National Institute for Health and Care Excellence

Draft

Chronic kidney disease

[A] Evidence reviews for the diagnostic accuracy of eGFR calculations in adults, children, and young people from black, Asian and other minority ethnic groups with CKD

NICE guideline <number>

Evidence review underpinning recommendation 1.1.3 and research recommendations on diagnostic accuracy of eGFR calculations in adults, children, and young people from black, Asian and other minority ethnic groups with CKD living in the UK in the NICE guideline

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Draft for Consultation

These evidence reviews were developed by Guideline Updates Team

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ISBN:

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Diagnostic accuracy of eGFR calculations in adults, children, and young people from Black, Asian and other minority ethnic groups with chronic kidney disease (CKD)

1.1 Review question

In adults, children, and young people from black, Asian and other minority ethnic groups with CKD, what is the diagnostic accuracy of eGFR calculations?

1.1.1 Introduction

The NICE guideline on chronic kidney disease in adults: assessment and management (NICE guideline CG182) was reviewed in 2017 as part of NICE's surveillance programme. As a result of the review, the decision was made to update the guideline. During the scope of the update and as part of the guideline equality impact assessment, it was suggested to consider ethnicity modifiers for the different estimated glomerular filtration rate (eGFR) calculations. Stakeholders highlighted that there are equalities issues surrounding implementation of the recommendations with some population groups not receiving the care they should and limited access to services in certain areas of the country.

The aim of this review is to determine diagnostic accuracy of eGFR calculations in adults, children, and young people from black, Asian and other minority ethnic groups with CKD. See Appendix A for full details of the review protocol.

1.1.2 Summary of the protocol

Table 1: PICO table

Population	Adults, children, and young people from black, Asian and other minority ethnic groups with suspected or diagnosed chronic kidney disease GFR categories G1 to G5. Exclusion: • people receiving renal replacement therapy (RRT) • people with acute kidney injury combined with rapidly progressive glomerulonephritis • pregnant women • people receiving palliative care.
Test	Adjusted and unadjusted (for race) eGFR equations
Reference standard	Measured GFR • (urinary or plasma clearance of inulin, iohexol, iothalamate, para aminohippurate [PAH], diethylenetriaminepentaacetic acid [DTPA] or ethylenediaminetetraacetic acid [EDTA]).
Outcomes	• Likelihood ratios • P30, P15, P5 values • Sensitivity/specificity • PPV and NPV

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 section in Appendix B.

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

Protocol deviation

GRADE was not used in this review for the following reasons:

- Imprecision could not be evaluated because P15 and P30 accuracy values could not be used as minimal clinically important differences. P values refer to the percentage of participants with an index test value (eGFR score) sufficiently close to their score on the reference standard (measured GFR [mGFR]). P values P30, P15 and P5 were deemed useful for decision making (referring to the percentage of the total sample who had an index test score within 5%, 15% and 30% of their reference standard score, respectively).
- Three studies reported sensitivity and specificity without confidence intervals, none reported likelihood ratios and 2 x 2 table and confidence intervals for sensitivity and specificity could not be calculated. Therefore, imprecision could not be evaluated on these studies either.

The following methods were specific for this review:

1. The QUADAS (quality assessment tool for diagnostic accuracy studies) was used to assess the risk of bias in the included studies. QUADAS includes questions about the interpretation of the tests (index and reference standard) which are not relevant for the aim of this review which is not about interpretation but calculation of eGFR using different equations from objective measures such as serum creatinine or cystatin-c levels, age, and gender (see the list of equations on Appendix M). Therefore, those questions in QUADAS were marked as 'unclear' without leading to an increased risk of bias in the overall judgement. These questions were:
    a. Were the index test results interpreted without knowledge of the results of the reference standard?
    b. Were the reference standard results interpreted without knowledge of the results of the index test?

1.1.4 Diagnostic evidence

1.1.4.1 Included studies

A systematic search was carried out to identify cross-sectional studies and systematic reviews of cross-sectional studies, which found 6,896 references (see Appendix C for the literature search strategy). Based on title and abstract screening, 6,770 references were excluded, and 126 references were ordered for full text screening. In total 29 cross sectional studies were included based on their relevance to the review protocol (Appendix A). The diagnostic evidence study selection is presented as a PRISMA diagram in Appendix D.

A second set of searches were conducted at the end of the guideline development process for all updated review questions using the original search strategies, to capture papers published whilst the guideline was being developed. This search returned 271 references for this review question. Two cross sectional studies were ordered for full text screening and both were included based on their relevance to the review protocol (**Error! Reference source not found.**).

See section 1.1.11 References – included studies for a list of references for included studies.

1.1.4.2 Excluded studies

See Appendix K for a list of excluded studies with the primary reason for exclusion.

1.1.5 Summary of studies included in the diagnostic evidence

Table 2 Summary of studies included in the diagnostic evidence

Study	Characteristics	CKD-EPI original equations	Index test - CKD-EPI ethnicity adjusted equations in brackets	Reference standard - measured GFR by:
Chen 2014	Country: Taiwan Sample size: 139 Adults with CKD	CKD-EPI creatinine 2009	CKD-EPI creatinine 2009 (Asian v2, Asian v3, Japanese, Taiwanese, Taiwanese Asian v1)	Inulin Clearance
Du 2012	Country: China Sample size: 111 Adults with kidney damage	-	CKD-EPI creatinine 2009 (Asian v1) CKD-EPI cystatin C 2008 Cystatin alone (Chinese v1) CKD-EPI creatinine-cystatin C 2008 v1 (Chinese v1)	99mTc-DTPA
Feng 2013	Country: China Sample size: 101 Adults with CKD	CKD-EPI cystatin C 2008 Cystatin alone; CKD-EPI creatinine-cystatin C 2011 v2	CKD-EPI cystatin C 2008 Cystatin alone (Chinese v1, Chinese v2) CKD-EPI creatinine-cystatin C 2008 v1 (Chinese v1, Chinese v2)	99mTc-DTPA clearance
Guan 2018	Country: China Sample size: 368 Adults with CKD	CKD-EPI creatinine-cystatin C 2012	CKD-EPI creatinine-cystatin C 2008 v1 (Chinese v1, Chinese v2)	99m Tc-DTPA
Guo 2014	Country: China Sample size: 252 Adults with CKD	CKD-EPI creatinine 2009; CKD-EPI cystatin C 2012; CKD-EPI creatinine-cystatin C 2012	CKD-EPI cystatin C 2008 Cystatin alone (Chinese v2) CKD-EPI creatinine-cystatin C 2008 v1 (Chinese v2)	99mTc-DTPA
Holness 2020	Country: South Africa Sample size: 80 Adults with CKD (10 potential donors, 2 healthy)	CKD-EPI creatinine 2009 without ethnicity factor	CKD-EPI creatinine 2009 with black ethnicity factor	99mTc-DTPA

Study	Characteristics	CKD-EPI original equations	Index test - CKD-EPI ethnicity adjusted equations in brackets	Reference standard - measured GFR by:
Horio 2010 Horio 2013a Horio 2013b	Country: Japan Sample size: 350 Adults with CKD	CKD-EPI cystatin C 2012 CKD-EPI creatinine-cystatin C 2012	CKD-EPI creatinine 2009 (Japanese) CKD-EPI cystatin C 2008 Cystatin + age + sex (Japanese) CKD-EPI creatinine-cystatin C 2008 v1 (Japanese) CKD-EPI creatinine-cystatin C 2012 (Japanese)	Serum and urine inulin clearance
Hu 2019	Country: China Sample size: 1,471 Adults with CKD	CKD-EPI cystatin C 2012	CKD-EPI cystatin C 2008 Cystatin alone (Chinese v2)	99mTc-DTPA
Jeong 2017	Country: Korea Sample size: 1,312 Adults with CKD	CKD-EPI creatinine 2009	CKD-EPI creatinine 2009 (Asian v2)	51Cr-EDTA
Jessani 2014	Country: Pakistan Sample size: 581 Adults with CKD	CKD-EPI creatinine 2009	CKD-EPI creatinine 2009 (Pakistan)	Urinary clearance of inulin
Kong 2013	Country: China Sample size: 682 Adults with CKD	CKD-EPI creatinine 2009	CKD-EPI creatinine 2009 (Asian v1)	99mTc-DTPA
Li 2017	Country: China Sample size: 839 Old adults with CKD	CKD-EPI cystatin C 2012 CKD-EPI creatinine-cystatin C 2012	CKD-EPI cystatin C 2012 (Chinese v1) CKD-EPI creatinine-cystatin C 2012 (Chinese v1)	9mTc-DTPA
Li 2010	Country: China Sample size: 257 Adults with CKD and with or without diabetes	CKD-EPI creatinine-cystatin C 2008 v1	CKD-EPI creatinine-cystatin C 2008 v1 (Chinese v1)	99mTc-DTPA
Liu 2014	Country: China Sample size: 210 Adults with CKD and type 2 diabetes	CKD-EPI creatinine 2009	CKD-EPI creatinine 2009 (Asian v1, Asian v5)	99mTc-DTPA

