC AUC: 0.65)										
Bhowmik 2013	Cross-sectional	1451	0.723 (0.629,0.800)	0.559 (0.532,0.585)	LR+ 1.639 (1.435,1.873)	Serious[5]	Not serious	N/A[2]	Not serious	Moderate
					LR- 0.496 (0.362,0.678)				Serious[3]	Low

[1] Downgraded by 2 increments because the majority of the evidence was at very high risk of bias
[2] Inconsistency not applicable as evidence from a single study
[3] Downgraded 1 increment as 95% confidence interval of likelihood ratio crosses one end of a defined MID interval (0.5, 2)
[4] Unclear how optimised cut-off was calculated
[5] Downgraded by 1 increment because the majority of the evidence was at high risk of bias
YI – Youden's index
ROC AUC: Receiver Operating Characteristic: Area Under the Curve

1 ***Hypertension***

2 *BMI*

No. of studies	Study design	Sample size	Sensitivity (95%CI)	Specificity (95%CI)	Effect size (95%CI)	Risk of bias	Indirect ness	Inconsistency	Imprecision	Quality
Men at cut off 22 kg/m² (ROC AUC: 0.64)										
Bhowmik 2013	Cross-sectional	842	0.717 (0.639,0.784)	0.520 (0.483,0.557)	LR+ 1.494 (1.315,1.697)	Serious[1]	Not serious	N/A[2]	Not serious	Moderate
					LR- 0.544 (0.417,0.711)				Serious[3]	Low
Women at cut-off 22.8 kg/m² (ROC AUC: 0.62)										
Bhowmik 2013	Cross-sectional	1451	0.645 (0.577,0.707)	0.578 (0.550,0.605)	LR+ 1.528 (1.355,1.724)	Serious[1]	Not serious	N/A[2]	Not serious	Moderate
					LR- 0.614 (0.508,0.742)				Not serious	Moderate
[1] Downgraded by 1 increment because the majority of the evidence was at high risk of bias [2] Inconsistency not applicable as evidence from a single study [3] Downgraded 1 increment as 95% confidence interval of likelihood ratio crosses one end of a defined MID interval (0.5, 2) ROC AUC: Receiver Operating Characteristic: Area Under the Curve										

3 *Waist circumference*

No. of studies	Study design	Sample size	Sensitivity (95%CI)	Specificity (95%CI)	Effect size (95%CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
Men at cut-off 79 cm (ROC AUC: 0.63)										
Bhowmik 2013	Cross-sectional	842	0.786 (0.712,0.845)	0.449 (0.412,0.486)	LR+ 1.426 (1.281,1.589)	Serious[1]	Not serious	N/A[2]	Not serious	Moderate
					LR- 0.477 (0.346,0.657)				Serious[3]	Low
Women at cut-off 81 cm (ROC AUC: 0.65)										
Bhowmik 2013	Cross-sectional	1451	0.645 (0.577,0.707)	0.612 (0.585,0.639)	LR+ 1.662 (1.470,1.880)	Serious[1]	Not serious	N/A[2]	Not serious	Moderate
					LR- 0.580 (0.480,0.701)				Serious[3]	Low
[1] Downgraded by 1 increment because the majority of the evidence was at high risk of bias [2] Inconsistency not applicable as evidence from a single study [3] Downgraded 1 increment as 95% confidence interval of likelihood ratio crosses one end of a defined MID interval (0.5, 2) ROC AUC: Receiver Operating Characteristic: Area Under the Curve										

4 *Waist-to-hip ratio*

No. of studies	Study design	Sample size	Sensitivity (95%CI)	Specificity (95%CI)	Effect size (95%CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality

Men at cut-off 0.93 (ROC AUC: 0.68)										
Bhowmik 2013	Cross-sectional	842	0.541 (0.460,0.620)	0.634 (0.598,0.669)	LR+ 1.478 (1.237,1.766)	Serious[1]	Not serious	N/A[2]	Not serious	Moderate
					LR- 0.724 (0.602,0.871)				Not serious	Moderate
Women at cut-off 0.89 (ROC AUC: 0.62)										
Bhowmik 2013	Cross-sectional	1451	0.558 (0.490,0.624)	0.645 (0.618,0.671)	LR+ 1.572 (1.363,1.813)	Serious[1]	Not serious	N/A[2]	Not serious	Moderate
					LR- 0.685 (0.585,0.803)				Not serious	Moderate

[1] Downgraded by 1 increment because the majority of the evidence was at high risk of bias
[2] Inconsistency not applicable as evidence from a single study
ROC AUC: Receiver Operating Characteristic: Area Under the Curve

Waist-to-height ratio

No. of studies	Study design	Sample size	Sensitivity (95%CI)	Specificity (95%CI)	Effect size (95%CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
Men at cut-off 0.52 (ROC AUC: 0.64)										
Bhowmik 2013	Cross-sectional	842	0.629 (0.548,0.703)	0.605 (0.568,0.641)	LR+ 1.592 (1.364,1.859)	Serious[1]	Not serious	N/A[2]	Not serious	Moderate
					LR- 0.613 (0.493,0.763)				Serious[3]	Low
Women at cut-off 0.54 (ROC AUC: 0.65)										
Bhowmik 2013	Cross-sectional	1451	0.659 (0.592,0.720)	0.604 (0.577,0.631)	LR+ 1.664 (1.476,1.876)	Serious[1]	Not serious	N/A[2]	Not serious[3]	Moderate
					LR- 0.565 (0.465,0.686)				Serious[3]	Low

[1] Downgraded by 1 increment because the majority of the evidence was at high risk of bias
[2] Inconsistency not applicable as evidence from a single study
[3] Downgraded 1 increment as 95% confidence interval of likelihood ratio crosses one end of a defined MID interval (0.5, 2)
ROC AUC: Receiver Operating Characteristic: Area Under the Curve

Dyslipidaemia

BMI

No. of studies	Study design	Sample size	Sensitivity (95%CI)	Specificity (95%CI)	Effect size (95%CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
Men at cut off 22 kg/m^2 (ROC AUC: 0.7)										
Bhowmik 2013	Cross-sectional	842	0.745 (0.692,0.791)	0.593 (0.551,0.634)	LR+ 1.830 (1.621,2.066)	Serious[1]	Not serious	N/A[2]	Serious[3]	Low
					LR- 0.430 (0.350,0.529)				Serious[3]	Low

No. of studies	Study design	Sample size	Sensitivity (95%CI)	Specificity (95%CI)	Effect size (95%CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
Women at cut-off 21.9 kg/m^2 (ROC AUC: 0.62)										
Bhowmik 2013	Cross-sectional	1451	0.691 (0.641,0.737)	0.501 (0.471,0.531)	LR+ 1.385 (1.264,1.517)	Serious[1]	Not serious	N/A[2]	Not serious	Moderate
					LR- 0.617 (0.523,0.728)				Not serious	Moderate

[1] Downgraded by 1 increment because the majority of the evidence was at high risk of bias
[2] Inconsistency not applicable as evidence from a single study
[3] Downgraded 1 increment as 95% confidence interval of likelihood ratio crosses one end of a defined MID interval (0.5, 2)
ROC AUC: Receiver Operating Characteristic: Area Under the Curve

Waist circumference

No. of studies	Study design	Sample size	Sensitivity (95%CI)	Specificity (95%CI)	Effect size (95%CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
Men at cut-off 82 cm (ROC AUC: 0.7)										
Bhowmik 2013	Cross-sectional	842	0.765 (0.713,0.810)	0.563 (0.521,0.604)	LR+ 1.751 (1.562,1.962)	Serious[1]	Not serious	N/A[2]	Not serious	Moderate
					LR- 0.417 (0.336,0.519)				Serious[3]	Low
Women at cut-off 81 cm (ROC AUC: 0.66)										
Bhowmik 2013	Cross-sectional	1451	0.618 (0.567,0.667)	0.641 (0.612,0.669)	LR+ 1.721 (1.537,1.928)	Serious[1]	Not serious	N/A[2]	Not serious	Moderate
					LR- 0.596 (0.519,0.685)				Not serious	Moderate

[1] Downgraded by 1 increment because the majority of the evidence was at high risk of bias
[2] Inconsistency not applicable as evidence from a single study
[3] Downgraded 1 increment as 95% confidence interval of likelihood ratio crosses one end of a defined MID interval (0.5, 2)
ROC AUC: Receiver Operating Characteristic: Area Under the Curve

Waist-to-hip ratio

No. of studies	Study design	Sample size	Sensitivity (95%CI)	Specificity (95%CI)	Effect size (95%CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
Men at cut-off 0.93 (ROC AUC: 0.59)										
Bhowmik 2013	Cross-sectional	842	0.569 (0.512,0.624)	0.707 (0.667,0.744)	LR+ 1.942 (1.649,2.287)	Serious[1]	Not serious	N/A[2]	Serious[3]	Low
					LR- 0.610 (0.529,0.702)				Not serious	Moderate
Women at cut-off 0.86 (ROC AUC: 0.68)										
		1451			LR+ 1.726 (1.571,1.897)	Serious[1]	Not serious	N/A[2]	Not serious	Moderate

Bhowmik 2013	Cross-sectional		0.725 (0.677,0.769)	0.580 (0.550,0.609)	LR- 0.474 (0.398,0.565)				Serious[3]	Low

[1] Downgraded by 1 increment because the majority of the evidence was at high risk of bias
[2] Inconsistency not applicable as evidence from a single study
[3] Downgraded 1 increment as 95% confidence interval of likelihood ratio crosses one end of a defined MID interval (0.5, 2)
ROC AUC: Receiver Operating Characteristic: Area Under the Curve

Waist-to-height ratio

No. of studies	Study design	Sample size	Sensitivity (95%CI)	Specificity (95%CI)	Effect size (95%CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
Men at cut-off 0.51 (ROC AUC: 0.71)										
Bhowmik 2013	Cross-sectional	842	0.729 (0.676,0.777)	0.609 (0.567,0.649)	LR+ 1.864 (1.644,2.114)	Serious[1]	Not serious	N/A[2]	Serious[3]	Low
					LR- 0.445 (0.365,0.543)				Serious[3]	Low
Women at cut-off 0.53 (ROC AUC: 0.66)										
Bhowmik 2013	Cross-sectional	1451	0.691 (0.641,0.737)	0.552 (0.522,0.581)	LR+ 1.542 (1.402,1.697)	Serious[1]	Not serious	N/A[2]	Not serious	Moderate
					LR- 0.560 (0.475,0.659)				Serious[3]	Low

[1] Downgraded by 1 increment because the majority of the evidence was at high risk of bias
[2] Inconsistency not applicable as evidence from a single study
[3] Downgraded 1 increment as 95% confidence interval of likelihood ratio crosses one end of a defined MID interval (0.5, 2)
ROC AUC: Receiver Operating Characteristic: Area Under the Curve

Black African / Caribbean population

Type 2 diabetes

BMI

No. of studies	Study design	Sample size	Sensitivity (95%CI)	Specificity (95%CI)	Effect size (95%CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
Women (18-39) at cut-off 26 kg/m^2 (ROC AUC: 0.74)										
Foucan 2002	Cross-sectional	2762	0.830 (0.646,0.929)	0.690 (0.672,0.707)	LR+ 2.677 (2.244,3.195)	Very Serious[1]	Not serious	N/A[2]	Not serious	Low
					LR- 0.246 (0.109,0.559)				Serious[3]	Very low
Women (40-74) at cut-off 27 kg/m^2 (ROC AUC: 0.64)										
Foucan 2002	Cross-sectional	2387	0.620 (0.563,0.674)	0.520 (0.499,0.541)	LR+ 1.292 (1.168,1.428)	Very Serious[1]	Not serious	N/A[2]	Not serious	Low
					LR- 0.731 (0.627,0.851)				Not serious	Low

[1] Downgraded by 2 increments because the majority of the evidence was at very high risk of bias
[2] Inconsistency not applicable as evidence from a single study
[3] Downgraded 1 increment as 95% confidence interval of likelihood ratio crosses one end of a defined MID interval (0.5, 2)
ROC AUC: Receiver Operating Characteristic: Area Under the Curve

Waist circumference

No. of studies	Study design	Sample size	Sensitivity (95%CI)	Specificity (95%CI)	Effect size (95%CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
Women (18-39) at cut-off 85 cm (ROC AUC: 0.88)										
Foucan 2002	Cross-sectional	2762	0.840 (0.657,0.935)	0.780 (0.764,0.795)	LR+ 3.818 (3.201,4.555)	Very Serious[1]	Not serious	N/A[2]	Not serious	Low
					LR- 0.205 (0.088,0.479)				Not serious	Low
Women (40-74) at cut-off 88 cm (ROC AUC: 0.68)										
Foucan 2002	Cross-sectional	2387	0.700 (0.645,0.750)	0.600 (0.579,0.621)	LR+ 1.750 (1.597,1.918)	Very Serious[1]	Not serious	N/A[2]	Not serious	Low
					LR- 0.500 (0.418,0.598)				Serious[3]	Very low

[1] Downgraded by 2 increments because the majority of the evidence was at very high risk of bias
[2] Inconsistency not applicable as evidence from a single study
[3] Downgraded 1 increment as 95% confidence interval of likelihood ratio crosses one end of a defined MID interval (0.5, 2)
ROC AUC: Receiver Operating Characteristic: Area Under the Curve

Hypertension

BMI

No. of studies	Study design	Sample size	Sensitivity (95%CI)	Specificity (95%CI)	Effect size (95%CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
Men/women at cut-off [5] 30 kg/m^2										
Okoro 2020	Cross-sectional	240	0.262 (0.169,0.381)	0.844 (0.783,0.890)	LR+ 1.672 (0.983,2.845)	Very serious[1]	Serious[4]	N/A[2]	Very serious[8]	Very low
					LR- 0.875 (0.748,1.025)				Serious[7]	Very low
Men at cut-off 22.86 kg/m^2 (ROC AUC: 0.15)										
Gutema 2020	Cross-sectional	1673	0.357 (0.313,0.403)	0.788 (0.764,0.810)	LR+ 1.684 (1.427,1.987)	Serious[6]	Not serious	N/A[2]	Not serious	Moderate
					LR- 0.816 (0.757,0.880)				Not serious	Moderate
Men at cut-off 24.49 kg/m^2 (YI: 0.33)										
Ononamadu 2017	Cross-sectional	436	0.729 (0.632,0.809)	0.600 (0.547,0.651)	LR+ 1.823 (1.525,2.179)	Very serious[1]	Not serious	N/A[2]	Serious[3]	Very low
					LR- 0.451 (0.321,0.634)				Serious[3]	Very low
Women (18-39) at cut-off 24 kg/m^2 (ROC AUC: 0.74)										
Foucan 2002	Cross-sectional	2762	0.740 (0.691,0.784)	0.600 (0.580,0.619)	LR+ 1.850 (1.708,2.003)	Very serious[1]	Not serious	N/A[2]	Serious[3]	Very low
					LR- 0.433 (0.361,0.520)				Serious[3]	Very low
Women (40-70) at cut-off 26 kg/m^2 (ROC AUC: 0.64)										
Foucan 2002	Cross-sectional	2387	0.700 (0.675,0.724)	0.510 (0.480,0.540)	LR+ 1.429 (1.331,1.533)	Very serious[1]	Not serious	N/A[2]	Not serious	Low
					LR- 0.588 (0.532,0.651)				Not serious	Low
Women at cut-off 24.02 kg/m^2 (YI: 0.15)										
Gutema 2020	Cross-sectional	1672	0.264 (0.226,0.305)	0.854 (0.833,0.873)	LR+ 1.808 (1.476,2.215)	Serious[6]	Not serious	N/A[2]	Serious[3]	Low
					LR- 0.862 (0.813,0.914)				Not serious	Moderate
Women at cut off 24.44 (YI: 0.2)										
Ononamadu 2017	Cross-sectional	476	0.741 (0.652,0.814)	0.489 (0.438,0.540)	LR+ 1.450 (1.250,1.683)	Very serious[1]	Not serious	N/A[2]	Not serious	Low
					LR- 0.529 (0.380,0.737)				Serious[3]	Very low

[1] Downgraded by 2 increments because the majority of the evidence was at very high risk of bias
[2] Inconsistency not applicable as evidence from a single study
[3] Downgraded 1 increment as 95% confidence interval of likelihood ratio crosses one end of a defined MID interval (0.5, 2)
[4] Downgrade 1 increment as evidence is partially direct due to recruitment limited to practising doctors. This is a limited reflection of the general populace.
[5] Standard cut-offs evaluated

No. of studies	Study design	Sample size	Sensitivity (95%CI)	Specificity (95%CI)	Effect size (95%CI)	Risk of bias	Indirect ness	Inconsist ency	Imprecision	Quality
[6] Downgraded by 1 increment because the majority of the evidence was at high risk of bias [7] Downgraded 1 increment as 95% confidence interval of likelihood ratio crosses the line of no effect [8] Downgraded 2 increments as 95% confidence interval of likelihood ratio crosses one ends of a defined MID interval (0.5, 2) and the line of no effect YI: Youden's Index ROC AUC: Receiver Operating Characteristic: Area Under the Curve										

1 *Waist circumference*

No. of studies	Study design	Sample size	Sensitivity (95%CI)	Specificity (95%CI)	Effect size (95%CI)	Risk of bias	Indirect ness	Inconsiste ncy	Imprecisio n	Quality
Men/women at cut-off [5] 94 cm (M) and 80 cm (W)										
Okoro 2020	Cross-sectional	240	0.508 (0.388,0.626)	0.581 (0.507,0.651)	LR+ 1.212 (0.902,1.628)	Very serious[1]	Serious[4]	N/A[2]	Serious[7]	Very low
					LR- 0.847 (0.643,1.117)				Serious[7]	Very low
Men at cut-off 84.05 cm (YI: 0.18)										
Gutema 2020	Cross-sectional	1673	0.325 (0.283,0.370)	0.854 (0.833,0.873)	LR+ 2.226 (1.839,2.694)	Serious[6]	Not serious	N/A[2]	Serious[3]	Low
					LR- 0.790 (0.738,0.847)				Not serious	Moderate
Men at cut-off 91.44 (YI: 0.35)										
Ononamadu 2017	Cross-sectional	436	0.531 (0.432,0.629)	0.842 (0.799,0.877)	LR+ 3.356 (2.465,4.571)	Very serious[1]	Not serious	N/A[2]	Not serious	Low
					LR- 0.557 (0.448,0.692)				Serious[3]	Very low
Women (18-39) at cut-off 76 cm (ROC AUC: 0.75)										
Foucan 2002	Cross-sectional	2762	0.720 (0.670,0.765)	0.640 (0.621,0.659)	LR+ 2.000 (1.837,2.177)	Very serious[1]	Not serious	N/A[2]	Serious[3]	Very low
					LR- 0.438 (0.368,0.520)				Serious[3]	Very low
Women (40-70) at cut-off 84.5 cm (ROC AUC: 0.68)										
Foucan 2002	Cross-sectional	2387	0.710 (0.685,0.734)	0.540 (0.510,0.570)	LR+ 1.543 (1.434,1.661)	Very serious[1]	Not serious	N/A[2]	Not serious	Low
					LR- 0.537 (0.485,0.594)				Serious[3]	Very low
Women at cut-off 79.5 cm (YI: 0.13)										
Gutema 2020	Cross-sectional	1672	0.520 (0.475,0.565)	0.615 (0.587,0.642)	LR+ 1.351 (1.207,1.511)	Serious[6]	Not serious	N/A[2]	Not serious	Moderate
					LR- 0.780 (0.704,0.866)				Not serious	Moderate
Women at cut-off 96.52 (YI: 0.17)										
		476			LR+ 1.721 (1.284,2.306)	Very serious[1]		N/A[2]	Serious[3]	Very low