Study	Characteristics	CKD-EPI original equations	Index test - CKD-EPI ethnicity adjusted equations in brackets	Reference standard - measured GFR by:
Ma 2007	Country: China Sample size: 567 Adults with CKD	-	CKD-EPI cystatin C 2008 Cystatin alone (Chinese v1) CKD-EPI creatinine-cystatin C 2008 v1 (Chinese v3)	99mTc-DTPA
Pei 2013b	Country: China Sample size: 534 Adults with CKD	CKD-EPI creatinine 2009	CKD-EPI creatinine-cystatin C 2008 v1 (Chinese)	99mTc-DTPA
Pei 2012b	Country: China Sample size: 569 Adults with CKD	CKD-EPI creatinine 2009	CKD-EPI creatinine-cystatin C 2008 v1 (Chinese v1)	99mTc-DTPA
Pei 2012a	Country: China Sample size: 110 Adults with CKD	CKD-EPI creatinine 2009 CKD-EPI cystatin C 2011 equations re-expressed for standardized Scys v1 CKD-EPI cystatin C 2008 Cystatin + age + race + sex CKD-EPI creatinine-cystatin C 2008 v1	CKD-EPI creatinine-cystatin C 2008 v1 (Chinese v1)	99mTc-DTPA
Pei 2013a	Country: China Sample size: 703 Adults with CKD	CKD-EPI creatinine 2009	CKD-EPI creatinine 2009 (Chinese v1)	99mTc-DTPA
Rocha 2020	Country: Brazil Sample size: 100 (n=61 African Brazilian) Adults with CKD	CKD-EPI creatinine 2009 without ethnicity factor CKD-EPI creatinine-cystatin C 2012 without ethnicity factor	CKD-EPI creatinine 2009 with black ethnicity factor CKD-EPI creatinine-cystatin C 2012 with black ethnicity factor	Cr-EDTA
Stevens 2011	Country: US, Europe, Asia and South Africa Sample size: white and other (n=3,378), black (n=483),	-	CKD-EPI creatinine 2009 (Asian v1; Black race v1; Black race v2; Hispanic and Native American race; White and other race v1 and v2)	Urinary clearance of iothalamate

Study	Characteristics	CKD-EPI original equations	Index test - CKD-EPI ethnicity adjusted equations in brackets	Reference standard - measured GFR by:
	Asian (n=990) Native American and Hispanic (n=185) Adults with CKD			
Teo 2012	Country: Singapore Sample size: Chinese (n=94) Malay (n=74) Indian and others (n= 64) Adults with CKD	CKD-EPI creatinine 2009 CKD-EPI cystatin C 2011 equations re-expressed for standardized Scys v1 CKD-EPI cystatin C 2011 equations re-expressed for standardized Scys v2 CKD-EPI creatinine-cystatin C 2011 v2	CKD-EPI cystatin C 2008 Cystatin alone (Chinese v1) CKD-EPI creatinine-cystatin C 2008 v1 (Chinese v1, Chinese v3)	99mTc-DTPA
Tong 2017	Country: China Sample size: 545 Adults with CKD and cancer	CKD-EPI creatinine 2009 CKD-EPI cystatin C 2012 CKD-EPI creatinine-cystatin C 2012	CKD-EPI creatinine 2009 (Asian v4) CKD-EPI creatinine-cystatin C 2008 v1 (Chinese v1)	99mTc-DTPA
van Deventer 2011	Country: South Africa Sample size: 50 Adults with CKD	CKD-EPI creatinine 2009 without ethnicity factor	-	51Cr-EDTA plasma clearance
Wang 2016	Country: China Sample size: 170 Adults with CKD	CKD-EPI creatinine 2009	CKD-EPI creatinine 2009 (Asian v1)	99mTc-DTPA
Xie 2017	Country: China Sample size: 170 Adults with CKD	CKD-EPI creatinine 2009	CKD-EPI creatinine 2009 (Asian v5)	99mTc-DTPA
Yang 2017	Country: China Sample size: 632 Adults with CKD	CKD-EPI creatinine 2009 CKD-EPI cystatin C 2012 CKD-EPI creatinine-cystatin C 2012	CKD-EPI cystatin C 2008 Cystatin alone (Chinese v1) CKD-EPI creatinine-cystatin C 2008 v1 (Chinese v1)	99mTc-DTPA
Yang 2019	Country: China	CKD-EPI creatinine 2009	CKD-EPI creatinine 2009 (Chinese v2)	99mTc-DTPA

Study	Characteristics	CKD-EPI original equations	Index test - CKD-EPI ethnicity adjusted equations in brackets	Reference standard - measured GFR by:
	Sample size: 313 Adults with CKD	CKD-EPI cystatin C 2012 CKD-EPI creatinine-cystatin C 2012	CKD-EPI cystatin C 2012 (Chinese v2) CKD-EPI creatinine-cystatin C 2012 (Chinese v2)	
Ye 2016	Country: China Sample size: 1,522 Adults with CKD	CKD-EPI creatinine 2009 CKD-EPI cystatin C 2012 CKD-EPI creatinine-cystatin C 2012	CKD-EPI creatinine 2009 (Chinese v1) CKD-EPI cystatin C 2008 Cystatin alone (Chinese v1 and Chinese v2) CKD-EPI creatinine-cystatin C 2008 v1 (Chinese v1 and Chinese v2)	99mTc-DTPA

See Appendix E for full evidence tables.

1.1.6 Summary of the diagnostic evidence

Table 3 CKD-EPI creatinine 2009 – Adults with CKD

CKD-EPI equations – adjusted version	P15 median (range) No. of studies (sample) Ethnicity	P30 median (range) No. of studies (sample) Ethnicity	Sensitivity (95% CI) No. of studies (sample) Ethnicity	Specificity (95% CI) No. of studies (sample) Ethnicity
CKD-EPI creatinine 2009	42.2 (29.8 to 56.4) 3 studies (n=2,006) Chinese, Indian, Malay	70.6 (37.1 to 87.8) 18 studies (n=6,732) Chinese, Indian, Korean, Malay, Pakistani, South African, Taiwanese, Brazilian	63.4[a] 1 study (n=632) Chinese	95.1[a] 1 study (n=632) Chinese
CKD-EPI creatinine 2009 without ethnicity factor	46 1 study (n=50) South African	72.5 (72 to 75.4) 3 studies (n=191) South African, Brazilian	91 (71 to 99)[b] 1 study (n=50) South African	93 (76 to 99)[b] 1 study (n=50) South African
Asian v1	Not reported	78.4 (61 to 85) 3 studies (n=447) Asian, Chinese	Not reported	Not reported

CKD-EPI equations – adjusted version	P15 median (range) No. of studies (sample) Ethnicity	P30 median (range) No. of studies (sample) Ethnicity	Sensitivity (95% CI) No. of studies (sample) Ethnicity	Specificity (95% CI) No. of studies (sample) Ethnicity
Asian v2	Not reported	63.6 (52.5 to 74.7) 2 studies (n=1,451) Korean, Taiwanese	Not reported	Not reported
Asian v3	Not reported	54 1 study (n=139) Taiwanese	Not reported	Not reported
Asian v4	Not reported	40.55 1 study (n=545) Chinese	Not reported	Not reported
Asian v5	Not reported	61.7 (52.1 to 71.4) 2 studies (n=380) Chinese	Not reported	Not reported
Japanese	Not reported	72.7 (70 to 75) 2 studies (n=489) Japanese, Taiwanese	Not reported	Not reported
Taiwanese	Not reported	73.4 1 study (n=139) Taiwanese	Not reported	Not reported
Taiwanese Asian v1	Not reported	74.1 1 study (n=139) Taiwanese	Not reported	Not reported
Pakistan	Not reported	74.2 1 study (n=281) Pakistani	Not reported	Not reported
Chinese v1	43.9 1 study (n=1,522) Chinese	77.9 (71.4 to 84.5) 2 studies (n=2,225) Chinese	Not reported	Not reported
Chinese v2	Not reported	43.4 1 study (n=313) Chinese	Not reported	Not reported

CKD-EPI equations – adjusted version	P15 median (range) No. of studies (sample) Ethnicity	P30 median (range) No. of studies (sample) Ethnicity	Sensitivity (95% CI) No. of studies (sample) Ethnicity	Specificity (95% CI) No. of studies (sample) Ethnicity
Black race v1	Not reported	82 1 study (n=384) African origin	Not reported	Not reported
Black race v2	Not reported	82 1 study (n=384) African origin	Not reported	Not reported
White and other race v1	Not reported	85 1 study (n=67) Asian	Not reported	Not reported
White and other race v2	Not reported	80 1 study (n=185) Native American and Hispanic	Not reported	Not reported
Hispanic and Native American race	Not reported	81 1 study (n=185) Native American and Hispanic	Not reported	Not reported

(a) The cut-off value for eGFR and mGFR was <60 mL/min/1.73 m^2 to predict diagnosis of CKD (one or more markers of kidney damage or GFR <60 present for >3 months [KDOQI criteria])
(b) The cut-off value for eGFR and mGFR was <60 mL/min/1.73 m^2

Table 4 CKD-EPI creatinine 2009 – Adults with mGFR ≥60

CKD-EPI equations – adjusted version	P15 median (range) No. of studies (sample) Ethnicity	P30 median (range) No. of studies (sample) Ethnicity	Sensitivity No. of studies (sample) Ethnicity	Specificity No. of studies (sample) Ethnicity
CKD-EPI creatinine 2009	45.0 (40.6 to 49.4) 2 studies (n=1,029) Chinese	78.2 (65.0 to 91.7) 6 studies (n=1,968) Chinese, Korean, Taiwanese	Not reported	Not reported
Asian v1	Not reported	71.0 1 study (n=124) Chinese	Not reported	Not reported

CKD-EPI equations – adjusted version	P15 median (range) No. of studies (sample) Ethnicity	P30 median (range) No. of studies (sample) Ethnicity	Sensitivity No. of studies (sample) Ethnicity	Specificity No. of studies (sample) Ethnicity
Asian v2	Not reported	75.0 (57.5 to 92.6) 2 studies (n=754) Korean, Taiwanese	Not reported	Not reported
Asian v3	Not reported	57.5 1 study (n=80) Taiwanese	Not reported	Not reported
Asian v5	Not reported	80.6 1 study (n=124) Chinese	Not reported	Not reported
Japanese	Not reported	84.6 (81.3 to 88.0) 2 studies (n=430) Japanese, Taiwanese	Not reported	Not reported
Taiwanese	Not reported	81.3 1 study (n=80) Taiwanese	Not reported	Not reported
Taiwanese Asian v1	Not reported	81.3 1 study (n=80) Taiwanese	Not reported	Not reported
Chinese v1	54.2 1 study (n=928) Chinese	85 1 study (n=928) Chinese	Not reported	Not reported

Table 5 CKD-EPI creatinine 2009 – Adults with mGFR <60

CKD-EPI equations – adjusted version	P15 median (range) No. of studies (sample) Ethnicity	P30 median (range) No. of studies (sample) Ethnicity	Sensitivity No. of studies (sample) Ethnicity	Specificity No. of studies (sample) Ethnicity
CKD-EPI creatinine 2009	23.3 (22.5 to 24.1) 2 studies (n=745) Chinese	51.2 (44.2 to 71.4) 7 studies (n=1,973) Chinese, Korean, Taiwanese	87.9[a] 1 study (n=396) Chinese	91.6[a] 1 study (n=396) Chinese

CKD-EPI equations – adjusted version	P15 median (range) No. of studies (sample) Ethnicity	P30 median (range) No. of studies (sample) Ethnicity	Sensitivity No. of studies (sample) Ethnicity	Specificity No. of studies (sample) Ethnicity
Asian v1	Not reported	46.5 1 study (n=86) Chinese	83.8[a] 1 study (n=396) Chinese	93.4[a] 1 study (n=396) Chinese
Asian v2	Not reported	50.8 (45.8 to 55.8) 2 studies (n=697) Korean, Taiwanese	Not reported	Not reported
Asian v3	Not reported	49 1 study (n=59) Taiwanese	Not reported	Not reported
Asian v5	Not reported	58.1 1 study (n=86) Chinese	Not reported	Not reported
Japanese	Not reported	60.5 (56 to 65) 2 studies (n=409) Japanese, Taiwanese	Not reported	Not reported
Taiwanese	Not reported	62.7 1 study (n=59) Taiwanese	Not reported	Not reported
Taiwanese Asian v1	Not reported	64.4 1 study (n=59) Taiwanese	Not reported	Not reported
Chinese v1	27.8 1 study (n=594) Chinese	50 1 study (n=594) Chinese	Not reported	Not reported

(a) The cut-off value for eGFR and mGFR was <60 mL/min/1.73 m^2 to predict GFR categories G3 to G5

Table 6 CKD-EPI creatinine 2009 – Adults with mGFR G1 and G2

CKD-EPI equations – adjusted version	P15 median (range) No. of studies (sample) Ethnicity	P30 median (range) No. of studies (sample) Ethnicity	Sensitivity median (range) No. of studies (sample) Ethnicity	Specificity median (range) No. of studies (sample) Ethnicity
CKD-EPI creatinine 2009	47.4 (46 to 48.8) 1 study (n=286) Chinese	84.5 (57.5 to 92.7) 4 studies (n=1,235) Chinese	61.7 (60 to 63.4)[a] 1 study (n=286) Chinese	87.4 (81.2 to 93.7)[a] 1 study (n=286) Chinese
Asian v1	51.8 (48.4 to 55.2) 1 study (n=286) Chinese	86.8 (78.9 to 100) 2 studies (n=302) Chinese	64.2 (59.6 to 68.8)[a] 1 study (n=286) Chinese	86.0 (80.6 to 91.4)[a] 1 study (n=286) Chinese
Japanese	Not reported	90.5 (86 to 95) 1 study (n=131) Japanese	Not reported	Not reported

(a) The cut-off value for eGFR and mGFR was ≥60 mL/min/1.73 m^2 to predict GFR categories G1 and G2

Table 7 CKD-EPI creatinine 2009 – Adults with mGFR G3

CKD-EPI equations – adjusted version	P15 median (range) No. of studies (sample) Ethnicity	P30 median (range) No. of studies (sample) Ethnicity	Sensitivity No. of studies (sample) Ethnicity	Specificity No. of studies (sample) Ethnicity
CKD-EPI creatinine 2009	42.6 1 study (n=197) Chinese	57.94 (36.4 to 68) 4 studies (n=677) Chinese	71.1[a] 1 study (n=197) Chinese	86.6[a] 1 study (n=197) Chinese
Asian v1	35 1 study (n=197) Chinese	58.05 (55.7 to 60.4) 2 studies (n=258) Chinese	65[a] 1 study (n=197) Chinese	86.6[a] 1 study (n=197) Chinese
Japanese	Not reported	71 1 study (n=113) Japanese	Not reported	Not reported

(a) The cut-off value for eGFR and mGFR was 30 to 59 mL/min/1.73 m^2 to predict GFR category G3

Table 8 CKD-EPI creatinine 2009 – Adults with mGFR G4 and G5

CKD-EPI equations – adjusted version	P15 median (range) No. of studies (sample) Ethnicity	P30 median (range) No. of studies (sample) Ethnicity	Sensitivity median (range) No. of studies (sample) Ethnicity	Specificity median (range) No. of studies (sample) Ethnicity
CKD-EPI creatinine 2009	29.65 (29.6 to 29.7) 1 study (n=199) Chinese	47.1 (26.7 to 54.5) 4 studies (n=346) Chinese	62.5 (51.5 to 73.5)[a] 1 study (n=199) Chinese	96.3 (94.5 to 98.1)[a] 1 study (n=199) Chinese
Asian v1	27.2 (23.8 to 30.6) 1 study (n=199) Chinese	46.2 (40.0 to 50.0) 2 studies (n=233) Chinese	58.9 (47.5 to 70.4)[a] 1 study (n=199) Chinese	96.5 (94.7 to 98.3)[a] 1 study (n=199) Chinese
Japanese	Not reported	58 1 study (n=93) Japanese	Not reported	Not reported

(a) The cut-off value for eGFR and mGFR was ≥60 mL/min/1.73 m^2 to predict GFR categories G1 and G2

Table 9 CKD-EPI cystatin C 2008 Cystatin alone

CKD-EPI equations – adjusted version	P15 median (range) No. of studies (sample) Ethnicity	P30 median (range) No. of studies (sample) Ethnicity	Sensitivity No. of studies (sample) Ethnicity	Specificity No. of studies (sample) Ethnicity
Adults with CKD				
CKD-EPI cystatin C 2008 Cystatin alone	34.65 1 study (n=101) Chinese	63.37 1 study (n=101) Chinese	Not reported	Not reported
Chinese v1	42.1 (39.6 to 44.7) 4 studies (n=2,284) Chinese	65.3 (50.8 to 72.3) 5 studies (n=2,916) Chinese	73.3[a] 1 study (n=632)	93.3[a] 1 study (n=632)
Chinese v2	41.5 (38.9 to 46.6) 3 studies (n=1,875) Chinese	67.0 (50.8 to 76.2) 4 studies (n=3,346) Chinese	Not reported	Not reported
Adults with mGFR ≥60				

CKD-EPI equations – adjusted version	P15 median (range) No. of studies (sample) Ethnicity	P30 median (range) No. of studies (sample) Ethnicity	Sensitivity No. of studies (sample) Ethnicity	Specificity No. of studies (sample) Ethnicity
Chinese v1	48 1 study (n=928) Chinese	78.7 1 study (n=928) Chinese	Not reported	Not reported
Chinese v2	57.5 (52.6 to 62.4) 2 studies (n=1,029) Chinese	85.1 (84.1 to 86.1) 2 studies (n=1,029) Chinese	Not reported	Not reported
Adults with mGFR <60				
Chinese v1	33.7 1 study (n=594) Chinese	62.1 1 study (n=594) Chinese	Not reported	Not reported
Chinese v2	30.3 (23.2 to 37.4) 2 studies (n=745) Chinese	54.8 (45.7 to 64.0) 2 studies (n=745) Chinese	Not reported	Not reported
Adults with mGFR G1 and G2				
Chinese v1	Not reported	52.4 (40.0 to 72.7) 2 studies (n=345) Chinese	Not reported	Not reported
Adults with mGFR G3				
Chinese v1	Not reported	55.6 (50.7 to 60.6) 2 studies (n=270) Chinese	Not reported	Not reported
Adults with mGFR G4 and G5				
Chinese v1 CKD-EPI cystatin C 2008 Cystatin alone	Not reported	37.8 (10.0 to 62.5) 2 studies (n=128) Chinese	Not reported	Not reported