Ononamadu 2017	Cross-sectional		0.402 (0.315,0.495)	0.767 (0.720,0.807)	LR- 0.780 (0.664,0.918)		Not serious		Not serious	Low

[1] Downgraded by 2 increments because the majority of the evidence was at very high risk of bias
[2] Inconsistency not applicable as evidence from a single study
[3] Downgraded 1 increment as 95% confidence interval of likelihood ratio crosses one end of a defined MID interval (0.5, 2)
[4] Downgrade 1 increment as evidence is partially direct due to recruitment limited to practising doctors. This is a limited reflection of the general populace.
[5] Standard cut-offs evaluated
[6] Downgraded by 1 increment because the majority of the evidence was at high risk of bias
[7] Downgraded 1 increment as 95% confidence interval of likelihood ratio crosses the line of no effect
YI: Youden's Index
ROC AUC: Receiver Operating Characteristic: Area Under the Curve

Waist- to- hip

No. of studies	Study design	Sample size	Sensitivity (95%CI)	Specificity (95%CI)	Effect size (95%CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
Men/women at cut-off [5] 0.9 (M) and 0.85 (W)										
Okoro 2020	Cross-sectional	240	0.785 (0.668,0.868)	0.425 (0.354,0.498)	LR+ 1.364 (1.140,1.631)	Very serious[1]	Serious[4]	N/A[2]	Not serious	Very low
					LR- 0.507 (0.309,0.832)				Serious[3]	Very low
Men at cut-off 0.91 (YI: 0.14)										
Gutema 2020	Cross-sectional	1673	0.508 (0.461,0.555)	0.627 (0.600,0.654)	LR+ 1.362 (1.211,1.531)	Serious[6]	Not serious	N/A[2]	Not serious	Moderate
					LR- 0.785 (0.707,0.871)				Not serious	Moderate
Women at cut-off 0.91 (YI: 0.1)										
Gutema 2020	Cross-sectional	1672	0.417 (0.374,0.462)	0.682 (0.655,0.708)	LR+ 1.311 (1.146,1.500)	Serious[6]	Not serious	N/A[2]	Not serious	Moderate
					LR- 0.855 (0.785,0.931)				Not serious	Moderate

[1] Downgraded by 2 increments because the majority of the evidence was at very high risk of bias
[2] Inconsistency not applicable as evidence from a single study
[3] Downgraded 1 increment as 95% confidence interval of likelihood ratio crosses one end of a defined MID interval (0.5, 2)
[4] Downgrade 1 increment as evidence is partially direct due to recruitment limited to practising doctors. This is a limited reflection of the general populace.
[5] Standard cut-offs evaluated
[6] Downgraded by 1 increment because the majority of the evidence was at high risk of bias
YI: Youden's Index
ROC AUC: Receiver Operating Characteristic: Area Under the Curve

Waist-to-height

No. of studies	Study design	Sample size	Sensitivity (95%CI)	Specificity (95%CI)	Effect size (95%CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
Men/women at cut-off 0.5[5]										
Okoro 2020	Cross-sectional	240	0.723 (0.603,0.818)	0.469 (0.397,0.543)	LR+ 1.362 (1.111,1.671)	Very serious[1]	Serious[4]	N/A[2]	Not serious	Very low
					LR- 0.590 (0.387,0.900)				Serious[3]	Very low
Men at cut-off 0.55 (YI: 0.33)										
Ononamadu 2017	Cross-sectional	436	0.490 (0.391,0.589)	0.830 (0.786,0.866)	LR+ 2.880 (2.110,3.932)	Very serious[1]	Not serious	N/A[2]	Not serious	Low
					LR- 0.615 (0.503,0.752)				Not serious	Low
Men at cut-off 0.5 (YI: 0.16)										
Gutema 2020	Cross-sectional	1673	0.419 (0.374.0.466)	0.740 (0.715,0.764)	LR+ 1.612 (1.394,1.863)	Serious[6]	Not serious	N/A[2]	Not serious	Moderate
					LR- 0.785 (0.720,0.856)				Not serious	Moderate
Women at cut-off 0.51 (YI 0.15)										
Gutema 2020	Cross-sectional	1672	0.564 (0.519,0.608)	0.587 (0.559,0.615)	LR+ 1.366 (1.231,1.515)	Serious[6]	Not serious	N/A[2]	Not serious	Moderate
					LR- 0.743 (0.664,0.831)				Not serious	Moderate
Women at cut-off 0.508 (YI: 0.22)										
Ononamadu 2017	Cross-sectional	476	0.813 (0.729,0.874)	0.404 (0.355,0.455)	LR+ 1.363 (1.205,1.541)	Very serious[1]	Not serious	N/A[2]	Not serious	Low
					LR- 0.464 (0.310,0.696)				Serious[3]	Very low

[1] Downgraded by 2 increments because the majority of the evidence was at very high risk of bias
[2] Inconsistency not applicable as evidence from a single study
[3] Downgraded 1 increment as 95% confidence interval of likelihood ratio crosses one end of a defined MID interval (0.5, 2)
[4] Downgrade 1 increment as evidence is partially direct due to recruitment limited to practising doctors. This is a limited reflection of the general populace.
[5] Standard cut-offs evaluated
[6] Downgraded by 1 increment because the majority of the evidence was at high risk of bias
YI: Youden's Index

Dyslipidaemia

BMI

No. of studies	Study design	Sample size	Sensitivity (95%CI)	Specificity (95%CI)	Effect size (95%CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
Men at cut-off [4] 22.5 kg/m^2										
Kenate 2020	Cross-sectional	476	0.606 (0.523,0.683)	0.698 (0.646,0.744)	LR+ 2.003 (1.623,2.471)	Very serious[1]	Not serious	N/A[2]	Serious[3]	Very low
					LR- 0.565 (0.456,0.701)				Serious[3]	Very low
Men at cut-off [5] 27 kg/m^2										
Paccaud 2000	Cross-sectional	385	0.480 (0.417,0.544)	0.830 (0.761,0.88	LR+ 2.824 (1.935,4.120)	Not serious	Not serious	N/A[2]	Serious[3]	Moderate
					LR- 0.627 (0.543,0.723)				Not serious	High
Women (18-39) at cut-off 24 kg/m^2 (ROC AUC: 0.74)										
Foucan 2002	Cross-sectional	2762	0.640 (0.576,0.700)	0.520 (0.501,0.539)	LR+ 1.333 (1.200,1.482)	Very serious[1]	Not serious	N/A[2]	Not serious	Low
					LR- 0.692 (0.580,0.827)				Not serious	Low
Women (40-70) at cut-off 27 kg/m^2 (ROC AUC: 0.68)										
Foucan 2002	Cross-sectional	2387	0.540 (0.501,0.579)	0.500 (0.477,0.523)	LR+ 1.080 (0.991,1.177)	Very serious[1]	Not serious	N/A[2]	Serious[6]	Very low
					LR- 0.920 (0.835,1.014)				Serious[6]	Very low
Women at cut-off [4] 24.5 kg/m^2										
Kenate 2020	Cross-sectional	439	0.469 (0.379,0.561)	0.650 (0.597,0.700)	LR+ 1.341 (1.049,1.715)	Very serious[1]	Not serious	N/A[2]	Not serious	Low
					LR- 0.816 (0.675,0.988)				Not serious	Low
Women at cut-off [5] 27 kg/m^2										
Paccaud 2000	Cross-sectional	421	0.690 (0.621,0.752)	0.530 (0.466,0.593)	LR+ 1.468 (1.243,1.734)	Not serious	Not serious	N/A[2]	Not serious	High
					LR- 0.585 (0.458,0.747)				Serious[3]	Moderate

[1] Downgraded by 2 increments because the majority of the evidence was at very high risk of bias
[2] Inconsistency not applicable as evidence from a single study
[3] Downgraded 1 increment as 95% confidence interval of likelihood ratio crosses one end of a defined MID interval (0.5, 2)
[4] Cut-offs thought to be generated utilising ROC analysis
[5] Published cut-off values were assessed
[6] Downgraded 1 increment as 95% confidence interval of likelihood ratio crosses the line of no effect
ROC AUC: Receiver Operating Characteristic: Area Under the Curve

Waist circumference

No. of studies	Study design	Sample size	Sensitivity (95%CI)	Specificity (95%CI)	Effect size (95%CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
Men at cut-off [4] 83.7 cm										
Kenate 2020	Cross-sectional	476	0.380 (0.304,0.463)	0.749 (0.699,0.792)	LR+ 1.512 (1.143,2.000)	Very serious[1]	Not serious	N/A[2]	Serious[3]	Very low
					LR- 0.828 (0.718,0.955)				Not serious	Low
Men at cut-off [5] 94 cm										
Paccaud 2000	Cross-sectional	385	0.480 (0.417,0.544)	0.860 (0.795,0.907)	LR+ 3.429 (2.256,5.210)	Not serious	Not serious	N/A[2]	Not serious	High
					LR- 0.605 (0.526,0.695)				Not serious	High
Women (18-39) at cut-off 75 cm (ROC AUC: 0.63)										
Foucan 2002	Cross-sectional	2762	0.650 (0.586,0.709)	0.540 (0.521,0.559)	LR+ 1.413 (1.273,1.568)	Very serious[1]	Not serious	N/A[2]	Not serious	Low
					LR- 0.648 (0.541,0.777)				Not serious	Low
Women (40-70) at cut-off 87.5 cm (ROC AUC: 0.55)										
Foucan 2002	Cross-sectional	2387	0.580 (0.541,0.618)	0.510 (0.487,0.533)	LR+ 1.184 (1.090,1.285)	Very serious[1]	Not serious	N/A[2]	Not serious	Low
					LR- 0.824 (0.743,0.913)				Not serious	Low
Women at cut-off [4] 78 cm										
Kenate 2020	Cross-sectional	439	0.726 (0.636,0.800)	0.267 (0.222,0.318)	LR+ 1.028 (0.725,1.458)	Very serious[1]	Not serious	N/A[2]	Serious[6]	Very low
					LR- 0.990 (0.868,1.128)				Serious[6]	Very low
Women at cut-off [5] 80 cm										
Paccaud 2000	Cross-sectional	421	0.890 (0.837,0.927)	0.470 (0.407,0.534)	LR+ 1.679 (1.473,1.915)	Not serious	Not serious	N/A[2]	Not serious	High
					LR- 0.234 (0.153,0.359)				Not serious	High

[1] Downgraded by 2 increments because the majority of the evidence was at very high risk of bias
[2] Inconsistency not applicable as evidence from a single study
[3] Downgraded 1 increment as 95% confidence interval of likelihood ratio crosses one end of a defined MID interval (0.5, 2)
[4] Cut-offs thought to be generated utilising ROC analysis
[5] Published cut-off values were assessed
[6] Downgraded 1 increment as 95% confidence interval of likelihood ratio crosses the line of no effect
ROC AUC: Receiver Operating Characteristic: Area Under the Curve

Waist- to-hip

No. of studies	Study design	Sample size	Sensitivity (95%CI)	Specificity (95%CI)	Effect size (95%CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
Men at cut-off [4] 0.88										
Kenate 2020	Cross-sectional	476	0.775 (0.699,0.836)	0.368 (0.318,0.421)	LR+ 1.226 (1.087,1.384)	Very serious[1]	Not serious	N/A[2]	Not serious	Low
					LR- 0.612 (0.437,0.856)				Serious[3]	Very low
Men at cut-off [5] 0.9										
Paccaud 2000	Cross-sectional	385	0.630 (0.566,0.689)	0.650 (0.570,0.722)	LR+ 1.800 (1.417,2.286)	Not serious	Not serious	N/A[2]	Serious[3]	Moderate
					LR- 0.569 (0.464,0.698)				Serious[3]	Moderate
Women at cut off [4] 0.82										
Kenate 2020	Cross-sectional	439	0.991 (0.940,0.999)	0.006 (0.002,0.024)	LR+ 1.442 (0.132,15.76)	Very serious[1]	Not serious	N/A[2]	Very serious[7]	Very low
					LR- 0.997 (0.978,1.017)				Serious[6]	Very low
Women at cut-off [5] 0.8										
Paccaud 2000	Cross-sectional	421	0.820 (0.759,0.868)	0.430 (0.368,0.495)	LR+ 1.439 (1.263,1.639)	Not serious	Not serious	N/A[2]	Not serious	High
					LR- 0.419 (0.298,0.587)				Serious[3]	Moderate

[1] Downgraded by 2 increments because the majority of the evidence was at very high risk of bias
[2] Inconsistency not applicable as evidence from a single study
[3] Downgraded 1 increment as 95% confidence interval of likelihood ratio crosses one end of a defined MID interval (0.5, 2)
[4] Cut-offs thought to be generated utilising ROC analysis
[5] Published cut-off values were assessed
[6] Downgraded 1 increment as 95% confidence interval of likelihood ratio crosses the line of no effect
[7] Downgraded 2 increments as 95% confidence interval of likelihood ratio crosses one ends of a defined MID interval (0.5, 2) and the line of no effect

1 # Area under the curve (c-statistics)

2 ## Prognostic accuracy

3 ### Black African/ Caribbean

4 ***Type 2 diabetes***

5 *BMI*

No. of studies	Study design	Sample size	AUC (95%CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
Men and women								
MacKay 2009	Prospective	282	0.616 (95% CI not reported)	Very serious[1]	Not serious	NA[2]	Serious[3]	Very low
Men								
Sargeant 2002	Prospective	290	0.74 (0.59 - 0.88)	Very serious[1]	Not serious	NA[2]	Very serious[4]	Very low
Stevens 2001	Prospective	1102	0.69 (95% CI not reported)	Very serious[1]	Not serious	NA[2]	Not serious	Low
Women								
Sargeant 2002	Prospective	438	0.62 (0.51 -0.72)	Very serious[1]	Not serious	NA[2]	Very serious[4]	Very low
Stevens 2001	Prospective	1817	0.66 (95% CI not reported)	Very serious[1]	Not serious	NA[2]	Not serious	Low
[1] Downgraded by 2 increments because the majority of the evidence was at very high risk of bias [2] Inconsistency not applicable as evidence from a single study [3] Downgraded 1 increment as the confidence interval was not reported and there were 251-500 people in the study [4] Downgraded by 2 increments because the confidence interval crossed into 3 or more classification categories								

6 *Waist circumference*

No. of studies	Study design	Sample size	AUC (95%CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
Men and women								
MacKay 2009	Prospective	282	0.63 (95% CI not reported)	Very serious[1]	Not serious	NA[2]	Serious[3]	Very low
Men								
Sargeant 2002	Prospective	290	0.78 (0.65 -0.91)	Very serious[1]	Not serious	NA[2]	Very serious[4]	Very low
Stevens 2001	Prospective	1102	0.7 (95% CI not reported)	Very serious[1]	Not serious	NA[2]	Not serious	Low

Women								
Sargeant 2002	Prospective	438	0.61 (0.50 -0.71)	Very serious[1]	Not serious	NA[2]	Very serious[4]	Very low
Stevens 2001	Prospective	1817	0.69 (95% CI not reported)	Very serious[1]	Not serious	NA[2]	Not serious	Low

[1] Downgraded by 2 increments because the majority of the evidence was at very high risk of bias
[2] Inconsistency not applicable as evidence from a single study
[3] Downgraded 1 increment as the confidence interval was not reported and there were 251-500 people in the study
[4] Downgraded by 2 increments because the confidence interval crossed into 3 or more classification categories

Waist-to-hip ratio

No. of studies	Study design	Sample size	AUC (95%CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
Men and women								
MacKay 2009	Prospective	282	0.691 (95% CI not reported)	Very serious[1]	Not serious	NA[2]	Serious[3]	Very low
Men								
Sargeant 2002	Prospective	290	0.76 (0.63 - 0.89)	Very serious[1]	Not serious	NA[2]	Very serious[4]	Very low
Stevens 2001	Prospective	1102	0.66 (95% CI not reported)	Very serious[1]	Not serious	NA[2]	Not serious	Low
Women								
Sargeant 2002	Prospective	438	0.60 (0.50- 0.70)	Very serious[1]	Not serious	NA[2]	Very serious[4]	Very low
Stevens 2001	Prospective	1817	0.67 (95% CI not reported)	Very serious[1]	Not serious	NA[2]	Not serious	Low

[1] Downgraded by 2 increments because the majority of the evidence was at very high risk of bias
[2] Inconsistency not applicable as evidence from a single study
[3] Downgraded 1 increment as the confidence interval was not reported and there were 251-500 people in the study
[4] Downgraded by 2 increments because the confidence interval crossed into 3 classification categories

Waist-to-height ratio

No. of studies	Study design	Sample size	AUC (95%CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
Men and women								
MacKay 2009	Prospective	282	0.645 (95% CI not reported)	Very serious[1]	Not serious	NA[2]	Serious[3]	Very low
Men								
Sargeant 2002	Prospective	290	0.78 (0.66 - 0.90)	Very serious[1]	Not serious	NA[2]	Very serious[4]	Very low
Women								
Sargeant 2002	Prospective	438	0.61 (0.51 - 0.72)	Very serious[1]	Not serious	NA[2]	Very serious[3]	Very low

[1] Downgraded by 2 increments because the majority of the evidence was at very high risk of bias [2] Inconsistency not applicable as evidence from a single study [3] Downgraded 1 increment as the confidence interval was not reported and there were 251-500 people in the study [4] Downgraded by 2 increments because the confidence interval crossed into 3 or more classification categories

BMI + Waist circumference

No. of studies	Study design	Sample size	AUC (95%CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
Men								
Stevens 2001	Prospective	1102	0.7 (95% CI not reported)	Very serious[1]	Not serious	NA[2]	Not serious	Low
Women								
Stevens 2001	Prospective	1817	0.69 (95% CI not reported)	Very serious[1]	Not serious	NA[2]	Not serious	Low
[1] Downgraded by 2 increments because the majority of the evidence was at very high risk of bias [2] Inconsistency not applicable as evidence from a single study								