(a) The cut-off value for eGFR and mGFR was <60 mL/min/1.73 m^2 to predict diagnosis of CKD (one or more markers of kidney damage or GFR <60 present for >3 months [KDOQI criteria])

Table 10 CKD-EPI cystatin C 2008 Cystatin + age + race + sex

CKD-EPI equations – adjusted version	P15 No. of studies (sample) Ethnicity	P30 No. of studies (sample) Ethnicity	Sensitivity No. of studies (sample) Ethnicity	Specificity No. of studies (sample) Ethnicity
Adults with CKD				
CKD-EPI cystatin C 2008 Cystatin + age + race + sex	Not reported	64.6 1 study (n=110) Chinese	Not reported	Not reported
Japanese	Not reported	78.0 1 study (n=350) Japanese	Not reported	Not reported
Adults with mGFR ≥60				
CKD-EPI cystatin C 2008 Cystatin + age + race + sex	Not reported	75.4 1 study (n=61) Chinese	Not reported	Not reported
Adults with mGFR <60				
CKD-EPI cystatin C 2008 Cystatin + age + race + sex	Not reported	51.02 1 study (n=49) Chinese	Not reported	Not reported
Adults with mGFR G1 and G2				
Japanese	Not reported	85.0 to 95.0 1 study (n=131) Japanese	Not reported	Not reported
Adults with mGFR G3				
Japanese	Not reported	80.0 1 study (n=113) Japanese	Not reported	Not reported
Adults with mGFR G4 and G5				
Japanese	Not reported	60.0 1 study (n=93) Japanese	Not reported	Not reported

Table 11 CKD-EPI cystatin C 2011 equations re-expressed for standardized Scys v1

CKD-EPI equations – adjusted version	P15 median (range) No. of studies (sample) Ethnicity	P30 median (range) No. of studies (sample) Ethnicity	Sensitivity No. of studies (sample) Ethnicity	Specificity No. of studies (sample) Ethnicity
Adults with CKD				
CKD-EPI cystatin C 2011 equations re-expressed for standardized Scys v1	51.1 (40.5 to 60.9) 1 study (n=232) Chinese, Indian, Malay	84.4 (72.7 to 90.4) 2 studies (n=342) Chinese, Indian, Malay	Not reported	Not reported
Adults with mGFR ≥60				
CKD-EPI cystatin C 2011 equations re-expressed for standardized Scys v1	Not reported	82 1 study (n=61) Chinese	Not reported	Not reported
Adults with mGFR <60				
CKD-EPI cystatin C 2011 equations re-expressed for standardized Scys v1	Not reported	61.2 1 study (n=49) Chinese	Not reported	Not reported

Table 12 CKD-EPI cystatin C 2011 equations re-expressed for standardized Scys v2

CKD-EPI equations – adjusted version	P15 median (range) No. of studies (sample) Ethnicity	P30 median (range) No. of studies (sample) Ethnicity	Sensitivity No. of studies (sample) Ethnicity	Specificity No. of studies (sample) Ethnicity
Adults with CKD				
CKD-EPI cystatin C 2011 equations re-expressed for standardized Scys v2	87.5 (43.2 to 92.6) 1 study (n=232) Chinese, Indian, Malay	96.8 (79.7 to 98.4) 1 study (n=232) Chinese, Indian, Malay	Not reported	Not reported

Table 13 CKD-EPI cystatin C 2012

CKD-EPI equations – adjusted version	P15 median (range) No. of studies (sample) Ethnicity	P30 median (range) No. of studies (sample) Ethnicity	Sensitivity No. of studies (sample) Ethnicity	Specificity No. of studies (sample) Ethnicity
Adults with CKD				
CKD-EPI cystatin C 2012	37.6 (36.9 to 38.9) 3 studies (n=2,163) Chinese	63.0 (41.4 to 79) 8 studies (n=5,474) Chinese, Japanese	88.8[a] 1 study (n=632) Chinese	82.1[a] 1 study (n=632) Chinese
Chinese v1	43.03 1 study (n=389) Chinese	80.61 1 study (n=389) Chinese	Not reported	Not reported
Chinese v2	Not reported	62.3 1 study (n=313) Chinese	Not reported	Not reported
Adults with mGFR ≥60				
CKD-EPI cystatin C 2012	49.9 (44.4 to 55.4) 2 studies (n=1,029) Chinese	80.5 (77.9 to 83.2) 2 studies (n=1,029) Chinese	Not reported	Not reported
Adults with mGFR <60				
CKD-EPI cystatin C 2012	27.3 (26.9 to 27.8) 2 studies (n=745) Chinese	51.6 (51.5 to 51.7) 2 studies (n=745) Chinese	Not reported	Not reported
Adults with mGFR G1 and G2				
CKD-EPI cystatin C 2012	Not reported	85.8 (62.6 to 95.0) 2 studies (n=460) Chinese, Japanese	Not reported	Not reported
Adults with mGFR G3				
CKD-EPI cystatin C 2012	Not reported	64.6 (51.2 to 78.0) 2 studies (n=322) Chinese, Japanese	Not reported	Not reported
Adults with mGFR G4 and G5				

CKD-EPI equations – adjusted version	P15 median (range) No. of studies (sample) Ethnicity	P30 median (range) No. of studies (sample) Ethnicity	Sensitivity No. of studies (sample) Ethnicity	Specificity No. of studies (sample) Ethnicity
CKD-EPI cystatin C 2012	Not reported	52.6 (50.7 to 66.0) 2 studies (n=187) Chinese	Not reported	Not reported

(a) The cut-off value for eGFR and mGFR was <60 mL/min/1.73 m^2 to predict diagnosis of CKD (one or more markers of kidney damage or GFR <60 present for >3 months [KDOQI criteria])

Table 14 CKD-EPI creatinine-cystatin C 2008 v1

CKD-EPI equations – adjusted version	P15 median (range) No. of studies (sample) Ethnicity	P30 median (range) No. of studies (sample) Ethnicity	Sensitivity No. of studies (sample) Ethnicity	Specificity No. of studies (sample) Ethnicity
Adults with CKD				
CKD-EPI creatinine-cystatin C 2008 v1	33.5 (31.9 to 35.1) 1 study (n=257) Chinese	70.4 (70.3 to 82.7) 2 studies (n=367) Chinese	Not reported	Not reported
Chinese v1	37.1 (31.6 to 77.7) 4 studies (n=1,974) Chinese	66.4 (46.5 to 97.9) 8 studies (n=3,629) Chinese	67.7[a] 1 study (n=632) Chinese	97[a] 1 study (n=632) Chinese
Chinese v2	41.5 (36.1 to 49.7) 3 studies (n=1,875) Chinese	68.4 (38.04 to 78.7) 4 studies (n=2,243) Chinese	Not reported	Not reported
Chinese v3	64.0 (50.3 to 77.7) 2 studies (n=661) Chinese	85.5 (80.6 to 90.4) 2 studies (n=661) Chinese	Not reported	Not reported
Japanese	Not reported	81 1 study (n=350) Japanese	Not reported	Not reported
Adults with mGFR ≥60				

CKD-EPI equations – adjusted version	P15 median (range) No. of studies (sample) Ethnicity	P30 median (range) No. of studies (sample) Ethnicity	Sensitivity No. of studies (sample) Ethnicity	Specificity No. of studies (sample) Ethnicity
CKD-EPI creatinine-cystatin C 2008 v1	Not reported	91.8 1 study (n=61) Chinese	Not reported	Not reported
Chinese v1	42.6 1 study (n=928) Chinese	72.5 (45.4 to 79.6) 3 studies (n=1,110) Chinese	Not reported	Not reported
Chinese v2	59.0 (58.7 to 59.4) 2 studies (n=1,029) Chinese	87.9 (61.9 to 89.1) 3 studies (n=1,150) Chinese	Not reported	Not reported
Adults with mGFR <60				
CKD-EPI creatinine-cystatin C 2008 v1	Not reported	71.4 1 study (n=49) Chinese	Not reported	Not reported
Chinese v1	28.5 1 study (n=594) Chinese	59.4 (38.8 to 81.6) 3 studies (n=890) Chinese	Not reported	Not reported
Chinese v2	28.1 (20.5 to 35.7) 2 studies (n=745) Chinese	38.6 (20.6 to 64.3) 3 studies (n=992) Chinese	Not reported	Not reported
Adults with mGFR G1 and G2				
Chinese v1	Not reported	67.3 (42.5 to 81.8) 4 studies (n=965) Chinese	Not reported	Not reported
Adults with mGFR G3				
Chinese v1	Not reported	60.1 (46.4 to 62.3) 4 studies (n=541) Chinese	Not reported	Not reported
Adults with mGFR G4 and G5				

CKD-EPI equations – adjusted version	P15 median (range) No. of studies (sample) Ethnicity	P30 median (range) No. of studies (sample) Ethnicity	Sensitivity No. of studies (sample) Ethnicity	Specificity No. of studies (sample) Ethnicity
Chinese v1	Not reported	57.8 (40 to 66.7) 4 studies (n=181) Chinese	Not reported	Not reported

(a) *The cut-off value for eGFR and mGFR was <60 mL/min/1.73 m^2 to predict diagnosis of CKD (one or more markers of kidney damage or GFR <60 present for >3 months [KDOQI criteria])*

Table 15 CKD-EPI creatinine-cystatin C 2011 v2

CKD-EPI equations – adjusted version	P15 median (range) No. of studies (sample) Ethnicity	P30 median (range) No. of studies (sample) Ethnicity	Sensitivity No. of studies (sample) Ethnicity	Specificity No. of studies (sample) Ethnicity
Adults with CKD				
CKD-EPI creatinine-cystatin C 2011 v2	87.9 (36.6 to 89.2) 2 studies (n=333) Chinese, Indian, Malay	96.3 (63.3 to 97.3) 2 studies (n=333) Chinese, Indian, Malay	Not reported	Not reported

Table 16 CKD-EPI creatinine-cystatin C 2012

CKD-EPI equations – adjusted version	P15 median (range) No. of studies (sample) Ethnicity	P30 median (range) No. of studies (sample) Ethnicity	Sensitivity No. of studies (sample) Ethnicity	Specificity No. of studies (sample) Ethnicity
Adults with CKD				
CKD-EPI creatinine-cystatin C 2012	39.7 (34.1 to 44.2) 3 studies (n=2,163) Chinese	71.6 (47.6 to 99.4) 9 studies (n=4,432) Chinese, Japanese, Brazilian	79.9[a] 1 study (n=632) Chinese	93[a] 1 study (n=632) Chinese
CKD-EPI creatinine-cystatin C 2012 without black ethnicity adjustment	Not reported	80.3 1 study (n=61) Brazilian	Not reported	Note reported

CKD-EPI equations – adjusted version	P15 median (range) No. of studies (sample) Ethnicity	P30 median (range) No. of studies (sample) Ethnicity	Sensitivity No. of studies (sample) Ethnicity	Specificity No. of studies (sample) Ethnicity
Japanese	Not reported	82 1 study (n=350) Japanese	Not reported	Not reported
Chinese v1	49.3 1 study (n=389) Chinese	77.4 1 study (n=389) Chinese	Not reported	Not reported
Chinese v2	Not reported	55.3 1 study (n=313) Chinese	Not reported	Not reported
Adults with mGFR ≥60				
CKD-EPI creatinine-cystatin C 2012	55.8 (53.2 to 58.4) 2 studies (n=1,029) Chinese	81.2 (81.2 to 84.6) 3 studies (n=1,150) Chinese	Not reported	Not reported
Adults with mGFR <60				
CKD-EPI creatinine-cystatin C 2012	28.6 (27.2 to 30.1) 2 studies (n=745) Chinese	60.1 (49.7 to 76.8) 3 studies (n=992) Chinese	Not reported	Not reported
Adults with mGFR G1 and G2				
CKD-EPI creatinine-cystatin C 2012	Not reported	81.7 (71.5 to 92.0) 1 study (n=329) Chinese	Not reported	Not reported
Japanese	Not reported	93.5 (90.0 to 97.0) 1 study (n=131) Japanese	Not reported	Not reported
Adults with mGFR G3				
CKD-EPI creatinine-cystatin C 2012	Not reported	45.5 1 study (n=209) Chinese	Not reported	Not reported

CKD-EPI equations – adjusted version	P15 median (range) No. of studies (sample) Ethnicity	P30 median (range) No. of studies (sample) Ethnicity	Sensitivity No. of studies (sample) Ethnicity	Specificity No. of studies (sample) Ethnicity
Japanese	Not reported	77 1 study (n=113) Japanese	Not reported	Not reported
Adults with mGFR G4 and G5				
CKD-EPI creatinine-cystatin C 2012	Not reported	44.3 (41.3 to 47.4) 1 study (n=94) Chinese	Not reported	Not reported
Japanese	Not reported	73 1 study (n=93) Japanese	Not reported	Not reported

(a) *The cut-off value for eGFR and mGFR was <60 mL/min/1.73 m^2 to predict diagnosis of CKD (one or more markers of kidney damage or GFR <60 present for >3 months [KDOQI criteria])*

1.1.7 Economic evidence

A systematic review was conducted to identify economic evaluations for this review question. The search returned 666 records which were sifted against the review protocol. All records were excluded based on title and abstract. The study selection diagram is presented in **Error! Reference source not found.**. For more information on the search strategy please see **Error! Reference source not found.**.

No published cost-effectiveness studies were included in this review and this question was not prioritised for original economic modelling.

1.1.8 Evidence statements

All included studies were partially applicable because all of them were done outside the UK.

CKD-EPI creatinine 2009 – Adults with CKD (over the entire GFR range)

P15

There was large variation in the accuracy of the adjusted equation with P15 ranging from 22.5 to 56.4% (low to moderate risk of bias from 4 cross-sectional studies with 2,688 participants).

P30

There was large variation in the accuracy of the adjusted equation with P30 ranging from 26.1 to 92.7% (low to moderate risk of bias from 18 cross-sectional studies with 6,732).

Sensitivity and specificity

Specificity (range: 81.2 to 98.1%) was better than sensitivity (range: 51.5 to 87.9%) for this equation (moderate risk of bias from 2 cross-sectional studies with 1,710 participants).

CKD-EPI creatinine 2009 without black ethnicity adjustment Adults with CKD (over the entire GFR range)

P15

The was one study with 50 participants that reported P15 at 46% (1 cross sectional study with low risk of bias).

P30

There was low variation in the accuracy of the adjusted equation with P30 ranging from 72 to 75.4 (low to moderate risk of bias from 3 studies with 191 participants).

CKD-EPI creatinine 2009 (adjustment for different ethnicities) – Adults with CKD (over the entire GFR range)

P15

There was large variation in the accuracy of the adjusted equations with P15 ranging from 23.8 to 55.2% (low to moderate risk of bias from 3 cross-sectional studies with 2,254 participants).

P30

There was large variation in the accuracy of the adjusted equations with P30 ranging from 40 to 100% (low to moderate risk of bias from 15 cross-sectional studies with 7,194 participants).

Sensitivity and specificity

Specificity (range: 80.6 to 98.3%) was better than sensitivity (range: 47.5 to 91%) for these equations (low to moderate risk of bias from 2 cross-sectional studies with 1,128 participants).

CKD-EPI cystatin C 2008 Cystatin alone

P15 and P30

There was one study reporting the accuracy (P15 34.6 %and P30 63.3%) of this equation (low risk of bias from 1 cross-sectional study with 101 participants).

CKD-EPI cystatin C 2008 Cystatin alone (adjustment for different ethnicities) – Adults with CKD (over the entire GFR range)

P15

There was large variation in the accuracy of the adjusted equations with P15 ranging from 23.2 to 62.4% (low to moderate risk of bias from 5 cross-sectional studies with 2,536 participants).

P30

There was large variation in the accuracy of the adjusted equations with P30 ranging from 10 to 86.1% (low to moderate risk of bias from 8 cross-sectional studies with 4,750 participants).

Sensitivity and specificity

Specificity (93.3%) was better than sensitivity (73.3%) for one of these equations (moderate risk of bias from 1 cross-sectional study with 632 participants).

CKD-EPI cystatin C 2008 Cystatin + age + race + sex – Adults with CKD

P30

There was one study reporting the accuracy (P30 64.6%) of this equation (moderate risk of bias from 1 cross-sectional study with 110 participants).

CKD-EPI cystatin C 2008 Cystatin + age + race + sex (adjusted for different ethnicities) – Adults with CKD

P30

There was one study reporting the accuracy (P30 78%) of one of these equations (low risk of bias from 1 cross-sectional study with 350 participants).

CKD-EPI cystatin C 2011 equations re-expressed for standardized Scys v1 – Adults with CKD from 3 subpopulations (Chinese, Malay and Indian)

P15

There was one study reporting the accuracy (P15 40.5 to 60.9%) of this equation (low risk of bias from 1 cross-sectional study with 232 participants).

CKD-EPI cystatin C 2011 equations re-expressed for standardized Scys v1 – Adults with CKD (over the entire GFR range)

P30

There was large variation in the accuracy of the adjusted equations with P30 ranging from 61.2 to 90.4% (low to moderate risk of bias from 2 cross-sectional studies with 342 participants).

CKD-EPI cystatin C 2011 equations re-expressed for standardized Scys v2 – Adults with CKD from 3 subpopulations (Chinese, Malay and Indian)

P15

There was one study reporting the accuracy (P15 43.2 to 92.6%) of this equation (low risk of bias from 1 cross-sectional study with 232 participants).

P30

There was one study reporting the accuracy (P30 79.7 to 98.4%) of this equation (low risk of bias from 1 cross-sectional study with 232 participants).

CKD-EPI cystatin C 2012 – Adults with CKD (over the entire GFR range)

P15

There was large variation in the accuracy of the adjusted equation with P15 ranging from 26.9 to 55.4% (low to moderate risk of bias from 3 cross-sectional studies with 2,163 participants).

P30

There was large variation in the accuracy of the adjusted equation with P30 ranging from 40.9 to 95% (low to moderate risk of bias from 8 cross-sectional studies with 5,474 participants).