BMI + Waist-to-hip ratio

No. of studies	Study design	Sample size	AUC (95%CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
Men								
Stevens 2001	Prospective	1102	0.69 (95% CI not reported)	Very serious[1]	Not serious	NA[2]	Not serious	Low
Women								
Stevens 2001	Prospective	1817	0.69 (95% CI not reported)	Very serious[1]	Not serious	NA[2]	Not serious	Low
[1] Downgraded by 2 increments because the majority of the evidence was at very high risk of bias [2] Inconsistency not applicable as evidence from a single study								

Chinese population

Type 2 diabetes

BMI

No. of studies	Study design	Sample size	AUC (95%CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
Men and women								
Xia 2018	Prospective	2558	0.631 (0.607-0.655)	Very serious[1]	Not serious	NA[2]	Not serious	Low
Men								

Yang 2018	Prospective	5998	0.655 (0.626- 0.684)	Serious[3]	Not serious	NA[2]	Not serious	Moderate
Women								
Yang 2018	Prospective	3964	0.635 (0.602-0.667)	Serious[3]	Not serious	NA[2]	Not serious	Moderate

[1] Downgraded by 2 increments because the majority of the evidence was at very high risk of bias
[2] Inconsistency not applicable as evidence from a single study
[3] Downgraded by 1 increment because the majority of the evidence was at high risk of bias

Waist circumference

No. of studies	Study design	Sample size	AUC (95%CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
Men and women								
Xia 2018	Prospective	2558	0.646 (0.622-0.670)	Very serious[1]	Not serious	NA[2]	Not serious	Low
Men								
Yang 2018	Prospective	5998	0.629 (0.600-0.659)	Serious[4]	Not serious	NA[2]	Not serious	Moderate
Women								
Yang 2018	Prospective	3964	0.616 (0.581-0.651)	Serious[4]	Not serious	NA[2]	Serious[3]	Low

[1] Downgraded by 2 increments because the majority of the evidence was at very high risk of bias
[2] Inconsistency not applicable as evidence from a single study
[3] Downgraded by 1 increment because the confidence interval crossed into 2 classification categories
[4] Downgraded by 1 increment because the majority of the evidence was at high risk of bias

Waist-to-height ratio

No. of studies	Study design	Sample size	AUC (95%CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
Men								
Yang 2018	Prospective	5998	0.629 (0.600 - 0.658)	Serious[1]	Not serious	NA[2]	Not serious	Moderate
Women								
Yang 2018	Prospective	3964	0.609 (0.574 - 0.644)	Serious[1]	Not serious	NA[2]	Serious[3]	Low

[1] Inconsistency not applicable as evidence from a single study.
[2] Downgraded by 1 increment because the majority of the evidence was at high risk of bias
[3] Downgraded by 1 increment because the confidence interval crossed into 2 classification categories

1 ***Hypertension***

2 *BMI*

No. of studies	Study design	Sample size	AUC (95%CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
Men								
Yu 2020	Prospective	1557	0.593 (0.568 - 0.618)	Serious[1]	Not serious	NA[2]	Serious[3]	Low
Nguyen 2008	Prospective	2077	0.62 (95% CI not reported)	Very serious[4]	Not serious	NA[2]	Not serious	Low
Men (aged 18-40)								
Nguyen 2008	Prospective	946	0.64 (95% CI not reported)	Very serious[4]	Not serious	NA[2]	Not serious	Low
Men (aged 41-65)								
Nguyen 2008	Prospective	1131	0.61(95% CI not reported)	Very serious[4]	Not serious	NA[2]	Not serious	Low
Women								
Yu 2020	Prospective	1849	0.615 (0.592- 0.637)	Serious[1]	Not serious	NA[2]	Serious[3]	Low
Nguyen 2008	Prospective	2415	0.62 (95% CI not reported)	Very serious[4]	Not serious	NA[2]	Not serious	Low
Women (aged 18-40)								
Nguyen 2008	Prospective	1053	0.64 (95% CI not reported)	Very serious[4]	Not serious	NA[2]	Not serious	Low
Women (aged 41-65)								
Nguyen 2008	Prospective	1362	0.59 (95% CI not reported)	Very serious[4]	Not serious	NA[2]	Not serious	Low
In people with ideal blood pressure								
Wang 2018	Prospective	344	0.593 (0.484–0.702)	Very serious[4]	Not serious	NA[2]	Very serious[5]	Very low
In people with pre-hypertension								
Wang 2018	Prospective	375	0.587 (0.525–0.650)	Very serious[4]	Not serious	NA[2]	Serious[3]	Very low

[1] Downgraded by 1 increment because the majority of the evidence was at high risk of bias
[2] Inconsistency not applicable as evidence from a single study
[3] Downgraded by 1 increment because the confidence interval crossed into 2 classification categories
[4] Downgraded by 2 increments because the majority of the evidence was at very high risk of bias
[5] Downgraded by 2 increments because the confidence interval crossed into 3 classification categories

3 *Waist circumference*

No. of studies	Study design	Sample size	AUC (95%CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
Men								

Yu 2020	Prospective	1557	0.583 (0.558 - 0.608)	Serious[1]	Not serious	NA[2]	Serious[3]	Low
Women								
Yu 2020	Prospective	1849	0.644 (0.622 - 0.666)	Serious[1]	Not serious	NA[2]	Not serious	Moderate
In people with ideal blood pressure								
Wang 2018	Prospective	344	0.692 (0.598–0.787)	Very serious[4]	Not serious	NA[2]	Very serious[5]	Very low
In people with pre-hypertension								
Wang 2018	Prospective	375	0.615 (0.553–0.677)	Very serious[4]	Not serious	NA[2]	Serious[3]	Very low

[1] Downgraded by 1 increment because the majority of the evidence was at high risk of bias
[2] Inconsistency not applicable as evidence from a single study
[3] Downgraded by 1 increment because the confidence interval crossed into 2 classification categories
[4] Downgraded by 2 increments because the majority of the evidence was at very high risk of bias
[5] Downgraded by 2 increments because the confidence interval crossed into 3 classification categories

1 *Waist-to-hip ratio*

No. of studies	Study design	Sample size	AUC (95%CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
In people with ideal blood pressure								
Wang 2018	Prospective	344	0.671 (0.568-0.775)	Very serious[1]	Not serious	NA[2]	Very serious[3]	Very low
In people with pre-hypertension								
Wang 2018	Prospective	375	0.597 (0.534-0.660)	Very serious[1]	Not serious	NA[2]	Serious[4]	Very low

[1] Downgraded by 2 increments because the majority of the evidence was at very high risk of bias
[2] Inconsistency not applicable as evidence from a single study
[3] Downgraded by 2 increments because the confidence interval crossed into 3 classification categories
[4] Downgraded by 1 increment because the confidence interval crossed into 2 classification categories

2 *Waist-to-height ratio*

No. of studies	Study design	Sample size	AUC (95%CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
Men								
Yu 2020	Prospective	1557	0.597 (0.572 - 0.621)	Serious[1]	Not serious	NA[2]	Serious[3]	Low
Women								
Yu 2020	Prospective	1849	0.647 (0.625 -0.669)	Serious[1]	Not serious	NA[2]	Not serious	Moderate
In people with ideal blood pressure								
Wang 2018	Prospective	344	0.682 (0.591-0.772)	Very serious[4]	Not serious	NA[2]	Very serious[5]	Very low

In people with pre-hypertension								
Wang 2018	Prospective	375	0.604 (0.542-0.667)	Very serious[4]	Not serious	NA[2]	Serious[3]	Very low
[1] Downgraded by 1 increment because the majority of the evidence was at high risk of bias. [2] Inconsistency not applicable as evidence from a single study [3] Downgraded by 1 increment because the confidence interval crossed into 2 classification categories [4] Downgraded by 2 increments because the majority of the evidence was at very high risk of bias [5] Downgraded by 2 increments because the confidence interval crossed into 3 classification categories								

Cardiovascular disease

BMI

No. of studies	Study design	Sample size	AUC (95%CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
Men and women								
Xu 2014	Prospective	1034	0.566 (95% CI not reported)	Not serious	Not serious	NA[1]	Not serious	High
[1] Inconsistency not applicable as evidence from a single study								

Waist circumference

No. of studies	Study design	Sample size	AUC (95%CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
Men and women								
Xu 2014	Prospective	1034	0.543 (95% CI not reported)	Not serious	Not serious	NA[1]	Not serious	High
[1] Inconsistency not applicable as evidence from a single study								

Waist-to-height ratio

No. of studies	Study design	Sample size	AUC (95%CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
Men and women								
Xu 2014	Prospective	1034	0.586 (95% CI not reported)	Not serious	Not serious	NA[1]	Not serious	High
[1] Inconsistency not applicable as evidence from a single study								

Other Asian population

Type 2 diabetes

BMI

No. of studies	Study design	Sample size	AUC (95%CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
Men and women (Japanese population)								
Oda 2013	Prospective	2034	0.685 (0.580-0.790)	Very serious[1]	Not serious	NA[2]	Very serious[3]	Very low
Men (South Korean population)								
Son 2016	Prospective	2078	0.66 (0.602–0.718)	Very serious[1]	Not serious	NA[2]	Serious[4]	Very low
Women (South Korean population)								
Son 2016	Prospective	822	0.66 (0.602–0.718)	Very serious[1]	Not serious	NA[2]	Serious[4]	Very low

[1] Downgraded by 2 increments because the majority of the evidence was at very high risk of bias
[2] Inconsistency not applicable as evidence from a single study
[3] Downgraded by 2 increments because the confidence interval crossed into 3 classification categories
[4] Downgraded by 1 increment because the confidence interval crossed into 2 classification categories

Waist circumference

No. of studies	Study design	Sample size	AUC (95%CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
Men (South Korean population)								
Son 2016	Prospective	2078	0.668 (0.615–0.722)	Very serious[1]	Not serious	NA[2]	Serious[3]	Very low
Women (South Korean population)								
Son 2016	Prospective	822	0.691 (0.571–0.812)	Very serious[1]	Not serious	NA[2]	Very serious[4]	Very low

[1] Downgraded by 2 increments because the majority of the evidence was at very high risk of bias
[2] Inconsistency not applicable as evidence from a single study
[3] Downgraded by 1 increment because the confidence interval crossed into 2 classification categories
[4] Downgraded by 2 increments because the confidence interval crossed into 3 or more classification categories

Waist-to-height ratio

No. of studies	Study design	Sample size	AUC (95%CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
Men (South Korean population)								
Son 2016	Prospective	2078	0.697 (0.644–0.749)	Very serious[1]	Not serious	NA[2]	Serious[3]	Very low

Women (South Korean population)								
Son 2016	Prospective	822	0.679 (0.554–0.803)	Very serious[1]	Not serious	NA[2]	Very serious[3]	Very low

[1] Downgraded by 2 increments because the majority of the evidence was at very high risk of bias
[2] Inconsistency not applicable as evidence from a single study
[3] Downgraded by 1 increment because the confidence interval crossed into 2 classification categories
[4] Downgraded by 2 increments because the confidence interval crossed into 3 or more classification categories

1 ***Hypertension***

2 *BMI*

No. of studies	Study design	Sample size	AUC (95%CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
Men and women (South Korean population)								
Choi 2018	Prospective	1718	0.58 (0.56-0.6)	Very serious[1]	Serious[2]	NA[3]	Serious[4]	Very low
Men (South Korean population)								
Lee 2015	Prospective	2128	0.551 (0.483–0.619)	Serious[5]	Not serious	NA[3]	Serious[4]	Low
Women (South Korean population)								
Lee 2015	Prospective	2326	0.57 (0.55 - 0.59)	Serious[5]	Not serious	NA[3]	Not serious	Moderate

[1] Downgraded by 2 increments because the majority of the evidence was at very high risk of bias
[2] Downgrade 1 level for serious indirectness. Applicability is dependent on whether the outcome studied is hypertension or hypertension risk factors.
[3] Inconsistency not applicable as evidence from a single study
[4] Downgraded by 1 increment because the confidence interval crossed into 2 classification categories
[5] Downgraded by 1 increment because the majority of the evidence was at high risk of bias

3 *Waist circumference*

No. of studies	Study design	Sample size	AUC (95%CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
Men and women (South Korean population)								
Choi 2018	Prospective	1718	0.672 (0.634 - 0.711)	Very serious[1]	Serious[2]	NA[3]	Serious[4]	Very low
Men (South Korean population)								
Lee 2015	Prospective	2128	0.62 (0.6 - 0.64)	Serious[5]	Not serious	NA[3]	Not serious	Moderate
Women (South Korean population)								

Lee 2015	Prospective	2326	0.66 (0.64 - 0.68)	Serious[5]	Not serious	NA[3]	Not serious	Moderate

[1] Downgraded by 2 increments because the majority of the evidence was at very high risk of bias
[2] Downgrade 1 level for serious indirectness. Applicability is dependent on whether the outcome studies is hypertension or hypertension risk factors.
[3] Inconsistency not applicable as evidence from a single study
[4] Downgraded by 1 increment because the confidence interval crossed into 2 classification categories
[5] Downgraded by 1 increment because the majority of the evidence was at high risk of bias

Waist-to-hip ratio

No. of studies	Study design	Sample size	AUC (95%CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
Men and women (South Korean population)								
Choi 2018	Prospective	1718	0.648 (0.608 - 0.688)	Very serious[1]	Serious[2]	NA[3]	Not serious	Very low
Men (South Korean population)								
Lee 2015	Prospective	2128	0.62 (0.6 - 0.64)	Serious[4]	Not serious	NA[3]	Not serious	Moderate
Women (South Korean population)								
Lee 2015	Prospective	2326	0.68 (0.66 - 0.7)	Serious[4]	Not serious	NA[3]	Serious[5]	Low

[1] Downgraded by 2 increments because the majority of the evidence was at very high risk of bias
[2] Downgrade 1 level for serious indirectness. Applicability is dependent on whether the outcome studies is hypertension or hypertension risk factors.
[3] Inconsistency not applicable as evidence from a single study
[4] Downgraded by 1 increment because the majority of the evidence was at high risk of bias
[5] Downgraded by 1 increment because the confidence interval crossed into 2 classification categories

Waist-to-height ratio

No. of studies	Study design	Sample size	AUC (95%CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
Men and women (South Korean population)								
Choi 2018	Prospective	1718	0.662 (0.625 - 0.7)	Very serious[1]	Serious[2]	NA[3]	Serious[5]	Very low
Men (South Korean population)								
Lee 2015	Prospective	2128	0.62 (0.6 - 0.64)	Serious[4]	Not serious	NA[3]	Not serious	Moderate
Women (South Korean population)								
Lee 2015	Prospective	2326	0.68 (0.66 - 0.7)	Serious[4]	Not serious	NA[3]	Serious[5]	Low

[1] Downgraded by 2 increments because the majority of the evidence was at very high risk of bias
[2] Downgrade 1 level for serious indirectness. Applicability is dependent on whether the outcome studies is hypertension or hypertension risk factors.
[3] Inconsistency not applicable as evidence from a single study

[4] Downgraded by 1 increment because the majority of the evidence was at high risk of bias
[5] Downgraded by 1 increment because the confidence interval crossed into 2 classification categories

Cardiovascular disease

BMI

No. of studies	Study design	Sample size	AUC (95%CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
Men and women (South Korean population)								
Moon 2018	Prospective	8485	0.538 (0.514 - 0.562)	Very serious[1]	Not serious	NA[2]	Not serious	Low
Men and women (Thai population)								
Aekplakorn 2007	Prospective	2536	0.606 (0.0535 - 0.677)	Serious[4]	Not serious	NA[2]	Serious[3]	Low

[1] Downgraded by 2 increments because the majority of the evidence was at very high risk of bias
[2] Inconsistency not applicable as evidence from a single study
[3] Downgraded by 1 increment because the confidence interval crossed into 2 classification categories
[4] Downgraded by 1 increment because the majority of the evidence was at high risk of bias

Waist circumference

No. of studies	Study design	Sample size	AUC (95%CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
Men and women (South Korean population)								
Moon 2018	Prospective	8485	0.604 (0.58 - 0.627)	Very serious[1]	Not serious	NA[2]	Serious[3]	Very low
Men and women (Thai population)								
Aekplakorn 2007	Prospective	2536	0.627 (0.556 - 0.697)	Serious[4]	Not serious	NA[2]	Serious[3]	Low

[1] Downgraded by 2 increments because the majority of the evidence was at very high risk of bias
[2] Inconsistency not applicable as evidence from a single study
[3] Downgraded by 1 increment because the confidence interval crossed into 2 classification categories
[4] Downgraded by 1 increment because the majority of the evidence was at high risk of bias

Waist-to-hip ratio

No. of studies	Study design	Sample size	AUC (95%CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
Men and women (Thai population)								
Aekplakorn 2007	Prospective	2536	0.592 (0.521 - 0.664)	Serious[1]	Not serious	NA[2]	Serious[3]	Low

[1] Downgraded by 1 increment because the majority of the evidence was at high risk of bias
[2] Inconsistency not applicable as evidence from a single study

[3] Downgraded by 1 increment because the confidence interval crossed into 2 classification categories

1 *Waist-to-height ratio*

No. of studies	Study design	Sample size	AUC (95%CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
Men and women (Thai population)								
Aekplakorn 2007	Prospective	2536	0.651 (0.584 - 0.719)	Serious[1]	Not serious	NA[2]	Very serious[3]	Very low

[1] Downgraded by 1 increment because the majority of the evidence was at high risk of bias
[2] Inconsistency not applicable as evidence from a single study
[3] Downgraded by 2 increments because the confidence interval crossed into 3 classification categories

2 **Arab population**

3 ***Type 2 diabetes***

4 *BMI*

No. of studies	Study design	Sample size	AUC (95%CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
Men								
Mansour 2007	Prospective	7101	0.66 (0.64- 0.68)	Very serious[1]	Not serious	NA[2]	Not serious	Low
Women								
Mansour 2007	Prospective	6629	0.61 (0.59- 0.64)	Very serious[1]	Not serious	NA[2]	Serious[3]	Very low

[1] Downgraded by 2 increments because the majority of the evidence was at very high risk of bias
[2] Inconsistency not applicable as evidence from a single study
[3] Downgraded by 1 increments because the confidence interval crossed into 2 classification categories

Waist circumference

No. of studies	Study design	Sample size	AUC (95%CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
Men								
Mansour 2007	Prospective	7101	0.71 (0.69- 0.73)	Very serious[1]	Not serious	NA[2]	Serious[3]	Very low
Women								
Mansour 2007	Prospective	6629	0.69 (0.66- 0.71)	Very serious[1]	Not serious	NA[2]	Serious[3]	Very low

[1] Downgraded by 2 increments because the majority of the evidence was at very high risk of bias
[2] Inconsistency not applicable as evidence from a single study
[3] Downgraded by 1 increment because the confidence interval crossed into 2 classification categories