Sensitivity and specificity

Sensitivity (88.8%) was better than specificity (82.1%) for this equation (moderate risk of bias from 1 cross-sectional study with 632 participants).

CKD-EPI cystatin C 2012 (adjusted for different ethnicities) – Adults with CKD

P15

There was one study reporting the accuracy (P15 43.0%) of one of these equations (moderate risk of bias from 1 cross-sectional study with 389 participants).

P30

There was variation in the accuracy of the adjusted equations with P30 ranging from 62.3 to 80.6% (moderate risk of bias from 2 cross-sectional studies with 702 participants).

CKD-EPI creatinine-cystatin C 2008 v1 – Adults with CKD (over the entire GFR range)

P15

There was one study reporting the accuracy (P15 ranging from 31.9 to 35.1%) of this equation (moderate risk of bias from 1 cross-sectional study with 257 participants with and without diabetes).

P30

There was variation in the accuracy of the adjusted equation with P30 ranging from 70.3 to 91.8% (moderate risk of bias from 2 cross-sectional studies with 367 participants).

CKD-EPI creatinine-cystatin C 2008 v1 (adjusted for different ethnicities) – Adults with CKD (over the entire GFR range)

P15

There was large variation in the accuracy of the adjusted equations with P15 ranging from 20.5 to 77.7% (low to moderate risk of bias from 6 cross-sectional studies with 2,793 participants).

P30

There was large variation in the accuracy of the adjusted equations with P30 ranging from 20.6 to 97.9% (low to moderate risk of bias from 14 cross-sectional studies with 5,853 participants).

Sensitivity and specificity

Specificity (97%) was better than sensitivity (67.7%) for one of these equations (moderate risk of bias from 1 cross-sectional study with 632 participants).

CKD-EPI creatinine-cystatin C 2011 v2 – Adults with CKD

P15

There was large variation in the accuracy of the adjusted equation with P150 ranging from 36.6 to 89.2% (low risk of bias from 2 cross-sectional studies with 333 participants).

P30

There was large variation in the accuracy of the adjusted equation with P30 ranging from 63.3 to 97.3% (low risk of bias from 2 cross-sectional studies with 333 participants).

CKD-EPI creatinine-cystatin C 2012 – Adults with CKD (over the entire GFR range)

P15

There was large variation in the accuracy of the adjusted equation with P150 ranging from 27.2 to 58.4% (low to moderate risk of bias from 3 cross-sectional studies with 2,163 participants).

P30

There was large variation in the accuracy of the adjusted equation with P30 ranging from 47.6 to 99.4% (low to moderate risk of bias from 9 cross-sectional studies with 4,432 participants).

Sensitivity and specificity

Specificity (93%) was better than sensitivity (79.9%) for the equation (moderate risk of bias from 1 cross-sectional study with 632 participants).

CKD-EPI creatinine-cystatin C 2012 without black ethnicity adjustment

P30

There was one study with 61 participants that reported P30 accuracy for this equation at 80.3% (low risk of bias).

CKD-EPI creatinine-cystatin C 2012 (adjusted for different ethnicities) – Adults with CKD (over the entire GFR range)

P15

There was one study reporting the accuracy (P15 49.3%) of one of these equations (moderate risk of bias from 1 cross-sectional study with 389 participants).

P30

There was large variation in the accuracy of the adjusted equations with P30 ranging from 55.3 to 97% (low to moderate risk of bias from 3 cross-sectional studies with 1,052 participants).

1.1.9 The committee's discussion and interpretation of the evidence

1.1.9.1. The outcomes that matter most

All studies included reported P30 as an outcome measure, some reported P15 and fewer reported sensitivity and specificity. The committee was doubtful that P30 accuracy was a good enough measure to make a recommendation on one eGFR equation/adjustment over another because P30 covers a wide range compared to P15 which would be preferred if there were enough data. The committee agreed that the ideal accuracy outcome for this review would be P5. The committee deemed sensitivity and specificity as unimportant, given the review was to determine the accuracy of equations in estimating a continuous variable (GFR) and to provide evidence on whether the eGFR equations were similar to the measured GFR rather than a positive/negative diagnosis.

1.1.9.2 The quality of the evidence

It was not possible to use GRADE in this review (see section 1.1.3).

The QUADAS (quality assessment tool for diagnostic accuracy studies) was used to assess the risk of bias in the included studies. More than two thirds of studies were given a moderate risk of bias due to an unclear timeframe between index and reference tests and unclear exclusion criteria. The studies were all rated as partially applicable as none were conducted on UK black, Asian and minority ethnic groups and this was one of the main reasons the committee agreed that recommendations could not be made based on the evidence found.

1.1.9.3 Benefits and harms

The committee agreed that it was not possible to make any recommendations on the specific eGFR equations or ethnicity adjustments found in these studies due to: a) the lack of applicability to UK black, Asian and minority ethnic groups or children and young people (all studies included adult populations), b) the value of P30 as a measure of accuracy, c) the broad range of P30 values found across equations.

The committee agreed that adding an ethnicity adjustment to eGFR equations for different ethnicities may not be valid or accurate as there is no validated measure of 'ethnicity' used and the key measurement to determine accuracy might conceivably be based on muscle mass which differs from person to person within the same ethnicity. Equally, African American is different from British African, or people from north, east or South Africa and will differ from other regions. It was also highlighted that ethnicity adjustments did not factor-in people with mixed ethnicity; of whom the UK has a large population.

Some committee members highlighted that the accuracy of GFR was only important for medication dosing and that the rate of decline/trajectory is more important. It was also highlighted however that eGFR was often used as a basis to recall a patient with CKD for follow up and therefore a lack of accuracy could have a negative impact on patient care.

The committee discussed the relevance of ethnic adjustments and agreed that variations were likely to be due to other biomarkers, for example body density rather than family origin. It also noted that in the UK many people are from mixed ethnic backgrounds and it questioned the usefulness of ethnicity based modifiers in those people. The committee strongly agreed that research recommendations should be made on appropriate eGFR equations for black, Asian and minority ethnic groups including adults, children and young people in the UK and that different factors (for example: body density) as well as ethnicity should be explored as appropriate biomarkers. The committee highlighted that further evidence might improve the accuracy of eGFR equations which could have an impact on patient care. It made a research recommendation to investigate this, however, in the meantime the committee agreed that primary care still needed an accurate way of estimating GFR in people from black African and Caribbean family origin, and in the absence of appropriate robust new evidence, the existing guideline recommendation should be retained which recommends to multiply eGFR by 1.159 if calculated using the CKD EPI creatinine equation.

1.1.9.4 Cost effectiveness and resource use

No cost effectiveness evidence was found. Since no new recommendations were made as part of this review question, the committee did not expect any additional cost or resource impact.

1.1.9.5 Other factors the committee took into account

The committee highlighted that although the evidence presented focused on the CKD-EPI equation and ethnicity adjustments, some laboratories in the UK still use the MDRD equation despite the previous guideline recommendation to use CKD-EPI. It was highlighted that the evidence review for the previous guideline had shown the superiority of CKD-EPI over MDRD, but this could be updated if the new evidence indicated this had changed and should be referred to the NICE surveillance team for future consideration because this was not part of the scope for the current update of the guideline.

It was also highlighted that CKD-EPI was not used by clinicians for children and young people and unlikely to be accurate in this population, therefore the wording of the existing recommendation (1.1.3) should be changed from ‘people’ to ‘adults’ of African-Caribbean or African family origin. Children and young people were added to the research recommendation.

1.1.10 Recommendations supported by this evidence review

This evidence review supports recommendation 1.1.3 and the research recommendation on diagnostic accuracy of eGFR calculations in adults, children, and young people from black, Asian and other minority ethnic groups with CKD living in the UK.

1.1.11 References – included studies

1.1.11.1 Diagnostic

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Wang, Jinghua, Xie, Peng, Huang, Jian-Min et al. (2016) The new Asian modified CKD-EPI equation leads to more accurate GFR estimation in Chinese patients with CKD. International urology and nephrology 48(12): 2077-2081

Xie, Peng, Huang, Jian-Min, Li, Ying et al. (2017) The modified CKD-EPI equation may be not more accurate than CKD-EPI equation in determining glomerular filtration rate in Chinese patients with chronic kidney disease. Journal of nephrology 30(3): 397-402

Yang, Min, Zou, Yonghua, Lu, Tong et al. (2019) Revised Equations to Estimate Glomerular Filtration Rate from Serum Creatinine and Cystatin C in China. Kidney & blood pressure research 44(4): 553-564

Yang, Min, Xu, Guang, Ling, Lilu et al. (2017) Performance of the creatinine and cystatin C-based equations for estimation of GFR in Chinese patients with chronic kidney disease. Clinical and experimental nephrology 21(2): 236-246

Ye, Xiaoshuang, Liu, Xun, Song, Dan et al. (2016) Estimating glomerular filtration rate by serum creatinine or/and cystatin C equations: An analysis of multi-centre Chinese subjects. Nephrology (Carlton, Vic.) 21(5): 372-8

1

Appendices

Appendix A – Review protocol

Review protocol for diagnostic accuracy of eGFR calculations in adults, children, and young people from black, Asian and other minority ethnic groups with CKD