Waist-to-hip ratio

No. of studies	Study design	Sample size	AUC (95%CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
Men								
Mansour 2007	Prospective	7101	0.74 (0.72- 0.76)	Very serious[1]	Not serious	NA[2]	Not serious	Low
Women								
Mansour 2007	Prospective	6629	0.72 (0.7- 0.74)	Very serious[1]	Not serious	NA[2]	Not serious	Low

[1] Downgraded by 2 increments because the majority of the evidence was at very high risk of bias
[2] Inconsistency not applicable as evidence from a single study

Waist-to-height ratio

No. of studies	Study design	Sample size	AUC (95%CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
Men								
Mansour 2007	Prospective	7101	0.71 (0.69- 0.73)	Very serious[1]	Not serious	NA[2]	Serious[3]	Very low
Women								
Mansour 2007	Prospective	6629	0.69 (0.67- 0.72)	Very serious[1]	Not serious	NA[2]	Serious[3]	Very low

[1] Downgraded by 2 increments because the majority of the evidence was at very high risk of bias
[2] Inconsistency not applicable as evidence from a single study
[3] Downgraded by 1 increment because the confidence interval crossed into 2 classification categories

Other ethnicities – Iranian population

Type 2 diabetes

BMI

No. of studies	Study design	Sample size	AUC **(95%CI)**	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
Men								
Zafari 2018	Prospective	2419	0.68 (0.65 – 0.71)	Very serious[1]	Not serious	NA[3]	Serious[2]	Very low
Hadeaegh 2006	Prospective	1852	0.693 (95% CI not reported)	Very serious[1]	Not serious	NA[3]	Not serious	Low
Men aged 20-49								
Bozorgmanesh 2010	Prospective	Unclear: 1368 men in the study	0.66 (95% CI not reported)	Very serious[1]	Not serious	NA[3]	Serious[4]	Very low
Men aged 50+								
Bozorgmanesh 2010	Prospective	Unclear: 1368 men in the study	0.69 (95% CI not reported)	Very serious[1]	Not serious	NA[3]	Serious[4]	Very low
Women								
Zafari 2018	Prospective	3319	0.72 (0.70- 0.74)	Very serious[1]	Not serious	NA[3]	Not serious	Low
Hadeaegh 2009 (2)	Prospective	2801	0.69 (95% CI not reported)	Very serious[1]	Not serious	NA[3]	Not serious	Low
Women aged 20-49								
Bozorgmanesh 2010	Prospective	Unclear: 1874 women in the study	0.76 (95% CI not reported)	Very serious[1]	Not serious	NA[3]	Serious[4]	Very low
Women aged 50+								
Bozorgmanesh 2010	Prospective	Unclear: 1874 women in the study	0.63 (95% CI not reported)	Very serious[1]	Not serious	NA[3]	Serious[4]	Very low

[1] Downgraded by 2 increments because the majority of the evidence was at very high risk of bias
[2] Downgraded by 1 increment because the confidence interval crossed into 2 classification categories

[3] Inconsistency not applicable as evidence from a single study
[4] Downgraded 1 increment as the confidence interval was not reported and there were an unclear number of people in the analysis

Waist circumference

No. of studies	Study design	Sample size	AUC (95%CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
Men								
Zafari 2018	Prospective	1415	0.68 (0.65- 0.71)	Very serious[1]	Not serious	N/A[2]	Serious[3]	Very low
Women								
Zafari 2018	Prospective	1166	0.74 (0.72-0.77)	Very serious[1]	Not serious	N/A[2]	Not serious	Low

[1] Downgraded by 2 increments because the majority of the evidence was at very high risk of bias
[2] Inconsistency not applicable as evidence from a single study
[3] Downgraded by 1 increment because the confidence interval crossed into 2 classification categories

Waist-to-hip ratio

No. of studies	Study design	Sample size	AUC (95%CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
Men								
Zafari 2018	Prospective	2419	0.68 (0.65- 0.71)	Very serious[1]	Not serious	NA[3]	Serious[2]	Very low
Men aged 20-49								
Bozorgmanesh 2010	Prospective	Unclear: 1368 men in the study	0.67 (95% CI not reported)	Very serious[1]	Not serious	NA[3]	Serious[4]	Very low
Men aged 50+								
Bozorgmanesh 2010	Prospective	Unclear: 1368 men in the study	0.7 (95% CI not reported)	Very serious[1]	Not serious	NA[3]	Serious[4]	Very low
Women								
Zafari 2018	Prospective	3319	0.71 (0.69- 0.74)	Very serious[1]	Not serious	NA[3]	Serious[2]	Very low
Women aged 20-49								
Bozorgmanesh 2010	Prospective	Unclear: 1874 women in the study	0.77 (95% CI not reported)	Very serious[1]	Not serious	NA[3]	Serious[4]	Very low
Women aged 50+								

Bozorgmanesh 2010	Prospective	Unclear: 1874 women in the study	0.64 ((95% CI not reported)	Very serious[1]	Not serious	NA[3]	Serious[4]	Very low

[1] Downgraded by 2 increments because the majority of the evidence was at very high risk of bias
[2] Downgraded by 1 increment because the confidence interval crossed into 2 classification categories
[3] Inconsistency not applicable as evidence from a single study
[4] Downgraded 1 increment as the confidence interval was not reported and there were an unclear number of people in the analysis

Waist-to-height ratio

No. of studies	Study design	Sample size	AUC (95%CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
Men								
Zafari 2018	Prospective	2419	0.69 (0.67 – 0.72)	Very serious[1]	Not serious	NA[3]	Serious[2]	Very low
Hadeaegh 2006	Prospective	1852	0.716 (95% CI not reported)	Very serious[1]	Not serious	NA[3]	Not serious	Low
Men aged 20-49								
Bozorgmanesh 2010	Prospective	Unclear: 1368 men in the study	0.66 (95% CI not reported)	Very serious[1]	Not serious	NA[3]	Serious[4]	Very low
Men aged 50+								
Bozorgmanesh 2010	Prospective	Unclear: 1368 men in the study	0.69 (95% CI not reported)	Very serious[1]	Not serious	NA[3]	Serious[4]	Very low
Women								
Zafari 2018	Prospective	3319	0.75 (0.73- 0.78)	Very serious[1]	Not serious	NA[3]	Not serious	Low
Hadeaegh 2009 (2)	Prospective	2801	0.72 (95% CI not reported)	Very serious[1]	Not serious	NA[3]	Not serious	Low
Women aged 20-49								
Bozorgmanesh 2010	Prospective	Unclear: 1874 women in the study	0.79 (95% CI not reported)	Very serious[1]	Not serious	NA[3]	Serious[4]	Very low
Women aged 50+								
Bozorgmanesh 2010	Prospective	Unclear: 1874 women in the study	0.65 ((95% CI not reported)	Very serious[1]	Not serious	NA[3]	Serious[4]	Very low

[1] Downgraded by 2 increments because the majority of the evidence was at very high risk of bias
[2] Downgraded by 1 increment because the confidence interval crossed into 2 classification categories
[3] Inconsistency not applicable as evidence from a single study
[4] Downgraded 1 increment as the confidence interval was not reported and there were an unclear number of people in the analysis

Cardiovascular disease

BMI

No. of studies	Study design	Sample size	AUC (95%CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
Men aged ≤ 60 years								
Hadeaegh 2009 (1)	Prospective	1614	0.588 (0.534–0.643)	Serious[1]	Not serious	NA[2]	Serious[3]	Low
Men aged > 60 years								
Hadeaegh 2009 (1)	Prospective	1614	0.563 (0.500–0.625)	Serious[1]	Not serious	NA[2]	Serious[3]	Low
Women aged ≤ 60 years								
Hadeaegh 2009 (1)	Prospective	2006	0.551 (0.483–0.619)	Serious[1]	Not serious	NA[2]	Serious[3]	Low
Women aged > 60 years								
Hadeaegh 2009 (1)	Prospective	2006	0.541 (0.465–0.617)	Serious[1]	Not serious	NA[2]	Serious[3]	Low

[1] Downgraded by 1 increment because the majority of the evidence was at high risk of bias
[2] Inconsistency not applicable as evidence from a single study
[3] Downgraded by 1 increment because the confidence interval crossed into 2 classification categories

Waist circumference

No. of studies	Study design	Sample size	AUC (95%CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
Men (overall)								
Taliaei 2012	Prospective	3068	0.59 (0.55-0.63)	Very serious[1]	Not serious	NA[2]	Serious[3]	Very low
Men aged ≤ 60 years								
Hadeaegh 2009 (1)	Prospective	1614	0.623 (0.57 - 0.675)	Serious[4]	Not serious	NA[2]	Serious[3]	Low
Men aged > 60 years								
Hadeaegh 2009 (1)	Prospective	1614	0.576 (0.513 - 0.64)	Serious[4]	Not serious	NA[2]	Serious[3]	Low
Women (overall)								
Taliaei 2012	Prospective	3255	0.59 (0.55-0.63)	Very serious[1]	Not serious	NA[2]	Serious[3]	Very low
Women aged ≤ 60 years								

Hadeaegh 2009 (1)	Prospective	2006	0.599 (0.5324 - 0.664)	Serious[4]	Not serious	NA[2]	Serious[3]	Low
Women aged > 60 years								
Hadeaegh 2009 (1)	Prospective	2006	0.567 (0.493 - 0.642)	Serious[4]	Not serious	NA[2]	Serious[3]	Low

[1] Downgraded by 2 increments because the majority of the evidence was at very high risk of bias
[2] Inconsistency not applicable as evidence from a single study
[3] Downgraded by 1 increment because the confidence interval crossed into 2 classification categories
[4] Downgraded by 1 increment because the majority of the evidence was at high risk of bias

Waist-to-hip ratio

No. of studies	Study design	Sample size	AUC (95%CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
Men aged ≤ 60 years								
Hadeaegh 2009 (1)	Prospective	1614	0.649 (0.597 - 0.702)	Serious[1]	Not serious	NA[2]	Very serious[3]	Very low
Men aged > 60 years								
Hadeaegh 2009 (1)	Prospective	1614	0.57 (0.504 - 0.637)	Serious[1]	Not serious	NA[2]	Serious[4]	Low
Women aged ≤ 60 years								
Hadeaegh 2009 (1)	Prospective	2006	0.643 (0.581 - 0.704)	Serious[1]	Not serious	NA[2]	Very serious[3]	Very low
Women aged > 60 years								
Hadeaegh 2009 (1)	Prospective	2006	0.578 (0.503 - 0.652)	Serious[1]	Not serious	NA[2]	Serious[4]	Low

[1] Downgraded by 1 increment because the majority of the evidence was at high risk of bias
[2] Inconsistency not applicable as evidence from a single study.
[3] Downgraded by 2 increments because the confidence interval crossed into 3 classification categories
[4] Downgraded by 1 increment because the confidence interval crossed into 2 classification categories

Waist-to-height ratio

No. of studies	Study design	Sample size	AUC (95%CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
Men aged ≤ 60 years								
Hadeaegh 2009 (1)	Prospective	1614	0.627 (0.572 - 0.681)	Serious[1]	Not serious	NA[2]	Serious[3]	Low
Men aged > 60 years								
Hadeaegh 2009 (1)	Prospective	1614	0.588 (0.524 - 0.652)	Serious[1]	Not serious	NA[2]	Serious[3]	Low
Women aged ≤ 60 years								
Hadeaegh 2009 (1)	Prospective	2006	0.608 (0.547 - 0.67)	Serious[1]	Not serious	NA[2]	Serious[3]	Low

Women aged > 60 years								
Hadeaegh 2009 (1)	Prospective	2006	0.58 (0.505 - 0.655)	Serious[1]	Not serious	NA[2]	Serious[3]	Low

[1] Downgraded by 1 increment because the majority of the evidence was at high risk of bias
[2] Inconsistency not applicable as evidence from a single study.
[3] Downgraded by 1 increment because the confidence interval crossed into 2 classification categories

Other ethnicities - Hispanic population

Type 2 diabetes

BMI

No. of studies	Study design	Sample size	AUC (95%CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
Men and women								
Mackay 2009	Prospective	361	0.658 (95% CI not reported)	Very serious[1]	Not serious	NA[2]	Serious[3]	Very low

[1] Downgraded by 2 increments because the majority of the evidence was at very high risk of bias
[2] Inconsistency not applicable as evidence from a single study
[3] Downgraded 1 increment as the confidence interval was not reported and there were 251-500 people in the study

Waist circumference

No. of studies	Study design	Sample size	AUC (95%CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
Men and women								
Mackay 2009	Prospective	361	0.647 (95% CI not reported)	Very serious[1]	Not serious	NA[2]	Serious[3]	Very low

[1] Downgraded by 2 increments because the majority of the evidence was at very high risk of bias
[2] Inconsistency not applicable as evidence from a single study
[3] Downgraded 1 increment as the confidence interval was not reported and there were 251-500 people in the study

Waist-to-hip ratio

No. of studies	Study design	Sample size	AUC (95%CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
Men and women								
Mackay 2009	Prospective	361	0.582 (95% CI not reported)	Very serious[1]	Not serious	NA[2]	Serious[3]	Very low

[1] Downgraded by 2 increments because the majority of the evidence was at very high risk of bias
[2] Inconsistency not applicable as evidence from a single study
[3] Downgraded 1 increment as the confidence interval was not reported and there were 251-500 people in the study

Waist-to-height ratio

No. of studies	Study design	Sample size	AUC (95%CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
Men and women								
Mackay 2009	Prospective	361	0.65 (95% CI not reported)	Very serious[1]	Not serious	NA[2]	Serious[3]	Very low
[1] Downgraded by 2 increments because the majority of the evidence was at very high risk of bias [2] Inconsistency not applicable as evidence from a single study [3] Downgraded 1 increment as the confidence interval was not reported and there were 251-500 people in the study								

Other ethnicities- Peruvian population

Type 2 diabetes

BMI

No. of studies	Study design	Sample size	AUC (95%CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
Men								
Zafra-Tanaka 2020	Prospective	1230	0.67 (0.60–0.74)	Serious[1]	Not serious	NA[2]	Serious[3]	Low
Women								
Zafra-Tanaka 2020	Prospective	1292	0.69 (0.63–0.76)	Serious[1]	Not serious	NA[2]	Serious[3]	Low
[1] Downgraded by 1 increment because the majority of the evidence was at high risk of bias [2] Inconsistency not applicable as evidence from a single study [3] Downgraded by 1 increment because the confidence interval crossed into 2 classification categories								

Waist circumference

No. of studies	Study design	Sample size	AUC (95%CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
Men								
Zafra-Tanaka 2020	Prospective	1230	0.66 (0.59–0.72)	Serious[1]	Not serious	NA[2]	Very serious[3]	Very low
Women								
Zafra-Tanaka 2020	Prospective	1292	0.71 (0.65–0.77)	Serious[1]	Not serious	NA[2]	Serious[4]	Low
[1] Downgraded by 1 increment because the majority of the evidence was at high risk of bias [2] Inconsistency not applicable as evidence from a single study [3] Downgraded by 2 increments because the confidence interval crossed into 3 classification categories								

[4] Downgraded by 1 increment because the confidence interval crossed into 2 classification categories

1 *Waist-to-hip ratio*

No. of studies	Study design	Sample size	AUC (95%CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
Men								
Zafra-Tanaka 2020	Prospective	1230	0.62 (0.54–0.69)	Serious[1]	Not serious	NA[2]	Serious[3]	Low
Women								
Zafra Tanaka 2020	Prospective	1292	0.59 (0.52–0.66)	Serious[1]	Not serious	NA[2]	Serious[3]	Low

[1] Downgraded by 1 increment because the majority of the evidence was at high risk of bias
[2] Inconsistency not applicable as evidence from a single study
[3] Downgraded by 1 increment because the confidence interval crossed into 2 classification categories

2 *Waist-to-height ratio*

No. of studies	Study design	Sample size	AUC (95%CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
Men								
Zafra-Tanaka 2020	Prospective	1230	0.65 (0.59–0.72)	Serious[1]	Not serious	NA[2]	Very serious[3]	Very low
Women								
Zafra-Tanaka 2020	Prospective	1292	0.71 (0.65–0.77)	Serious[1]	Not serious	NA[2]	Serious[4]	Low

[1] Downgraded by 1 increment because the majority of the evidence was at high risk of bias
[2] Inconsistency not applicable as evidence from a single study
[3] Downgraded by 2 increments because the confidence interval crossed into 3 classification categories
[4] Downgraded by 1 increment because the confidence interval crossed into 2 classification categories

3 **Other ethnicities- Brazilian population**

4 ***Hypertension***

5 *BMI*

No. of studies	Study design	Sample size	AUC (95%CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
Men aged <40								
Rezende 2018	Prospective	86	0.56 (0.43–0.69)	Very serious[1]	Not serious	NA[2]	Serious[3]	Very low
Men aged ≥40								
Rezende 2018	Prospective	66	0.57 (0.42–0.73)	Very serious[1]	Not serious	NA[2]	Very serious[3]	Very low

Women aged <40								
Rezende 2018	Prospective	197	0.63 (0.54–0.73)	Very serious[1]	Not serious	NA[2]	Very serious[3]	Very low
Women aged ≥40								
Rezende 2018	Prospective	122	0.61 (0.50–0.71)	Very serious[1]	Not serious	NA[2]	Very serious[3]	Very low

[1] Downgraded by 2 increments because the majority of the evidence was at very high risk of bias
[2] Inconsistency not applicable as evidence from a single study
[3] Downgraded by 1 increment because the confidence interval crossed into 2 classification categories
[4] Downgraded by 2 increments because the confidence interval crossed into 3 classification categories

Waist circumference

No. of studies	Study design	Sample size	AUC (95%CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
Men aged <40								
Rezende 2018	Prospective	86	0.62 (0.49–0.74)	Very serious[1]	Not serious	NA[2]	Very serious[3]	Very low
Men aged ≥40								
Rezende 2018	Prospective	66	0.54 (0.39–0.68)	Very serious[1]	Not serious	NA[2]	Serious[4]	Very low
Women aged <40								
Rezende 2018	Prospective	197	0.65 (0.56–0.73)	Very serious[1]	Not serious	NA[2]	Very serious[3]	Very low
Women aged ≥40								
Rezende 2018	Prospective	122	0.64 (0.53–0.75)	Very serious[1]	Not serious	NA[2]	Very serious[3]	Very low

[1] Downgraded by 2 increments because the majority of the evidence was at very high risk of bias
[2] Inconsistency not applicable as evidence from a single study
[3] Downgraded by 2 increments because the confidence interval crossed into 3 classification categories
[4] Downgraded by 1 increment because the confidence interval crossed into 2 classification categories

Waist-to-height ratio

No. of studies	Study design	Sample size	AUC (95%CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
Men aged <40								
Rezende 2018	Prospective	86	0.59 (0.46–0.72)	Very serious[1]	Not serious	NA[2]	Very serious[3]	Very low
Men aged ≥40								
Rezende 2018	Prospective	66	0.50 (0.34–0.64)	Very serious[1]	Not serious	NA[2]	Serious[4]	Very low
Women aged <40								
Rezende 2018	Prospective	197	0.62 (0.53–0.71)	Very serious[1]	Not serious	NA[2]	Very serious[3]	Very low

Women aged ≥40								
Rezende 2018	Prospective	122	0.65 (0.55–0.75)	Very serious[1]	Not serious	NA[2]	Very serious[3]	Very low
[1] Downgraded by 2 increments because the majority of the evidence was at very high risk of bias [2] Inconsistency not applicable as evidence from a single study [3] Downgraded by 2 increments because the confidence interval crossed into 3 classification categories [4] Downgraded by 1 increment because the confidence interval crossed into 2 classification categories								

White population

Type 2 diabetes

BMI

No. of studies	Study design	Sample size	AUC (95%CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
Men and women								
MacKay 2009	Prospective	430	0.734 (95% CI not reported)	Very serious[1]	Not serious	NA[2]	Serious[3]	Very low
Men								
Wannamethee 2010	Prospective	3519	0.726 (95% CI not reported)	Very serious[1]	Not serious	NA[2]	Not serious	Low
Stevens 2001	Prospective	4602	0.70 (95% CI not reported)	Very serious[1]	Not serious	NA[2]	Not serious	Low
Women								
Wannamethee 2010	Prospective	3404	0.733 (95% CI not reported)	Very serious[1]	Not serious	NA[2]	Not serious	Low
Stevens 2001	Prospective	5293	0.72 (95% CI not reported)	Very serious[1]	Not serious	NA[2]	Not serious	Low
[1] Downgraded by 2 increments because the majority of the evidence was at very high risk of bias [2] Inconsistency not applicable as evidence from a single study [3] Downgraded 1 increment as the confidence interval was not reported and there were 251-500 people in the study								

Waist circumference

No. of studies	Study design	Sample size	AUC (95%CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
Men and women								
MacKay 2009	Prospective	430	0.716 (95% CI not reported)	Very serious[1]	Not serious	NA[2]	Serious[3]	Very low
Men								
Wannamethee 2010	Prospective	3519	0.713 (95% CI not reported)	Very serious[1]	Not serious	NA[2]	Not serious	Low
Stevens 2001	Prospective	4602	0.7 (95% CI not reported)	Very serious[1]	Not serious	NA[2]	Not serious	Low
Women								

Wannamethee 2010	Prospective	3404	0.78 (95% CI not reported)	Very serious[1]	Not serious	NA[2]	Not serious	Low
Stevens 2001	Prospective	5293	0.73 (95% CI not reported)	Very serious[1]	Not serious	NA[2]	Not serious	Low

[1] Downgraded by 2 increments because the majority of the evidence was at very high risk of bias
[2] Inconsistency not applicable as evidence from a single study
[3] Downgraded 1 increment as the confidence interval was not reported and there were 251-500 people in the study

Waist-to-hip ratio

No. of studies	Study design	Sample size	AUC (95%CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
Men and women								
MacKay 2009	Prospective	430	0.670 (95% CI not reported)	Very serious[1]	Not serious	NA[2]	Serious[3]	Very low
Men								
Stevens 2001	Prospective	4602	0.67 (95% CI not reported)	Very serious[1]	Not serious	NA[2]	Not serious	Low
Women								
Stevens 2001	Prospective	5293	0.72 (95% CI not reported)	Very serious[1]	Not serious	NA[2]	Not serious	Low

[1] Downgraded by 2 increments because the majority of the evidence was at very high risk of bias
[2] Inconsistency not applicable as evidence from a single study
[3] Downgraded 1 increment as the confidence interval was not reported and there were 251-500 people in the study

Waist-to-height ratio

No. of studies	Study design	Sample size	AUC (95%CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
Men and women								
MacKay 2009	Prospective	430	0.730 (95% CI not reported)	Very serious[1]	Not serious	NA[2]	Serious[3]	Very low

[1] Downgraded by 2 increments because the majority of the evidence was at very high risk of bias
[2] Inconsistency not applicable as evidence from a single study
[3] Downgraded 1 increment as the confidence interval was not reported and there were 251-500 people in the study

BMI + Waist circumference

No. of studies	Study design	Sample size	AUC (95%CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
Men								
Stevens 2001	Prospective	1102	0.7 (95% CI not reported)	Very serious[1]	Not serious	NA[2]	Not serious	Low
Women								
Stevens 2001	Prospective	1817	0.73 (95% CI not reported)	Very serious[1]	Not serious	NA[2]	Not serious	Low

[1] Downgraded by 2 increments because the majority of the evidence was at very high risk of bias
[2] Inconsistency not applicable as evidence from a single study

BMI + Waist-to-hip ratio

No. of studies	Study design	Sample size	AUC (95%CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
Men								
Stevens 2001	Prospective	1102	0.71 (95% CI not reported)	Very serious[1]	Not serious	NA[2]	Not serious	Low
Women								
Stevens 2001	Prospective	1817	0.75 (95% CI not reported)	Very serious[1]	Not serious	NA[2]	Not serious	Low
[1] Downgraded by 2 increments because the majority of the evidence was at very high risk of bias [2] Inconsistency not applicable as evidence from a single study								

Hypertension

BMI

No. of studies	Study design	Sample size	AUC (95%CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
Men								
Gus 2009	Prospective	255	0.56 (0.47 0.64)	Very serious[1]	Not serious	NA[2]	Serious[3]	Very low
Women								
Gus 2009	Prospective	334	0.70 (0.63-0.77)	Very serious[1]	Not serious	NA[2]	Not serious	Low
[1] Downgraded by 2 increments because the majority of the evidence was at very high risk of bias [2] Inconsistency not applicable as evidence from a single study [3] Downgraded by 1 increment because the confidence interval crossed into 2 classification categories								

All-cause mortality

BMI

No. of studies	Study design	Sample size	AUC (95%CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
Men and women								
Schneider 2010	Prospective	10652	0.528 (0.50-0.55)	Very serious[1]	Not serious	NA[2]	Not serious	Low
Men								
Welborn 2007	Prospective	4508	0.53 (0.50–0.57)	Very serious[1]	Not serious	NA[2]	Not serious	Low
Women								
Welborn 2007	Prospective	4668	0.62 (0.57–0.66)	Very serious[1]	Not serious	NA[2]	Serious[3]	Very low
[1] Downgraded by 2 increments because the majority of the evidence was at very high risk of bias [2] Inconsistency not applicable as evidence from a single study								

[3] Downgraded by 1 increment because the confidence interval crossed into 2 classification categories

Waist circumference

No. of studies	Study design	Sample size	AUC (95%CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
Men and women								
Schneider 2010	Prospective	10652	0.508 (0.48-0.53)	Very serious[1]	Not serious	NA[2]	Not serious	Low
Men								
Welborn 2007	Prospective	4508	0.62 (0.59–0.64)	Very serious[1]	Not serious	NA[2]	Serious[3]	Very low
Women								
Welborn 2007	Prospective	4668	0.66 (0.62–0.70)	Very serious[1]	Not serious	NA[2]	Serious[3]	Very low

[1] Downgraded by 2 increments because the majority of the evidence was at very high risk of bias
[2] Inconsistency not applicable as evidence from a single study
[3] Downgraded by 1 increment because the confidence interval crossed into 2 classification categories

Waist-to-height ratio

No. of studies	Study design	Sample size	AUC (95%CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
Men and women								
Schneider 2010	Prospective	10652	0.531 (0.51-0.56)	Very serious[1]	Not serious	NA[2]	Not serious	Low
Men								
Welborn 2007	Prospective	4508	0.64 (0.61–0.68)	Very serious[1]	Not serious	NA[2]	Not serious	Low
Women								
Welborn 2007	Prospective	4668	0.68 (0.64–0.72)	Very serious[1]	Not serious	NA[2]	Serious[3]	Very low

[1] Downgraded by 2 increments because the majority of the evidence was at very high risk of bias
[2] Inconsistency not applicable as evidence from a single study
[3] Downgraded by 1 increment because the confidence interval crossed into 2 classification categories

Waist-to-hip ratio

No. of studies	Study design	Sample size	AUC (95%CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
Men and women								
Schneider 2010	Prospective	10652	0.512 (0.49 -0.53)	Very serious[1]	Not serious	NA[2]	Not serious	Low
Men								
Welborn 2007	Prospective	4508	0.66 (0.63–0.69)	Very serious[1]	Not serious	NA[2]	Not serious	Low
Women								
Welborn 2007	Prospective	4668	0.67 (0.63–0.71)	Very serious[1]	Not serious	NA[2]	Serious[3]	Very low

[1] Downgraded by 2 increments because the majority of the evidence was at very high risk of bias
[2] Inconsistency not applicable as evidence from a single study
[3] Downgraded by 1 increment because the confidence interval crossed into 2 classification categories

Diagnostic accuracy

Black African/ Caribbean

Type 2 Diabetes

BMI

No. of studies	Study design	Sample size	AUC (95%CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
Women (18-39 years old)								
Foucan 2002	Cross-sectional	(n=2762)	0.84 (0.78 -0.90)	Very serious[6]	Not serious	N/A[2]	Very serious[4]	Very low
Women (40-74 years old)								
Foucan 2002	Cross-sectional	(n=2387)	0.68 (0.66 - 0.70)	Very serious[6]	Not serious	N/A[2]	Serious[3]	Very low
Women (US black) ≥40 years old								
Diaz 2007	Cross-sectional	(n=491)*	0.61 (95% CI not reported)	Serious[1]	Not serious	N/A[2]	Serious[5]	Low
Women (English black) ≥40 years old								
Diaz 2007	Cross-sectional	(n=279)*	0.59 (95% CI not reported)	Serious[1]	Not serious	N/A[2]	Serious[5]	Low
Men (US black) ≥40 years old								
Diaz 2007	Cross-sectional	(n=491)*	0.60 (95% CI not reported)	Serious[1]	Not serious	N/A[2]	Serious[5]	Low
Men (English black) ≥40 years old								
Diaz 2007	Cross-sectional	(n=279)*	0.59 (95% CI not reported)	Serious[1]	Not serious	N/A[2]	Serious[5]	Low
Men and women (30-64 years old)								
Skogberg 2018	Cross-sectional	(n=225)	0.68 (0.58 - 0.79)	Not serious	Not serious	N/A[2]	Very serious[4]	Low
Men and women (≥20 years old)								
Yoon 2016	Cross-sectional	(n=854)	0.62 (0.62 - 0.62)	Serious[1]	Not serious	N/A[2]	Not serious	Moderate

[1] Downgraded by 1 increment because the majority of the evidence was at high risk of bias
[2] Inconsistency not applicable as evidence from a single study
[3] Downgraded by 1 increment because the confidence interval crossed into 2 classification categories
[4] Downgraded by 2 increments because the confidence interval crossed into 3 classification categories
[5] Downgraded 1 increment as the confidence interval was not reported and there were 251-500 people in the study
[6] Downgraded by 2 increments because the majority of the evidence was at very high risk of bias

* Study did not report how many participants were women and how many were men.

1 *Waist circumference*

No. of studies	Study design	Sample size	AUC (95%CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
Women (18-39 years old)								
Foucan 2002	Cross-sectional	(n=2762)	0.88 (0.84 - 0.92)	Very serious[6]	Not serious	N/A[2]	Serious[3]	Very low
Women (40-74 years old)								
Foucan 2002	Cross-sectional	(n=2387)	0.68 (0.65 - 0.71)	Very serious[6]	Not serious	N/A[2]	Serious[3]	Very low
Women (US black) ≥40 years old								
Diaz 2007	Cross-sectional	(n=491)*	0.69 (95% CI not reported)	Serious[1]	Not serious	N/A[2]	Serious[5]	Low
Women (English black) ≥40 years old								
Diaz 2007	Cross-sectional	(n=279)*	0.68 (95% CI not reported)	Serious[1]	Not serious	N/A[2]	Serious[5]	Low
Men (US black) ≥40 years old								
Diaz 2007	Cross-sectional	(n=491)*	0.65(95% CI not reported)	Serious[1]	Not serious	N/A[2]	Serious[5]	Low
Men (English black) ≥40 years old								
Diaz 2007	Cross-sectional	(n=279)*	0.67(95% CI not reported)	Serious[1]	Not serious	N/A[2]	Serious[5]	Low
Men and women (30-64 years old)								
Skogberg 2018	Cross-sectional	(n=225)	0.74 (0.64 - 0.84)	Not serious	Not serious	N/A[2]	Very Serious[4]	Low
Men and women (≥20 years old)								
Yoon 2016	Cross-sectional	(n=854)	0.65 (0.59 - 0.70)	Serious[1]	Not serious	N/A[2]	Very Serious[4]	Very low

[1] Downgraded by 1 increment because the majority of the evidence was at high risk of bias
[2] Inconsistency not applicable as evidence from a single study
[3] Downgraded by 1 increment because the confidence interval crossed into 2 classification categories
[4] Downgraded by 2 increments because the confidence interval crossed into 3 classification categories
[5] Downgraded 1 increment as the confidence interval was not reported and there were 251-500 people in the study
[6] Downgraded by 2 increments because the majority of the evidence was at very high risk of bias
* Study did not report how many participants were women and how many were men.

2 *Waist-to-hip ratio*

No. of studies	Study design	Sample size	AUC (95%CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
Men and women (30-64 years old)								
Skogberg 2018	Cross-sectional	(n=225)	0.66 (0.55 - 0.77)	Not serious	Not serious	N/A[1]	Very Serious[2]	Low

[1] Inconsistency not applicable as evidence from a single study [2] Downgraded by 2 increments because the confidence interval crossed into 3 classification categories

1 *Waist-to-height ratio*

No. of studies	Study design	Sample size	AUC (95%CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
Women (US black) ≥40 years old								
Diaz 2007	Cross-sectional	(n=491)*	0.70 (95% CI not reported)	Serious[4]	Not serious	N/A[1]	Serious[2]	Low
Women (English black) ≥40 years old								
Diaz 2007	Cross-sectional	(n=279)*	0.70 (95% CI not reported)	Serious[4]	Not serious	N/A[1]	Serious[2]	Low
Men (US black) ≥40 years old								
Diaz 2007	Cross-sectional	(n=491)*	0.62 (95% CI not reported)	Serious[4]	Not serious	N/A[1]	Serious[2]	Low
Men (English black) ≥40 years old								
Diaz 2007	Cross-sectional	(n=279)*	0.71 (95% CI not reported)	Serious[4]	Not serious	N/A[1]	Serious[2]	Low
Men and women (30-64 years old)								
Skogberg 2018	Cross-sectional	(n=225)	0.75 (0.65 - 0.85)	Not serious	Not serious	N/A[1]	Very Serious[3]	Low
[1] Inconsistency not applicable as evidence from a single study [2] Downgraded 1 increment as the confidence interval was not reported and there were 251-500 people in the study [3] Downgraded by 2 increments because the confidence interval crossed into 3 classification categories [4] Downgraded by 1 increment because the majority of the evidence was at high risk of bias * Study did not report how many participants were women and how many were men.								

2 ***Hypertension***

3 *BMI*

No. of studies	Study design	Sample size	AUC (95%CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
Women (18-39 years old)								
Foucan 2002	Cross-sectional	(n=2762)	0.74 (0.72 - 0.76)	Very serious[6]	Not serious	N/A[2]	Not serious	Low
Women (40-74 years old)								
Foucan 2002	Cross-sectional	(n=2387)	0.64 (0.63 - 0.67)	Very serious[6]	Not serious	N/A[2]	Not serious	Low
Women (20-64 years old)								
Gutema 2020 Sinaga 2018	Cross-sectional	(n=2069)	0.57 (0.50 - 0.63)	Serious[1]	Serious[3]	Very serious[4]	Serious[5]	Very low

Men (20-64 years old)								
Gutema 2020 Sinaga 2018	Cross-sectional	(n=1980)	0.63 (0.52 - 0.74)	Serious[1]	Serious[3]	Very serious[4]	Very serious[7]	Very low
Men and women (mean age 37.4 years [SD 11.3])								
Okoro 2021	Cross-sectional	(n=241)	0.68 (95% CI not reported)	Very serious[6]	Serious[3]	N/A[2]	Very serious[8]	Very low

[1] Downgraded by 1 increment because the majority of the evidence was at high risk of bias
[2] Inconsistency not applicable as evidence from a single study
[3] Downgraded for indirectness due to the majority of people included not being a population sample
[4] Downgraded 2 increments because I^2 was over 66%
[5] Downgraded by 1 increment because the confidence interval crossed into 2 classification categories
[6] Downgraded by 2 increments because the majority of the evidence was at very high risk of bias
[7] Downgraded by 2 increments because the confidence interval crossed into 3 classification categories
[8] Downgraded 2 increments as the confidence interval was not reported and there were 250 or fewer in the study

Waist circumference

No. of studies	Study design	Sample size	AUC (95%CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
Women (18-39 years old)								
Foucan 2002	Cross-sectional	(n=2762)	0.75 (0.73 - 0.77)	Very serious[6]	Not serious	N/A[2]	Not serious	Low
Women (40-74 years old)								
Foucan 2002	Cross-sectional	(n=2387)	0.68 (0.66 - 0.70)	Very serious[6]	Not serious	N/A[2]	Serious[5]	Very low
Women (20-64 years old)								
Gutema 2020 Sinaga 2018	Cross-sectional	(n=2069)	0.59 (0.54 - 0.63)	Serious[1]	Serious[3]	Serious[4]	Serious[5]	Very low
Men (20-64 years old)								
Gutema 2020 Sinaga 2018	Cross-sectional	(n=1980)	0.66 (0.54 - 0.79)	Serious[1]	Serious[3]	Very serious[7]	Very serious[8]	Very low
Men and women (mean age 37.4 years [SD 11.3])								
Okoro 2021	Cross-sectional	(n=241)	0.56 (95% CI not reported)	Very serious[6]	Serious[3]	N/A[2]	Very serious[9]	Very low

[1] Downgraded by 1 increment because the majority of the evidence was at high risk of bias
[2] Inconsistency not applicable as evidence from a single study
[3] Downgraded for indirectness due to the majority of people included not being a population sample
[4] Downgraded 1 increment because I2 was over 33%
[5] Downgraded by 1 increment because the confidence interval crossed into 2 classification categories

[6] Downgraded by 2 increments because the majority of the evidence was at very high risk of bias
[7] Downgraded 2 increments because I^2 was over 66%
[8] Downgraded by 2 increments because the confidence interval crossed into 3 classification categories
[9] Downgraded 2 increments as the confidence interval was not reported and there were 250 or fewer in the study