Objective	To determine the diagnostic accuracy of adjusted/unadjusted eGFR calculating equations in adults, children, and young people from black, Asian and other minority ethnic groups.
Type of review	Diagnostic
Study Type	• Diagnostic cross-sectional studies • Systematic reviews of diagnostic cross-sectional studies
Population	Adults, children, and young people from black, Asian and other minority ethnic groups with suspected or diagnosed chronic kidney disease GFR categories G1 to G5. Exclusion: • people receiving renal replacement therapy (RRT) • people with acute kidney injury combined with rapidly progressive glomerulonephritis • pregnant women • people receiving palliative care.
Test	Adjusted and unadjusted (for race) eGFR equations
Reference standard	Measured GFR • (urinary or plasma clearance of inulin, iohexol, iothalamate, para aminohippurate [PAH], diethylenetriaminepentaacetic acid [DTPA] or ethylenediaminetetraacetic acid [EDTA]).
Outcomes	• Likelihood ratios • P30, P15, P5 values • Sensitivity/specificity • PPV and NPV
Subgroup analyses	Data will be stratified by race. Where data allow, we will conduct subgroup analyses for:

	• People at high risk of developing progressive CKD (for example, people with diabetes, hypertension or cardiovascular disease, or people recovering from acute kidney injury). • GFR category at enrolment • People with a family history of renal disease.
Search date	No restriction
Exclusion criteria	• Non-human studies • Abstracts • Theses and conference papers • Non-English language

1

Appendix B – Methods

Diagnostic test accuracy evidence

In this guideline, diagnostic test accuracy (DTA) data are classified as any data in which a feature – be it a symptom, a risk factor, a test result or the output of some algorithm that combines many such features – is observed in some people who have the condition of interest at the time of the test and some people who do not. Such data either explicitly provide, or can be manipulated to generate, a 2x2 classification of true positives and false negatives (in people who, according to the reference standard, truly have the condition) and false positives and true negatives (in people who, according to the reference standard, do not).

The 'raw' 2x2 data can be summarised in a variety of ways. Those that were used for decision making in this guideline are as follows:

- **Positive likelihood ratios** describe how many times more likely positive features are in people with the condition compared to people without the condition. Values greater than 1 indicate that a positive result makes the condition more likely.
  - LR^+ = (TP/[TP+FN])/(FP/[FP+TN])
- **Negative likelihood ratios** describe how many times less likely negative features are in people with the condition compared to people without the condition. Values less than 1 indicate that a negative result makes the condition less likely.
  - LR^- = (FN/[TP+FN])/(TN/[FP+TN])
- **Sensitivity** is the probability that the feature will be positive in a person with the condition.
  - sensitivity = TP/(TP+FN)
- **Specificity** is the probability that the feature will be negative in a person without the condition.
  - specificity = TN/(FP+TN)
- **Positive predictive values** describe the probability that a person with a positive screening test has the disease.
  - PPV = TP/ (TP+FP)
- **Negative predictive values** describe probability that a person with a negative screening test doesn't have the disease.
  - NPV = TN/(TN+FN)

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

Table 17: 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 minimal important difference for positive likelihoods ratio at 2, and a corresponding minimal important difference 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.

Quality assessment

Individual studies were quality assessed using the QUADAS-2 tool, which contains four domains: patient selection, index test, reference standard, and flow and timing. 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.

Methods for combining diagnostic test accuracy evidence

Meta-analysis of diagnostic test accuracy data was conducted with reference to the Cochrane Handbook for Systematic Reviews of Diagnostic Test Accuracy (Deeks et al. 2010).

Where applicable, diagnostic syntheses were stratified by:

- Presenting symptomatology (features shared by all participants in the study, but not all people who could be considered for a diagnosis in clinical practice).
- The reference standard used for true diagnosis.

Where five or more studies were available for all included strata, a bivariate model was fitted using the `mada` package in R v3.4.0, which accounts for the correlations between positive and negative likelihood ratios, and between sensitivities and specificities. Where sufficient data were not available (2-4 studies), separate independent pooling was performed for positive likelihood ratios, negative likelihood ratios, sensitivity and specificity, using Microsoft Excel. This approach is conservative as it is likely to somewhat underestimate test accuracy, due to failing to account for the correlation and trade-off between sensitivity and specificity (see Deeks 2010).

Random-effects models (der Simonian and Laird) were fitted for all syntheses, as recommended in the Cochrane Handbook for Systematic Reviews of Diagnostic Test Accuracy (Deeks et al. 2010).

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.

Health economics

Literature reviews seeking to identify published cost–utility analyses of relevance to the issues under consideration were conducted for all questions. In each case, the search undertaken for the clinical review was modified, retaining population and intervention descriptors, but removing any study-design filter and adding a filter designed to identify relevant health economic analyses. In assessing studies for inclusion, population, intervention and comparator, criteria were always identical to those used in the parallel clinical search; only cost–utility analyses were included. Economic evidence profiles, including critical appraisal according to the Guidelines manual, were completed for included studies.

Economic studies identified through a systematic search of the literature are appraised using a methodology checklist designed for economic evaluations (NICE guidelines manual; 2014). This checklist is not intended to judge the quality of a study per se, but to determine whether an existing economic evaluation is useful to inform the decision-making of the committee for a specific topic within the guideline.

There are 2 parts of the appraisal process. The first step is to assess applicability (that is, the relevance of the study to the specific guideline topic and the NICE reference case); evaluations are categorised according to the criteria in Table 18.

Table 18 Applicability criteria

Level	Explanation
Directly applicable	The study meets all applicability criteria, or fails to meet one or more applicability criteria but this is unlikely to change the conclusions about cost effectiveness
Partially applicable	The study fails to meet one or more applicability criteria, and this could change the conclusions about cost effectiveness
Not applicable	The study fails to meet one or more applicability criteria, and this is likely to change the conclusions about cost effectiveness. These studies are excluded from further consideration

In the second step, only those studies deemed directly or partially applicable are further assessed for limitations (that is, methodological quality); see categorisation criteria in Table 19.

Table 19 Methodological criteria

Level	Explanation
Minor limitations	Meets all quality criteria, or fails to meet one or more quality criteria but this is unlikely to change the conclusions about cost effectiveness
Potentially serious limitations	Fails to meet one or more quality criteria and this could change the conclusions about cost effectiveness
Very serious limitations	Fails to meet one or more quality criteria and this is highly likely to change the conclusions about cost effectiveness. Such studies should usually be excluded from further consideration

Where relevant, a summary of the main findings from the systematic search, review and appraisal of economic evidence is presented in an economic evidence profile alongside the clinical evidence.

•

Appendix C – Literature search strategies

Background to the search

A NICE information specialist conducted the literature searches for the evidence review. The searches were originally run on the 23rd of April 2020 and updated on the 2nd of September 2020. This search report is compliant with the requirements of PRISMA-S.

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.

The MEDLINE strategy below was quality assured (QA) by 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 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.

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

Limits to exclude conferences were applied in adherence to standard NICE practice and the review protocol. Other publication types for letters, news and editorials were also excluded to retrieve the most relevant results.

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.

Clinical searches

Databases	Date searched	Version/files	No. retrieved
Cochrane Central Register of Controlled Trials (CENTRAL)	NA	Not searched at request of Technical Adviser (Chris Carmona)	NA
Cochrane Database of Systematic Reviews (CDSR)	23rd Apr 2020	4 of 12, April 2020	4
Database of Abstracts of Reviews of Effect (DARE)	23rd April 2020	Up to 2015	13
Embase (Ovid)	23rd Apr 2020	Embase <1974 to 2020 Week 16>	6,271

MEDLINE (Ovid)	23rd Apr 2020	Ovid MEDLINE(R) <1946 to April 22, 2020>	3,975
MEDLINE In-Process (Ovid)	23rd Apr 2020	Ovid MEDLINE(R) In-Process & Other Non-Indexed Citations <1946 to April 22, 2020>	490
MEDLINE Epub Ahead of Print[a]	23rd Apr 2020	Ovid MEDLINE(R) Epub Ahead of Print <April 22, 2020>	64

Search strategies

Database: Ovid MEDLINE(R) <1946 to April 22, 2020>

Search Strategy:

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1 exp Renal Insufficiency, Chronic/ (113392)

2 ((chronic* or progressi*) adj1 (renal* or kidney*)).tw. (73232)

3 ((kidney* or renal*) adj1 insufficien*).tw. (21299)

4 ckd*.tw. (23299)

5 ((kidney* or renal*) adj1 fail*).tw. (86568)

6 ((endstage* or end-stage* or "end stage*") adj1 (renal* or kidney*)).tw. (35469)

7 (esrd* or eskd*).tw. (14335)

8 "Chronic Kidney Disease-Mineral and Bone Disorder"/ (3458)

9 or/1-8 (214059)

10 (diaspor* or multicultural* or multi-cultural* or crosscultural* or cross-cultural* or transcultural* or trans-cultural* or ethn* or multiethn* or minorit* or race or races or racial* or multiracial* or biracial* or migrant* or immigrant* or refugee* or cultural* divers* or multilingual* or multi-lingual* or traveller* or Gyps* or Romany or Romani* or Rroma* or Roma or asylum seek* or seeking asylum or sociocultural or diversity or "diverse population*" or indigenous or ancestry group* or cultur* difference* or heritage* or foreign*).ti,ab. (596438)