1 *Waist-to-hip ratio*

No. of studies	Study design	Sample size	AUC (95%CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
Women (20-64 years old)								
Gutema 2020 Sinaga 2018	Cross-sectional	(n=2069)	0.56 (0.53 - 0.59)	Serious[7]	Serious[1]	Not serious	Not serious	Low
Men (20-64 years old)								
Gutema 2020 Sinaga 2018	Cross-sectional	(n=1980)	0.64 (0.52 - 0.75)	Serious[7]	Serious[1]	Very serious[2]	Very serious[3]	Very low
Men and women (mean age 37.4 years [SD 11.3])								
Okoro 2021	Cross-sectional	(n=241)	0.52 (95% CI not reported)	Very serious[4]	Serious[1]	N/A[5]	Very serious[6]	Very low

[1] Downgraded for indirectness due to the majority of people included not being a population sample
[2] Downgraded 2 increments because I2 was over 66%
[3] Downgraded by 2 increments because the confidence interval crossed into 3 classification categories
[4] Downgraded by 2 increments because the majority of the evidence was at very high risk of bias
[5] Inconsistency not applicable as evidence from a single study
[6] Downgraded 2 increments as the confidence interval was not reported and there were 250 or fewer in the study
[7] Downgraded by 1 increment because the majority of the evidence was at high risk of bias

2 *Waist-to-height ratio*

No. of studies	Study design	Sample size	AUC (95%CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
Women (20-64 years old)								
Gutema 2020 Sinaga 2018	Cross-sectional	(n=2069)	0.60 (0.56 - 0.65)	Serious[9]	Serious[1]	Serious[2]	Serious[3]	Very low
Men (20-64 years old)								
Gutema 2020 Sinaga 2018	Cross-sectional	(n=1980)	0.64 (0.53 - 0.76)	Serious[9]	Serious[1]	Very serious[7]	Very serious[6]	Very low
Men and women (mean age 37.4 years [SD 11.3])								

Okoro 2021	Cross-sectional	(n=241)	0.53 (95% CI not reported)	Very serious[4]	Serious[1]	N/A[5]	Very serious[8]	Very low

[1] Downgraded for indirectness due to the majority of people included not being a population sample
[2] Downgraded 1 increment because I^2 was over 33%
[3] Downgraded by 1 increment because the confidence interval crossed into 2 classification categories
[4] Downgraded by 2 increments because the majority of the evidence was at very high risk of bias
[5] Inconsistency not applicable as evidence from a single study
[6] Downgraded by 2 increments because the confidence interval crossed into 3 classification categories
[7] Downgraded 2 increments because I^2 was over 66%
[8] Downgraded 2 increments as the confidence interval was not reported and there were 250 or fewer in the study
[9] Downgraded by 1 increment because the majority of the evidence was at high risk of bias

Dyslipidaemia

BMI

No. of studies	Study design	Sample size	AUC (95%CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
Women (18-39 years old)								
Foucan 2002	Cross-sectional	(n=2762)	0.61 (0.57 - 0.65)	Very serious[1]	Not serious	N/A[2]	Serious[3]	Very low
Women (40-74 years old)								
Foucan 2002	Cross-sectional	(n=2387)	0.52 (0.49 - 0.55)	Very serious[1]	Not serious	N/A[2]	Not serious	Low

[1] Downgraded by 2 increment because the majority of the evidence was at very high risk of bias
[2] Inconsistency not applicable as evidence from a single study.
[3] Downgraded by 1 increment because the confidence interval crossed into 2 classification categories

Waist circumference

No. of studies	Study design	Sample size	AUC (95%CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
Woman (18-39 years old)								
Foucan 2002	Cross-sectional	(n=2762)	0.63 (0.59 - 0.69)	Very serious[1]	Not serious	N/A[2]	Serious[3]	Very low
Women (40-74 years old)								
Foucan 2002	Cross-sectional	(n=2387)	0.55 (0.53 - 0.58)	Very serious[1]	Not serious	N/A[2]	Not serious	Low

[1] Downgraded by 2 increments because the majority of the evidence was at very high risk of bias
[2] Inconsistency not applicable as evidence from a single study.
[3] Downgraded by 1 increment because the confidence interval crossed into 2 classification categories

South Asian population

Type 2 diabetes

BMI

No. of studies	Study design	Sample size	AUC (95%CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
Women (≥18 years old)								
Bhowmik 2013 Jayawardana 2013 Kapoor 2020 Mohan 2007	Cross-sectional	(n=7163)	0.64 (0.63 - 0.66)	Serious[7]	Not serious	Not serious	Not serious	Moderate
Women (UK Indian) ≥40 years old								
Diaz 2007	Cross-sectional	(n=271)	0.63 (95% CI not reported)	Serious[7]	Not serious	N/A[1]	Serious[5]	Low
Women (UK Pakistani) ≥40 years old								
Diaz 2007	Cross-sectional	(n=160)	0.73 (95% CI not reported)	Serious[7]	Not serious	N/A[1]	Very serious[6]	Very low
Women (UK Bangladeshi) ≥40 years old								
Diaz 2007	Cross-sectional	(n=75)	0.60 (95% CI not reported)	Serious[7]	Not serious	N/A[1]	Very serious[6]	Very low
Women (≥20 years old)								
Patel 2017	Cross-sectional	(n=5120)	0.78 (95% CI not reported)	Not serious	Not serious	N/A[1]	Not serious	High
Men (≥18 years old)								
Bhowmik 2013 Jayawardana 2013 Kapoor 2020 Mohan 2007	Cross-sectional	(n=6024)	0.64 (0.57 - 0.70)	Serious[7]	Not serious	Very serious[2]	Very serious[4]	Very low
Men (UK Indian) ≥40 years old								
Diaz 2007	Cross-sectional	(n=264)	0.61 (95% CI not reported)	Serious[7]	Not serious	N/A[1]	Serious[5]	Low
Men (UK Pakistani) ≥40 years old								
Diaz 2007	Cross-sectional	(n=136)	0.57 (95% CI not reported)	Serious[7]	Not serious	N/A[1]	Very serious[6]	Very low
Men (UK Bangladeshi) ≥40 years old								

Diaz 2007	Cross-sectional	(n=77)	0.67 (95% CI not reported)	Serious[7]	Not serious	N/A[1]	Very serious[6]	Very low
Men (≥20 years old)								
Patel 2017	Cross-sectional	(n=3772)	0.76 (95% CI not reported)	Not serious	Not serious	N/A[1]	Not serious	High
Men and women (≥20 years old)								
Siddiquee 2015	Cross-sectional	(n=2293)	0.63 (0.59 - 0.67)	Not serious	Not serious	N/A[1]	Serious[3]	Moderate

[1] Inconsistency not applicable as evidence from a single study.
[2] Downgraded 2 increments because I^2 was over 66%
[3] Downgraded by 1 increment because the confidence interval crossed into 2 classification categories
[4] Downgraded by 2 increments because the confidence interval crossed into 3 classification categories
[5] Downgraded 1 increment as the confidence interval was not reported and there were 251-500 people in the study
[6] Downgraded 2 increments as the confidence interval was not reported and there were 250 or fewer in the study
[7] Downgraded by 1 increment because the majority of the evidence was at high risk of bias

Waist circumference

No. of studies	Study design	Sample size	AUC (95%CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
Women (≥18 years old)								
Bhowmik 2013 Jayawardana 2013 Kapoor 2020 Mohan 2007	Cross-sectional	(n=7163)	0.68 (0.66 - 0.69)	Serious[6]	Not serious	Not serious	Not serious	Moderate
Women (UK Indian) ≥40 years old								
Diaz 2007	Cross-sectional	(n=271)	0.66 (95% CI not reported)	Serious[6]	Not serious	N/A[1]	Serious[5]	Low
Women (UK Pakistani) ≥40 years old								
Diaz 2007	Cross-sectional	(n=160)	0.83 (95% CI not reported)	Serious[6]	Not serious	N/A[1]	Very serious[4]	Very low
Women (UK Bangladeshi) ≥40 years old								
Diaz 2007	Cross-sectional	(n=75)	0.65 (95% CI not reported)	Serious[6]	Not serious	N/A[1]	Very serious[4]	Very low
Women (≥20 years old)								
Patel 2017	Cross-sectional	(n=5120)	0.80 (95% CI not reported)	Not serious	Not serious	N/A[1]	Not serious	High
Men (≥18 years old)								

Bhowmik 2013 Jayawardana 2013 Kapoor 2020 Mohan 2007	Cross-sectional	(n=6024)	0.68 (0.61 - 0.74)	Serious[6]	Not serious	Very serious[2]	Serious[3]	Very low
Men (UK Indian) ≥40 years old								
Diaz 2007	Cross-sectional	(n=264)	0.65 (95% CI not reported)	Serious[6]	Not serious	N/A[1]	Serious[5]	Low
Men (UK Pakistani) ≥40 years old								
Diaz 2007	Cross-sectional	(n=136)	0.51 (95% CI not reported)	Serious[6]	Not serious	N/A[1]	Very serious[4]	Very low
Men (UK Bangladeshi) ≥40 years old								
Diaz 2007	Cross-sectional	(n=77)	0.73 (95% CI not reported)	Serious[6]	Not serious	N/A[1]	Very serious[4]	Low
Men (≥20 years old)								
Patel 2017	Cross-sectional	(n=3772)	0.77 (95% CI not reported)	Not serious	Not serious	N/A[1]	Not serious	High
Men and women (≥20 years old)								
Siddiquee 2015	Cross-sectional	(n=2293)	0.68 (0.65 - 0.72)	Not serious	Not serious	N/A[1]	Serious[3]	Moderate

[1] Inconsistency not applicable as evidence from a single study.
[2] Downgraded 2 increments because I^2 was over 66%
[3] Downgraded by 1 increment because the confidence interval crossed into 2 classification categories
[4] Downgraded 2 increments as the confidence interval was not reported and there were 250 or fewer in the study
[5] Downgraded 1 increment as the confidence interval was not reported and there were 251-500 people in the study
[6] Downgraded by 1 increment because the majority of the evidence was at high risk of bias

1 *Waist-to-hip ratio*

No. of studies	Study design	Sample size	AUC (95%CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
Women (≥18 years old)								
Bhowmik 2013 Jayawardana 2013 Kapoor 2020	Cross-sectional	(n=4813)	0.69 (0.66 - 0.73)	Serious[4]	Not serious	Serious[1]	Serious[3]	Very low
Women (≥20 years old)								
Patel 2017	Cross-sectional	(n=5120)	0.78 (95% CI not reported)	Not serious	Not serious	N/A[2]	Not serious	High
Men (≥18 years old)								

Bhowmik 2013 Jayawardana 2013 Kapoor 2020	Cross-sectional	(n=3674)	0.67 (0.65 - 0.69)	Serious[4]	Not serious	Not serious	Not serious	Moderate
Men (≥20 years old)								
Patel 2017	Cross-sectional	(n=3772)	0.75 (95% CI not reported)	Not serious	Not serious	N/A[2]	Not serious	High
Men and women (≥20 years old)								
Siddiquee 2015	Cross-sectional	(n=2293)	0.68 (0.65 - 0.72)	Not serious	Not serious	N/A[2]	Serious[3]	Moderate

[1] Downgraded 1 increment because I^2 was over 33%
[2] Inconsistency not applicable as evidence from a single study.
[3] Downgraded by 1 increment because the confidence interval crossed into 2 classification categories
[4] Downgraded by 1 increment because the majority of the evidence was at high risk of bias

Waist-to-height ratio

No. of studies	Study design	Sample size	AUC (95%CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
Women (≥18 years old)								
Bhowmik 2013 Jayawardana 2013 Kapoor 2020	Cross-sectional	(n=4813)	0.69 (0.67 - 0.71)	Serious[7]	Not serious	Not serious	Serious[3]	Low
Women (UK Indian) ≥40 years old								
Diaz 2007	Cross-sectional	n=271	0.69 (95% CI not reported)	Serious[7]	Not serious	N/A[1]	Serious[6]	Low
Women (UK Pakistani) ≥40 years old								
Diaz 2007	Cross-sectional	n=160	0.80 (95% CI not reported)	Serious[7]	Not serious	N/A[1]	Very serious[5]	Very low
Women (UK Bangladeshi) ≥40 years old								
Diaz 2007	Cross-sectional	n=75	0.65 (95% CI not reported)	Serious[7]	Not serious	N/A[1]	Very serious[5]	Very low
Women (≥20 years old)								
Patel 2017	Cross-sectional	N=5120	0.79 (95% CI not reported)	Not serious	Not serious	N/A[1]	Not serious	High
Men (≥18 years old)								
Bhowmik 2013 Jayawardana 2013 Kapoor 2020	Cross-sectional	n=3674	0.67 (0.55- 0.80)	Serious[7]	Not serious	Very serious[2]	Very serious[4]	Very low

Men (UK Indian) ≥40 years old								
Diaz 2007	Cross-sectional	n=264	0.68 (95% CI not reported)	Serious[7]	Not serious	N/A[1]	Serious[6]	Low
Men (UK Pakistani) ≥40 years old								
Diaz 2007	Cross-sectional	n=136	0.54 (95% CI not reported)	Serious[7]	Not serious	N/A[1]	Very serious[5]	Very low
Men (UK Bangladeshi) ≥40 years old								
Diaz 2007	Cross-sectional	n=77	0.75 (95% CI not reported)	Serious[7]	Not serious	N/A[1]	Very serious[5]	Very low
Men (≥20 years old)								
Patel 2017	Cross-sectional	n=3772	0.76 (95% CI not reported)	Not serious	Not serious	N/A[1]	Not serious	High

[1] Inconsistency not applicable as evidence from a single study.
[2] Downgraded 2 increments because I^2 was over 66%
[3] Downgraded by 1 increment because the confidence interval crossed into 2 classification categories
[4] Downgraded by 2 increments because the confidence interval crossed into 3 or more classification categories
[5] Downgraded 2 increments as the confidence interval was not reported and there were 250 or fewer in the study
[6] Downgraded 1 increment as the confidence interval was not reported and there were 251-500 people in the study
[7] Downgraded by 1 increment because the majority of the evidence was at high risk of bias

Hypertension

BMI

No. of studies	Study design	Sample size	AUC (95%CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
Women (≥18 years old)								
Bhowmik 2013 Gupta 2012 Jayawardana 2013 Katulanda 2011 Mohan 2007	Cross-sectional	(n=11295)	0.62 (0.60 - 0.65)	Serious[1]	Not serious	Serious[2]	Not serious	Low
Women (≥20 years old)								
Patel 2017	Cross-sectional	(n=5120)	0.78 (95% CI not reported)	Not serious	Not serious	N/A[3]	Not serious	High
Men (≥18 years old)								
Bhowmik 2013 Gupta 2012 Jayawardana 2013	Cross-sectional	(n=9709)	0.65 (0.63 - 0.67)	Serious[1]	Not serious	Serious[2]	Not serious	Low

Katulanda 2011 Mohan 2007								
Men (≥20 years old)								
Patel 2017	Cross-sectional	(n=3772)	0.70 (95% CI not reported)	Not serious	Not serious	N/A[3]	Not serious	High
[1] Downgraded by 1 increment because the majority of the evidence was at high risk of bias [2] Downgraded 1 increment because I^2 was over 33% [3] Inconsistency not applicable as evidence from a single study.								

Waist circumference

No. of studies	Study design	Sample size	AUC (95%CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
Women (≥18 years old)								
Bhowmik 2013 Gupta 2012 Jayawardana 2013 Katulanda 2011 Mohan 2007	Cross-sectional	(n=11295)	0.63 (0.60 - 0.67)	Serious[1]	Not serious	Very Serious[2]	Not serious	Very low
Women (≥20 years old)								
Patel 2017	Cross-sectional	(n=5120)	0.78 (95% CI not reported)	Not serious	Not serious	N/A[3]	Not serious	High
Men (≥18 years old)								
Bhowmik 2013 Gupta 2012 Jayawardana 2013 Katulanda 2011 Mohan 2007	Cross-sectional	(n=9709)	0.66 (0.64 - 0.68)	Serious[1]	Not serious	Serious[4]	Not serious	Low
Men (≥20 years old)								
Patel 2017	Cross-sectional	(n=3772)	0.70 (95% CI not reported)	Not serious	Not serious	N/A[3]	Not serious	High
[1] Downgraded by 1 increment because the majority of the evidence was at high risk of bias [2] Downgraded 2 increments because I^2 was over 66% [3] Inconsistency not applicable as evidence from a single study. [4] Downgraded 1 increment because I^2 was over 33%								

1 *Waist-to-hip ratio*

No. of studies	Study design	Sample size	AUC (95%CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
Women (≥18 years old)								
Bhowmik 2013 Gupta 2012 Jayawardana 2013 Katulanda 2011	Cross-sectional	(n=8945)	0.60 (0.56 - 0.65)	Serious[1]	Not serious	Very Serious[2]	Serious[4]	Very low
Women (≥20 years old)								
Patel 2017	Cross-sectional	(n=5120)	0.76 (95% CI not reported)	Not serious	Not serious	N/A[3]	Not serious	High
Men (≥18 years old)								
Bhowmik 2013 Gupta 2012 Jayawardana 2013 Katulanda 2011	Cross-sectional	(n=7359)	0.65 (0.61 - 0.69)	Serious[1]	Not serious	Very Serious[2]	Not serious	Very low
Men (≥20 years old)								
Patel 2017	Cross-sectional	(n=3772)	0.68 (95% CI not reported)	Not serious	Not serious	N/A[3]	Not serious	High
[1] Downgraded by 1 increment because the majority of the evidence was at high risk of bias [2] Downgraded 2 increments because I^2 was over 66% [3] Inconsistency not applicable as evidence from a single study. [4] Downgraded by 1 increment because the confidence interval crossed into 2 classification categories								

2 *Waist-to-height ratio*

No. of studies	Study design	Sample size	AUC (95%CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
Women (≥18 years old)								
Bhowmik 2013 Gupta 2012 Jayawardana 2013	Cross-sectional	(n=4471)	0.65 (0.62 - 0.68)	Serious[1]	Not serious	Serious[2]	Not serious	Low
Women (≥20 years old)								
Patel 2017	Cross-sectional	(n=5120)	0.78 (95% CI not reported)	Not serious	Not serious	N/A[3]	Not serious	High
Men (≥18 years old)								

Bhowmik 2013 Gupta 2012 Jayawardana 2013	Cross-sectional	(n=2885)	0.67 (0.65 - 0.70)	Serious[1]	Not serious	Not serious	Serious[4]	Low
Men (≥20 years old)								
Patel 2017	Cross-sectional	(n=3772)	0.70 (95% CI not reported)	Not serious	Not serious	N/A[3]	Not serious	High

[1] Downgraded by 1 increment because the majority of the evidence was at high risk of bias
[2] Downgraded 1 increment because I^2 was over 33%
[3] Inconsistency not applicable as evidence from a single study.
[4] Downgraded by 1 increment because the confidence interval crossed into 2 classification categories

Dyslipidaemia

BMI

No. of studies	Study design	Sample size	AUC (95%CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
Women (≥20 years old)								
Bhowmik 2013	Cross-sectional	(n=1451)	0.62 (0.59 - 0.66)	Serious[1]	Not serious	N/A[2]	Serious[3]	Low
Men (≥20 years old)								
Bhowmik 2013	Cross-sectional	(n=842)	0.70 (0.67 - 0.74)	Serious[1]	Not serious	N/A[2]	Serious[3]	Low

[1] Downgraded by 1 increment because the majority of the evidence was at high risk of bias
[2] Inconsistency not applicable as evidence from a single study.
[3] Downgraded by 1 increment because the confidence interval crossed into 2 classification categories

Waist circumference

No. of studies	Study design	Sample size	AUC (95%CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
Women (≥20 years old)								
Bhowmik 2013	Cross-sectional	(n=1451)	0.66 (0.63 - 0.70)	Serious[1]	Not serious	N/A[2]	Serious[3]	Low
Men (≥20 years old)								
Bhowmik 2013	Cross-sectional	(n=842)	0.7 (0.67 - 0.74)	Serious[1]	Not serious	N/A[2]	Serious[3]	Low

[1] Downgraded by 1 increment because the majority of the evidence was at high risk of bias
[2] Inconsistency not applicable as evidence from a single study.
[3] Downgraded by 1 increment because the confidence interval crossed into 2 classification categories

1

2 *Waist-to-hip ratio*

No. of studies	Study design	Sample size	AUC (95%CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
Women (≥20 years old)								
Bhowmik 2013	Cross-sectional	(n=1451)	0.68 (0.65 - 0.71)	Serious[1]	Not serious	N/A[2]	Serious[3]	Low
Men (≥20 years old)								
Bhowmik 2013	Cross-sectional	(n=842)	0.68 (0.64 - 0.72)	Serious[1]	Not serious	N/A[2]	Serious[3]	Low

[1] Downgraded by 1 increment because the majority of the evidence was at high risk of bias
[2] Inconsistency not applicable as evidence from a single study.
[3] Downgraded by 1 increment because the confidence interval crossed into 2 classification categories

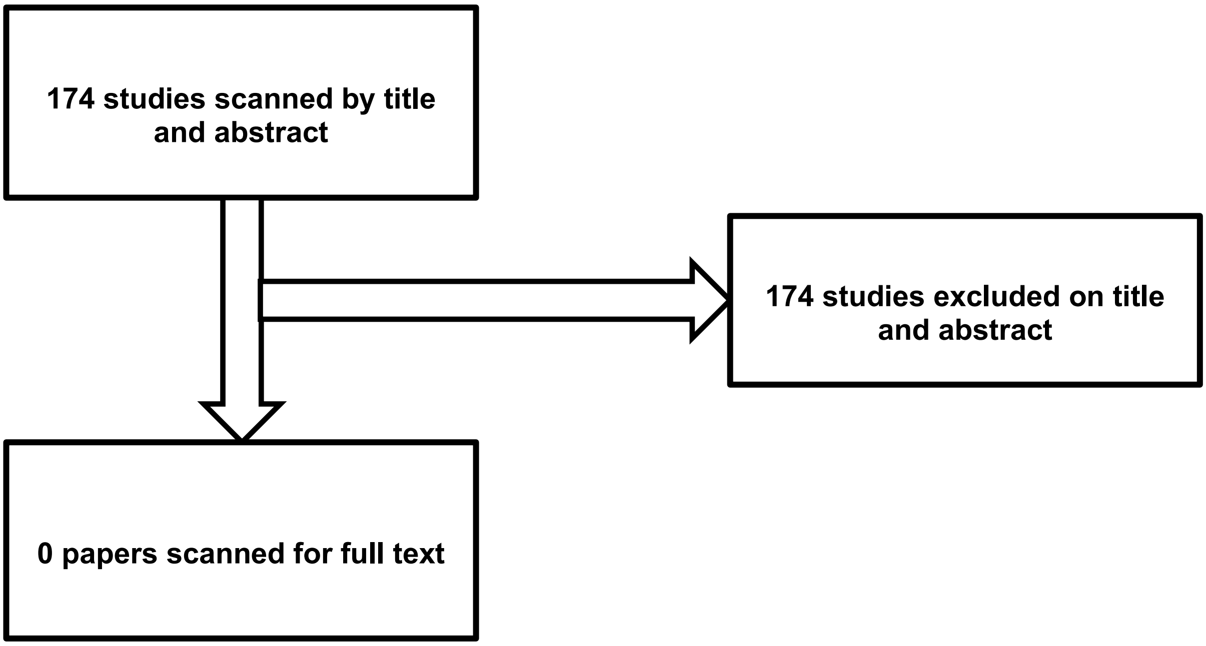
3 *Waist-to-height ratio*

No. of studies	Study design	Sample size	AUC (95%CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
Women (≥20 years old)								
Bhowmik 2013	Cross-sectional	(n=1451)	0.66 (0.63 - 0.69)	Serious[1]	Not serious	N/A[2]	Not serious	Moderate
Men (≥20 years old)								
Bhowmik 2013	Cross-sectional	(n=842)	0.71 (0.67 - 0.74)	Serious[1]	Not serious	N/A[2]	Serious[3]	Low

[1] Downgraded by 1 increment because the majority of the evidence was at high risk of bias
[2] Inconsistency not applicable as evidence from a single study.
[3] Downgraded by 1 increment because the confidence interval crossed into 2 classification categories

4

Appendix I - Economic evidence study selection



Appendix J – Economic evidence tables

No economic studies were identified which were applicable to this review question.

Appendix K – Health economic model

No economic analysis was conducted for this review question.

Appendix L – Excluded studies

Prognostic accuracy

Study	Code [Reason]
Al-Lawati, Jawad A, Barakat, Nabil M, Al-Lawati, Alya M et al. (2008) Optimal cut-points for body mass index, waist circumference and waist-to-hip ratio using the Framingham coronary heart disease risk score in an Arab population of the Middle East. Diabetes & vascular disease research 5(4): 304-9	- Cross sectional study
Barazzoni, Rocco, Gortan Cappellari, Gianluca, Semolic, Annamaria et al. (2019) Central adiposity markers, plasma lipid profile and cardiometabolic risk prediction in overweight-obese individuals. Clinical nutrition (Edinburgh, Scotland) 38(3): 1171-1179	- Outcome to be predicted do not match that specified in the protocol
Bello-Chavolla, Omar Yaxmehen, Almeda-Valdes, Paloma, Gomez-Velasco, Donaji et al. (2018) METS-IR, a novel score to evaluate insulin sensitivity, is predictive of visceral adiposity and incident type 2 diabetes. European journal of endocrinology 178(5): 533-544	- Assessment tool do not match that specified in the protocol
Caleyachetty R, Barber TM, Mohammed NI et al. (2021) Ethnicity-specific BMI cutoffs for obesity based on type 2 diabetes risk in England: a population-based cohort study. The lancet. Diabetes & endocrinology 9(7): 419-426	- Not a prognostic accuracy study
Castanheira, Marcelo, Chor, Dora, Braga, Jose Ueleres et al. (2018) Predicting cardiometabolic disturbances from waist-to-height ratio: findings from the Brazilian Longitudinal Study of Adult Health (ELSA-Brasil) baseline. Public health nutrition 21(6): 1028-1035	- Cross sectional study
Cheung, Bernard M Y, Wat, Nelson M S, Tam, Sidney et al. (2008) Components of the metabolic syndrome predictive of its development: a 6-year longitudinal study in Hong Kong Chinese. Clinical endocrinology 68(5): 730-7	- Outcome to be predicted do not match that specified in the protocol
Cheung, Yin Bun, Machin, David, Karlberg, Johan et al. (2004) A longitudinal study of pediatric body mass index values predicted health in middle age. Journal of clinical epidemiology 57(12): 1316-22	- Study in children

de Koning, Lawrence, Merchant, Anwar T, Pogue, Janice et al. (2007) Waist circumference and waist-to-hip ratio as predictors of cardiovascular events: meta-regression analysis of prospective studies. European heart journal 28(7): 850-6	- Systematic review used as source of primary studies
Esteghamati, Alireza, Mousavizadeh, Mostafa, Noshad, Sina et al. (2013) Accuracy of anthropometric parameters in identification of high-risk patients predicted with cardiovascular risk models. The American journal of the medical sciences 346(1): 26-31	- Cross sectional study
Farhangiyan, Zahra, Latifi, Seyed Mahmoud, Rashidi, Homeira et al. (2019) The most appropriate cut-off point of anthropometric indices in predicting the incidence of metabolic syndrome and its components. Diabetes & metabolic syndrome 13(4): 2739-2745	- Outcome to be predicted do not match that specified in the protocol
Freisling, Heinz, Arnold, Melina, Soerjomataram, Isabelle et al. (2017) Comparison of general obesity and measures of body fat distribution in older adults in relation to cancer risk: meta-analysis of individual participant data of seven prospective cohorts in Europe. British journal of cancer 116(11): 1486-1497	- Does not assess the prognostic accuracy of simple measures
Ge, Qiwei, Qi, Zhigang, Xu, Zhengcheng et al. (2021) Comparison of different obesity indices related with hypertension among different sex and age groups in China. Nutrition, metabolism, and cardiovascular diseases : NMCD 31(3): 793-801	- Cross sectional study
Guo, Heng, Liu, Jiaming, Zhang, Jingyu et al. (2016) The prevalence of metabolic syndrome using three different diagnostic criteria among low earning nomadic kazakhs in the far northwest of China: New cut-off points of waist circumference to diagnose mets and its implications. PLoS ONE 11(2): e0148976	- Cross sectional study
Ho, Sai-Yin, Lam, Tai-Hing, Janus, Edward D et al. (2003) Waist to stature ratio is more strongly associated with cardiovascular risk factors than other simple anthropometric indices. Annals of epidemiology 13(10): 683-91	- Cross sectional study
Janghorbani, Mohsen and Amini, Masoud (2016) The Visceral Adiposity Index in Comparison with Easily Measurable	- People with first degree relatives with type 2 diabetes

Anthropometric Markers Did Not Improve Prediction of Diabetes. Canadian journal of diabetes 40(5): 393-398	
Janghorbani, Mohsen and Amini, Masoud (2010) Comparison of body mass index with abdominal obesity indicators and waist-to-stature ratio for prediction of type 2 diabetes: The Isfahan diabetes prevention study. Obesity Research and Clinical Practice 4(1): e25-e32	- People with first degree relatives with type 2 diabetes
Janghorbani, Mohsen; Aminorroaya, Ashraf; Amini, Masoud (2017) Comparison of Different Obesity Indices for Predicting Incident Hypertension. High blood pressure & cardiovascular prevention : the official journal of the Italian Society of Hypertension 24(2): 157-166	- People included in the study had a family history of type 2 diabetes - People with first degree relatives with type 2 diabetes
Kariuki, Jacob K, Stuart-Shor, Eileen M, Leveille, Suzanne G et al. (2017) Validation of the nonlaboratory-based Framingham cardiovascular disease risk assessment algorithm in the Atherosclerosis Risk in Communities dataset. Journal of cardiovascular medicine (Hagerstown, Md.) 18(12): 936-945	- Evaluation of a risk assessment algorithm
Kazlauskaite R, Avery-Mamer EF, Li H et al. (2017) Race/ethnic comparisons of waist-to-height ratio for cardiometabolic screening: The study of women's health across the nation. American journal of human biology : the official journal of the Human Biology Council 29(1)	- Cross sectional study
Kengne, Andre Pascal, Beulens, Joline W J, Peelen, Linda M et al. (2014) Non-invasive risk scores for prediction of type 2 diabetes (EPIC-InterAct): a validation of existing models. The lancet. Diabetes & endocrinology 2(1): 19-29	- Validation of models to predict type 2 diabetes
Khera, Rohan, Pandey, Ambarish, Ayers, Colby R et al. (2020) Performance of the Pooled Cohort Equations to Estimate Atherosclerotic Cardiovascular Disease Risk by Body Mass Index. JAMA network open 3(10): e2023242	- Outcomes not separated by ethnicity
Kim, Yong Hwan and So, Wi-Young (2018) Anthropometrics and metabolic syndrome in healthy Korean adults: A 7-year longitudinal study. Journal of Men's Health 14(4): 1-10	- Outcome to be predicted do not match that specified in the protocol
Ko, Kwang-Pil, Oh, Dae-Kyu, Min, Haesook et al. (2012) Prospective study of optimal obesity index cutoffs for predicting development of	- Outcome to be predicted do not match that specified in the protocol

multiple metabolic risk factors: the Korean genome and epidemiology study. Journal of epidemiology 22(5): 433-9	
Lee, Sunghee, Lee, Seung Ku, Kim, Jong Yeol et al. (2017) Sasang constitutional types for the risk prediction of metabolic syndrome: A 14-year longitudinal prospective cohort study. BMC Complementary and Alternative Medicine 17(1): 438	- Outcome to be predicted do not match that specified in the protocol
Lim, Soo, Kim, Jung Hee, Yoon, Ji Won et al. (2012) Optimal cut points of waist circumference (WC) and visceral fat area (VFA) predicting for metabolic syndrome (MetS) in elderly population in the Korean Longitudinal Study on Health and Aging (KLoSHA). Archives of gerontology and geriatrics 54(2): e29-34	- Cross sectional study
Liu, Leilei, Liu, Yu, Sun, Xizhuo et al. (2018) Identification of an obesity index for predicting metabolic syndrome by gender: the rural Chinese cohort study. BMC endocrine disorders 18(1): 54	- Outcome to be predicted do not match that specified in the protocol
Lv, Yue-Bin, Shi, Xiao-Ming, Liu, Simin et al. (2018) Associations of Body Mass Index and Waist Circumference with 3-Year All-Cause Mortality Among the Oldest Old: Evidence from a Chinese Community-Based Prospective Cohort Study. Journal of the American Medical Directors Association 19(8): 672	- Not a prognostic accuracy study
Miklishanskaya, S.V.; Solomasova, L.V.; Mazur, N.A. (2021) Types of obesity and their prognostic value. Obesity Medicine 25: 100350	- Not a primary study or systematic review
Mousavi, S V, Mohebi, R, Mozaffary, A et al. (2015) Changes in body mass index, waist and hip circumferences, waist to hip ratio and risk of all-cause mortality in men. European journal of clinical nutrition 69(8): 927-32	- Not a prognostic accuracy study
Page, John H, Rexrode, Kathryn M, Hu, Frank et al. (2009) Waist-height ratio as a predictor of coronary heart disease among women. Epidemiology (Cambridge, Mass.) 20(3): 361-6	- Outcomes not separated by ethnicity
Pagsisihan, Daveric A., Sandoval, Mark Anthony, Paz-Pacheco, Elizabeth et al. (2016) Low indices of overweight and obesity are associated with cardiometabolic diseases among adult filipinos in a rural community.	- Cross sectional study

Journal of the ASEAN Federation of Endocrine Societies 31(2): 97-105	
Pavanello, Chiara, Zanaboni, Anna Maria, Gaito, Sabrina et al. (2018) Influence of body variables in the development of metabolic syndrome-A long term follow-up study. PloS one 13(2): e0192751	- Outcome to be predicted do not match that specified in the protocol
Qiao, Q and Nyamdorj, R (2010) Is the association of type II diabetes with waist circumference or waist-to-hip ratio stronger than that with body mass index?. European journal of clinical nutrition 64(1): 30-4	- Systematic review used as source of primary studies
Roberson, Lara L, Aneni, Ehimen C, Maziak, Wasim et al. (2014) Beyond BMI: The "Metabolically healthy obese" phenotype & its association with clinical/subclinical cardiovascular disease and all-cause mortality -- a systematic review. BMC public health 14: 14	- Systematic review used as source of primary studies
Romero-Saldana, Manuel, Fuentes-Jimenez, Francisco J, Vaquero-Abellan, Manuel et al. (2019) Predictive Capacity and Cutoff Value of Waist-to-Height Ratio in the Incidence of Metabolic Syndrome. Clinical nursing research 28(6): 676-691	- Outcome to be predicted do not match that specified in the protocol
Roswall, Nina, Li, Yingjun, Sandin, Sven et al. (2017) Changes in body mass index and waist circumference and concurrent mortality among Swedish women. Obesity (Silver Spring, Md.) 25(1): 215-222	- Not a prognostic accuracy study
Seo, Dong-Chul; Choe, Siyoung; Torabi, Mohammad R (2017) Is waist circumference >=102/88cm better than body mass index >=30 to predict hypertension and diabetes development regardless of gender, age group, and race/ethnicity? Meta-analysis. Preventive medicine 97: 100-108	- Systematic review used as source of primary studies
Simmonds, Mark, Burch, Jane, Llewellyn, Alexis et al. (2015) The use of measures of obesity in childhood for predicting obesity and the development of obesity-related diseases in adulthood: a systematic review and meta-analysis. Health technology assessment (Winchester, England) 19(43): 1-336	- Systematic review linked to childhood obesity
Song, Peige, Li, Xue, Bu, Yongjun et al. (2019) Temporal trends in normal weight central obesity and its associations with	- Not a prognostic accuracy study

cardiometabolic risk among Chinese adults. Scientific reports 9(1): 5411	
Tate, Joel, Knuiman, Matthew, Davis, Wendy A et al. (2020) A comparison of obesity indices in relation to mortality in type 2 diabetes: the Fremantle Diabetes Study. Diabetologia 63(3): 528-536	- Study population were previously diagnosed with type 2 diabetes
Tillin, T, Sattar, N, Godsland, I F et al. (2015) Ethnicity-specific obesity cut-points in the development of Type 2 diabetes - a prospective study including three ethnic groups in the United Kingdom. Diabetic medicine : a journal of the British Diabetic Association 32(2): 226-34	- Not a prognostic accuracy study
Tonstad, S and Graff-Iversen, S (2001) Action levels for obesity treatment in 40 to 42-y-old men and women compared with action levels for prevention of coronary heart disease. International journal of obesity and related metabolic disorders : journal of the International Association for the Study of Obesity 25(11): 1698-704	- Cross sectional study
Xu, Xinsen, Zhou, Lei, Miao, Runchen et al. (2016) Association of cancer mortality with postdiagnosis overweight and obesity using body mass index. Oncotarget 7(4): 5023-9	- Not a prognostic accuracy study
Xue, Ran, Li, Qianwen, Geng, Yaping et al. (2021) Abdominal obesity and risk of cardiovascular disease: A dose-response meta-analysis of 31 prospective studies. British Journal of Nutrition	- Systematic review used as source of primary studies
Zhang, Hui, Chen, Dandan, Shao, Jing et al. (2021) Development and internal validation of a prognostic model for 4-year risk of metabolic syndrome in adults: A retrospective cohort study. Diabetes, Metabolic Syndrome and Obesity: Targets and Therapy 14: 2229-2237	- Internal validation of a prognostic model
Zhang, HY, Shi, WH, Zhang, M et al. (2016) Establishing a noninvasive prediction model for type 2 diabetes mellitus based on a rural Chinese population. Zhonghua yu fang yi xue za zhi [Chinese journal of preventive medicine] 50(5): 397-403	- Study not reported in English
Zhong, Chong Ke, Zhong, Xiao Yan, Xu, Tan et al. (2016) Measures of Abdominal Adiposity and Risk of Stroke: A Dose-Response Meta-analysis	- Systematic review used as source of primary studies

of Prospective Studies. Biomedical and environmental sciences : BES 29(1): 12-23	

Diagnostic accuracy

Study	Code [Reason]
Adejumo, Esther Ngozi, Adejumo, Adedeji Olusola, Azenabor, Alfred et al. (2019) Anthropometric parameter that best predict metabolic syndrome in South west Nigeria. Diabetes & metabolic syndrome 13(1): 48-54	- Incorrect outcome: metabolic syndrome
Araneta, Maria Rosario G, Kanaya, Alka M, Hsu, William C et al. (2015) Optimum BMI cut points to screen asian americans for type 2 diabetes. Diabetes care 38(5): 814-20	- Accuracy outcomes are not sufficiently stratified within the Asian ethnicity
Bermudez, Valmore, Salazar, Juan, Rojas, Joselyn et al. (2016) Diabetes and Impaired Fasting Glucose Prediction Using Anthropometric Indices in Adults from Maracaibo City, Venezuela. Journal of community health 41(6): 1223-1233	- Incorrect population South American population
Beydoun, May A, Kuczmarski, Marie T Fanelli, Wang, Youfa et al. (2011) Receiver-operating characteristics of adiposity for metabolic syndrome: the Healthy Aging in Neighborhoods of Diversity across the Life Span (HANDLS) study. Public health nutrition 14(1): 77-92	- Outcome to be predicted does not match that specified in the protocol
Bohr, Adam D; Laurson, Kelly; McQueen, Matthew B (2016) A novel cutoff for the waist-to-height ratio predicting metabolic syndrome in young American adults. BMC public health 16: 295	- Outcomes not reported for separate ethnicities
Bouguerra, R, Alberti, H, Smida, H et al. (2007) Waist circumference cut-off points for identification of abdominal obesity among the tunisian adult population. Diabetes, obesity & metabolism 9(6): 859-68	- Incorrect population Arab or Iranian ethnicity
Browning, Lucy M; Hsieh, Shiun Dong; Ashwell, Margaret (2010) A systematic review of waist-to-height ratio as a screening tool for the prediction of cardiovascular disease and diabetes: 0.5 could be a suitable global boundary value. Nutrition research reviews 23(2): 247-69	- Systematic review Studies contributing data to the receiver operator characteristic (ROC) analysis were checked for inclusion in this review

Cheong, Kee Chee, Yusoff, Ahmad F, Ghazali, Sumarni M et al. (2013) Optimal BMI cut-off values for predicting diabetes, hypertension and hypercholesterolaemia in a multi-ethnic population. Public health nutrition 16(3): 453-9	- Study does not compare the accuracy of different measures of obesity
Correa, Marcia Mara, Thume, Elaine, De Oliveira, Elizabete Regina Araujo et al. (2016) Performance of the waist-to-height ratio in identifying obesity and predicting non-communicable diseases in the elderly population: A systematic literature review. Archives of gerontology and geriatrics 65: 174-82	- Systematic review Included studies checked for inclusion in this review
Darbandi, Mitra, Pasdar, Yahya, Moradi, Shima et al. (2020) Discriminatory Capacity of Anthropometric Indices for Cardiovascular Disease in Adults: A Systematic Review and Meta-Analysis. Preventing chronic disease 17: e131	- Systematic review Included studies checked for inclusion in this review
Deng, Guijuan, Yin, Lu, Liu, Weida et al. (2018) Associations of anthropometric adiposity indexes with hypertension risk: A systematic review and meta-analysis including PURE-China. Medicine 97(48): e13262	- Systematic review Included studies checked for inclusion in this review
Gadelha, Andre B, Myers, Jonathan, Moreira, Sergio et al. (2016) Comparison of adiposity indices and cut-off values in the prediction of metabolic syndrome in postmenopausal women. Diabetes & metabolic syndrome 10(3): 143-8	- Incorrect population
Ge, Qiwei, Qi, Zhigang, Xu, Zhengcheng et al. (2021) Comparison of different obesity indices related with hypertension among different sex and age groups in China. Nutrition, metabolism, and cardiovascular diseases : NMCD 31(3): 793-801	- Incorrect population Prognostic studies cover Chinese ethnicity
Hardy, Dale S., Garvin, Jane T., Xu, Hongyan et al. (2017) Anthropometric discriminators of type 2 diabetes among White and Black American adults. Journal of Diabetes 9(3): 296-307	- Not a diagnostic accuracy study
Hoebel, S.; De Ridder, J.H.; Malan, L. (2013) Determining ethnic-, gender-, and age-specific waist circumference cut-off points to predict metabolic syndrome: The Sympathetic Activity and Ambulatory Blood Pressure in Africans (SABPA) study. Journal of Endocrinology,	- Study does not compare the accuracy of different measures of obesity

Metabolism and Diabetes of South Africa 18(2): 88-96	
Huxley, R, James, W P T, Barzi, F et al. (2008) Ethnic comparisons of the cross-sectional relationships between measures of body size with diabetes and hypertension. Obesity reviews : an official journal of the International Association for the Study of Obesity 9suppl1: 53-61	- Results are not stratified by ethnicity In this study the results are broken down into Caucasian and Asian but this review is interested specifically in the South Asian population
Jafar, Tazeen H; Chaturvedi, Nish; Pappas, Gregory (2006) Prevalence of overweight and obesity and their association with hypertension and diabetes mellitus in an Indo-Asian population. CMAJ : Canadian Medical Association journal = journal de l'Association medicale canadienne 175(9): 1071-7	- Study does not compare the accuracy of different measures of obesity
Katchunga, Philippe Bianga, Hermans, Michel, Bamuleke, Bertrand Akonkwa et al. (2013) Relationship between waist circumference, visceral fat and metabolic syndrome in a Congolese community: further research is still to be undertaken. The Pan African medical journal 14: 20	- Study does not compare the accuracy of different measures of obesity
Kazlauskaite R, Avery-Mamer EF, Li H et al. (2017) Race/ethnic comparisons of waist-to-height ratio for cardiometabolic screening: The study of women's health across the nation. American journal of human biology : the official journal of the Human Biology Council 29(1)	- Study does not compare the accuracy of different measures of obesity
Kruger, H Salome, Schutte, Aletta E, Walsh, Corinna M et al. (2017) Body mass index cut-points to identify cardiometabolic risk in black South Africans. European journal of nutrition 56(1): 193-202	- Study does not compare the accuracy of different measures of obesity
Lawal, Yakubu, Bello, Fatima, Anumah, F E et al. (2019) Waist-height ratio: How well does it predict glucose intolerance and systemic hypertension?. Diabetes research and clinical practice 158: 107925	- Not a diagnostic accuracy study
Mabchour, Asma E. L., Delisle, Helene, Batal, Malek et al. (2015) Specific cut-off points for waist circumference and waist-to-height ratio as predictors of cardiometabolic risk in Black subjects: A cross-sectional study in Benin and Haiti. Diabetes, Metabolic Syndrome and Obesity: Targets and Therapy 8: 513-523	- Incorrect outcome: metabolic syndrome

Marcadenti, Aline, Fuchs, Sandra C, Moreira, Leila B et al. (2011) Accuracy of anthropometric indexes of obesity to predict diabetes mellitus type 2 among men and women with hypertension. American journal of hypertension 24(2): 175-80	- Incorrect population All the people recruited already had hypertension
Mussi, Ricardo Franklin de Freitas and Petroski, Edio Luiz (2019) Predictive capacity of obesity indicators for metabolic syndrome in adult quilombolas (inhabitants of black communities). Ciencia & saude coletiva 24(7): 2471-2480	- Incorrect population Not in Black African / Caribbean or South Asian population.
Nakamura, Kazuyo, Nanri, Hinako, Hara, Megumi et al. (2011) Optimal cutoff values of waist circumference and the discriminatory performance of other anthropometric indices to detect the clustering of cardiovascular risk factors for metabolic syndrome in Japanese men and women. Environmental health and preventive medicine 16(1): 52-60	- Incorrect population People from Japan
Namita and Ranjan, Din Prakash (2017) Study of body mass index, waist-to-hip ratio, systolic blood pressure-to-height ratio, and diastolic blood pressure-to-height ratio among pre-hypertensive and normotensive students. National Journal of Physiology, Pharmacy and Pharmacology 7(7): 665-673	- Outcome to be predicted do not match that specified in the protocol Pre-hypertension rather than hypertension
Oguoma, V M, Nwose, E U, Skinner, T C et al. (2016) Anthropometric indices: How they compare in screening of cardio- metabolic risks in a Nigerian sub-population. African journal of medicine and medical sciences 45(1): 91-98	- Unable to acquire this paper
Okosun, I S, Liao, Y, Rotimi, C N et al. (2000) Predictive values of waist circumference for dyslipidemia, type 2 diabetes and hypertension in overweight White, Black, and Hispanic American adults. Journal of clinical epidemiology 53(4): 401-8	- Study does not compare the accuracy of different measures of obesity
Pal, Amitava, De, Sujaya, Sengupta, Piyali et al. (2013) Re-evaluation of WHO-defined BMI cutoff value for defining overweight and obesity in the Bengalee (Indian) population. Mediterranean Journal of Nutrition and Metabolism 6(1): 31-37	- Outcome to be predicted do not match that specified in the protocol
Park, Jin-Sun, Ahn, Sung-Gyun, Hwang, Jung-Won et al. (2010) Impact of body mass index on the relationship of epicardial adipose tissue to	- Study does not compare the accuracy of different measures of obesity

metabolic syndrome and coronary artery disease in an Asian population. Cardiovascular diabetology 9: 29	
Pitkaniemi, J., Nyamdorj, R., Qiao, Q. et al. (2008) BMI compared with central obesity indicators in relation to diabetes and hypertension in Asians. Obesity 16(7): 1622-1635	- Accuracy outcomes are not sufficiently stratified within the Asian ethnicity
Pratyush, Daliparthy Devi, Tiwari, Shalbha, Singh, Saurabh et al. (2012) Waist circumference cutoff and its importance for diagnosis of metabolic syndrome in Asian Indians: A preliminary study. Indian journal of endocrinology and metabolism 16(1): 112-5	- Study does not compare the accuracy of different measures of obesity
Qiao, Q and Nyamdorj, R (2010) The optimal cutoff values and their performance of waist circumference and waist-to-hip ratio for diagnosing type II diabetes. European journal of clinical nutrition 64(1): 23-9	- Systematic review Included studies checked for inclusion in this review
Qureshi, Sarah Shoaib, Amer, Wasim, Kaleem, Maryam et al. (2019) Adult anthropometry in type 2 diabetic population: A case-control study. Pakistan Journal of Medical Sciences 35(5): 1284-1289	- Accuracy outcomes only reported graphically
Rahman, Md Mizanur, Akter, Shamima, Jung, Jenny et al. (2017) Trend, projection, and appropriate body mass index cut-off point for diabetes and hypertension in Bangladesh. Diabetes research and clinical practice 126: 43-53	- Systematic review Unable to access details of the included studies so they could not be checked for inclusion in this review
Raimi, Taiwo H., Dele-Ojo, Bolade F., Dada, Samuel A. et al. (2021) Triglyceride-Glucose Index and Related Parameters Predicted Metabolic Syndrome in Nigerians. Metabolic Syndrome and Related Disorders 19(2): 76-82	- The simple measures of obesity were mainly assessed in combination with the TyG index
Rajput, Rajesh, Singh, Jasminder, Saini, Ompal et al. (2014) Waist height ratio: A universal screening tool for prediction of metabolic syndrome in urban and rural population of Haryana. Indian Journal of Endocrinology and Metabolism 18(3): 394-399	- Incorrect outcome: metabolic syndrome
Rao, Shobha S, Parab, Prajakta S, Gokhale, Medha K et al. (2010) Parental history lowers body mass index risk cutoff for hypertension among urban Indian adults. Journal of the American College of Nutrition 29(3): 228-35	- Study does not compare the accuracy of different measures of obesity

Ray, Lopamudra; Ravichandran, Kandasamy; Nanda, Sunil Kumar (2018) Comparison of Lipid Accumulation Product Index with Body Mass Index and Waist Circumference as a Predictor of Metabolic Syndrome in Indian Population. Metabolic syndrome and related disorders 16(5): 240-245	- Incorrect outcome: metabolic syndrome
Rico-Martin, Sergio, Calderon-Garcia, Julian F, Sanchez-Rey, Purificacion et al. (2020) Effectiveness of body roundness index in predicting metabolic syndrome: A systematic review and meta-analysis. Obesity reviews : an official journal of the International Association for the Study of Obesity 21(7): e13023	- Systematic review Included studies checked for inclusion within this review
Salazar, Martin R., Carbajal, Horacio A., Espeche, Walter G. et al. (2011) Relationships among insulin resistance, obesity, diagnosis of the metabolic syndrome and cardio-metabolic risk. Diabetes and Vascular Disease Research 8(2): 109-116	- Incorrect population People from South America
Shah, A, Bhandary, S, Malik, S L et al. (2009) Waist circumference and waist-hip ratio as predictors of type 2 diabetes mellitus in the Nepalese population of Kavre District. Nepal Medical College journal : NMCJ 11(4): 261-7	- Unable to acquire this paper
Shahid, Rahat, Fazal, Nadeem, Ijaz, Aamir et al. (2019) Comparison of various abdominal obesity measures for predicting metabolic syndrome, diabetes, nephropathy, and dyslipidemia. Journal of the College of Physicians and Surgeons Pakistan 29(12): 1159-1164	- Outcome to be predicted do not match that specified in the protocol Gestational diabetes
Sosenko, J M, Kato, M, Soto, R et al. (1993) A comparison of adiposity measures for screening non-insulin dependent diabetes mellitus. International journal of obesity and related metabolic disorders : journal of the International Association for the Study of Obesity 17(8): 441-4	- Results are not stratified by ethnicity
Staiano, Amanda E; Bouchard, Claude; Katzmarzyk, Peter T (2013) BMI-specific waist circumference thresholds to discriminate elevated cardiometabolic risk in White and African American adults. Obesity facts 6(4): 317-24	- Accuracy outcomes do not match the protocol

Tladi, D.M., Mitchell, R., Mokgothu, C.J. et al. (2020) Determination of optimal cut-off values for waist circumferences used for the diagnosis of the metabolic syndrome among Batswana adults (ELS 32). Cardiovascular Journal of Africa 31(6): 314-318	- Study does not compare the accuracy of different measures of obesity
Tulloch-Reid, Marshall K., Ferguson, Trevor S., Younger, Novie O.M. et al. (2010) Appropriate waist circumference cut points for identifying insulin resistance in black youth: A cross sectional analysis of the 1986 Jamaica birth cohort. Diabetology and Metabolic Syndrome 2(1): 68	- Study does not compare the accuracy of different measures of obesity
Vikram, N K, Misra, A, Pandey, R M et al. (2003) Anthropometry and body composition in northern Asian Indian patients with type 2 diabetes: receiver operating characteristics (ROC) curve analysis of body mass index with percentage body fat as standard. Diabetes, nutrition & metabolism 16(1): 32-40	- All the people in the study had the condition of interest
Wai, Wint S, Dhami, Ranjodh S, Gelaye, Bizu et al. (2012) Comparison of measures of adiposity in identifying cardiovascular disease risk among Ethiopian adults. Obesity (Silver Spring, Md.) 20(9): 1887-95	- Outcome to be predicted do not match that specified in the protocol CVD risk factors rather than CVD
Warne, D K, Charles, M A, Hanson, R L et al. (1995) Comparison of body size measurements as predictors of NIDDM in Pima Indians. Diabetes care 18(4): 435-9	- Incorrect population Pima Indians
Zerga, Aregash Abebayehu, Tadesse, Sisay Eshete, Bezabih, Afework Mulugeta et al. (2020) Obesity indices for identifying metabolic syndrome among type two diabetes patients attending their follow-up in dessie referral hospital, north east Ethiopia. Diabetes, Metabolic Syndrome and Obesity: Targets and Therapy 13: 1297-1304	- Incorrect population The population had previously all been diagnosed with type II diabetes

Appendix M– Research recommendations – full details

Research recommendation

What are the most accurate and suitable measurements and boundary values to assess the health risk associated with overweight and obesity in adults of different ethnicities, particularly those with mixed, Black, Asian and minority family backgrounds?

Why this is important

There are currently limited prognostic accuracy studies linking simple anthropometric measures to future health outcomes stratified by the ethnicity of the people being followed. This guideline review found no prognostic accuracy studies in people of a South Asian family background and few in people with a black African / Caribbean family background. In addition, the great majority of studies included in the review were not UK based and it would be more appropriate to judge the accuracy of the measures in people within a UK context. It would also be useful to assess accuracy of published thresholds which can then be used to define overweight and obesity in adults.

Rationale for research recommendation

Importance to 'patients' or the population	Utilising the most accurate measure top assess the link of between overweight, obesity and central obesity to future health risks will support people to make more informed decision-making linked to weight management. Stratifying the analysis by ethnic family background will address known variation in health risks linked to central adiposity.
Relevance to NICE guidance	This guideline found there was limited ethnicity specific prognostic accuracy data linking simple measures to health outcomes in a UK population.
Relevance to the NHS	The outcome would provide UK population data linking simple measurements of overweight, obesity and central adiposity to health risks specific to a person's ethnic background.
National priorities	High
Current evidence base	Very little UK research specific to a person's ethnic background.
Equality considerations	None known

Modified PICO table

Population	Adults aged 18 years and above. Population should be stratified by ethnicity: • White • Black African/ Caribbean • Asian (South Asian, Chinese, any other Asian background) • Other ethnic groups (Arab, any other ethnic group) • Multiple/mixed ethnic group
Test	Method of measurement (and associated boundary values): • BMI • Waist-to-height ratio • Waist-to-hip ratio

	• Waist circumference Combinations of methods of measurement.
Reference standard	Development of a condition of interest: • Type 2 diabetes • Cardiovascular disease (including coronary heart disease) • Cancer • Dyslipidaemia • Hypertension • All-cause Mortality
Outcome	Prognostic accuracy: • Sensitivity • Specificity • Likelihood ratios • Predictive values The optimal/most appropriate cut-offs to predict the development of the relevant conditions.
Study design	Prognostic accuracy study
Timeframe	Mean follow-up should be 3 years at a minimum
Additional information	Study should include a large sample size (e.g. greater than 1000)