11 (black* or Afrocaribbean* or caribbean* or african* or African American* or Asia* or South American* or Hispanic* or Central American* or latina* or latino* or Jew* or sikh* or hindu* or muslim* or islam* or indian* or bangladeshi* or pakistani* or Eastern Europe* or Balkan* or Polish or Romanian* or white* or nonwhite* or Caucasian* or noncaucasian* or Irish or Italian* or BME or BAME).ti,ab. (789110)

12 ((displaced or alien*) adj2 (people* or person*)).ti,ab. (815)

[a] Please search for both development and re-run searches

13 (born adj2 overseas).ti,ab. (308)

14 ((marginal* or transient or undocumented) adj1 (people or population* or communit* or neighbourhood* or neighborhood* or group* or area* or demograph*)).ti,ab. (3143)

15 ((arab* or somali* or yemini* or Vietnamese or Chinese or Punjabi* or Somali* or Gujarati* or Japanese or Bengali* or Afghanistani* or Turkish or Kurdish or Yemeni* or Albanian* or German* or American* or Jamaican* or Nigerian* or Kenyan* or Zimbabwean* or Philippin* or Filipino* or "Sri Lankan*" or French or Chinese or Cantonese or Australia* or Somalia* or Portugues* or Canadian* or Ghanaian* or Lithuanian* or "Hong Kong" or Spanish or Iranian* or "New Zealand" or Kiwi* or Iraqi* or Turkish or Cypriot* or Malaysian* or Dutch or Ugandan* or Bulgarian* or Afghan* or Brazilian* or Slovak* or Mauritan* or Singapore* or Nepales* or Hungarian* or Latvian* or Russian* or Tanzanian* or Thai* or Swedish or Greek or Zambia* or Czech or Egyptia* or Trinidad* or Tobago* or Maltese or Austrian* or Belgian* or Libyan* or Korean* or Danish or Swiss) adj3 (cultur* or men or women or male* or female* or people* or population* or communit* or neighbourhood* or neighborhood* or group* or area* or demograph*)).ti,ab. (223136)

16 eh.fs. (160449)

17 exp "Emigrants and Immigrants"/ (12134)

18 exp Ethnic Groups/ (151161)

19 Minority Groups/ (13637)

20 exp Continental Population Groups/ (217270)

21 Refugees/ (10008)

22 "Transients and Migrants"/ (11431)

23 cross-cultural comparison/ or cultural characteristics/ or cultural diversity/ or ethnology/ (52633)

24 exp Human Migration/ (26169)

25 or/10-24 (1569266)

26 9 and 25 (15967)

27 Glomerular Filtration Rate/ (43611)

28 (glomerul* or GFR* or eGFR* or e-GFR*).tw. (158675)

29 27 or 28 (172071)

30 26 and 29 (4280)

31 limit 30 to english language (4107)

32 animals/ not humans/ (4659319)

33 31 not 32 (4032)

34 limit 33 to abstracts (3992)

35 limit 34 to (editorial or letter or news) (17)

36 34 not 35 (3975)

Database: Ovid MEDLINE(R) In-Process & Other Non-Indexed Citations <1946 to April 22, 2020>

Search Strategy:

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1 exp Renal Insufficiency, Chronic/ (0)

2 ((chronic* or progressi*) adj1 (renal* or kidney*)).tw. (9539)

3 ((kidney* or renal*) adj1 insufficien*).tw. (1122)

4 ckd*.tw. (4563)

5 ((kidney* or renal*) adj1 fail*).tw. (6416)

6 ((endstage* or end-stage* or "end stage*") adj1 (renal* or kidney*)).tw. (4948)

7 (esrd* or eskd*).tw. (2029)

8 "Chronic Kidney Disease-Mineral and Bone Disorder"/ (0)

9 or/1-8 (18714)

10 (diaspor* or multicultural* or multi-cultural* or crosscultural* or cross-cultural* or transcultural* or trans-cultural* or ethn* or multiethn* or minorit* or race or races or racial* or multiracial* or biracial* or migrant* or immigrant* or refugee* or cultural* divers* or multilingual* or multi-lingual* or traveller* or Gyps* or Romany or Romani* or Rroma* or Roma or asylum seek* or seeking asylum or sociocultural or diversity or "diverse population*" or indigenous or ancestry group* or cultur* difference* or heritage* or foreign*).ti,ab. (95106)

11 (black* or Afrocaribbean* or caribbean* or african* or African American* or Asia* or South American* or Hispanic* or Central American* or latina* or latino* or Jew* or sikh* or hindu* or muslim* or islam* or indian* or bangladeshi* or pakistani* or Eastern Europe* or Balkan* or Polish or Romanian* or white* or nonwhite* or Caucasian* or noncaucasian* or Irish or Italian* or BME or BAME).ti,ab. (130634)

12 ((displaced or alien*) adj2 (people* or person*)).ti,ab. (167)

13 (born adj2 overseas).ti,ab. (22)

14 ((marginal* or transient or undocumented) adj1 (people or population* or communit* or neighbourhood* or neighborhood* or group* or area* or demograph*)).ti,ab. (660)

15 ((arab* or somali* or yemini* or Vietnamese or Chinese or Punjabi* or Somali* or Gujarati* or Japanese or Bengali* or Afghanistani* or Turkish or Kurdish or Yemeni* or Albanian* or German* or American* or Jamaican* or Nigerian* or Kenyan* or Zimbabwean* or Philippin* or Filipino* or "Sri Lankan*" or French or Chinese or Cantonese or Australia* or Somalia* or Portugues* or Canadian* or Ghanaian* or Lithuanian* or "Hong Kong" or Spanish or Iranian* or "New Zealand" or Kiwi* or Iraqi* or Turkish or Cypriot* or Malaysian* or Dutch or Ugandan* or Bulgarian* or Afghan* or Brazilian* or Slovak* or Mauritan* or Singapore* or Nepales* or Hungarian* or Latvian* or Russian* or Tanzanian* or Thai* or Swedish or Greek or Zambia* or Czech or Egyptia* or Trinidad* or Tobago* or Maltese or Austrian* or Belgian* or Libyan* or Korean* or Danish or Swiss) adj3 (cultur* or men or women or male* or female* or people* or population* or communit* or neighbourhood* or neighborhood* or group* or area* or demograph*)).ti,ab. (29641)

16 eh.fs. (0)

17 exp "Emigrants and Immigrants"/ (0)

18 exp Ethnic Groups/ (0)

19 Minority Groups/ (0)

20 exp Continental Population Groups/ (0)

21 Refugees/ (0)

22 "Transients and Migrants"/ (0)

23 cross-cultural comparison/ or cultural characteristics/ or cultural diversity/ or ethnology/ (0)

24 exp Human Migration/ (0)

25 or/10-24 (228718)

26 9 and 25 (1928)

27 Glomerular Filtration Rate/ (0)

28 (glomerul* or GFR* or eGFR* or e-GFR*).tw. (16530)

29 27 or 28 (16530)

30 26 and 29 (497)

31 limit 30 to english language (494)

32 animals/ not humans/ (0)

33 31 not 32 (494)

34 limit 33 to abstracts (494)

35 limit 34 to (editorial or letter or news) (4)

36 34 not 35 (490)

Database: Ovid MEDLINE(R) Epub Ahead of Print <April 22, 2020>

Search Strategy:

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1 exp Renal Insufficiency, Chronic/ (0)

2 ((chronic* or progressi*) adj1 (renal* or kidney*)).tw. (1393)

3 ((kidney* or renal*) adj1 insufficien*).tw. (155)

4 ckd*.tw. (724)

5 ((kidney* or renal*) adj1 fail*).tw. (770)

6 ((endstage* or end-stage* or "end stage*") adj1 (renal* or kidney*)).tw. (718)

7 (esrd* or eskd*).tw. (322)

8 "Chronic Kidney Disease-Mineral and Bone Disorder"/ (0)

9 or/1-8 (2622)

10 (diaspor* or multicultural* or multi-cultural* or crosscultural* or cross-cultural* or transcultural* or trans-cultural* or ethn* or multiethn* or minorit* or race or races or racial* or multiracial* or biracial* or migrant* or immigrant* or refugee* or cultural* divers* or multilingual* or multi-lingual* or traveller* or Gyps* or Romany or Romani* or Rroma* or Roma or asylum seek* or seeking asylum or sociocultural or diversity or "diverse population*" or indigenous or ancestry group* or cultur* difference* or heritage* or foreign*).ti,ab. (14474)

11 (black* or Afrocaribbean* or caribbean* or african* or African American* or Asia* or South American* or Hispanic* or Central American* or latina* or latino* or Jew* or sikh* or hindu* or muslim* or islam* or indian* or bangladeshi* or pakistani* or Eastern Europe* or Balkan* or Polish or Romanian* or white* or nonwhite* or Caucasian* or noncaucasian* or Irish or Italian* or BME or BAME).ti,ab. (16545)

12 ((displaced or alien*) adj2 (people* or person*)).ti,ab. (20)

13 (born adj2 overseas).ti,ab. (11)

14 ((marginal* or transient or undocumented) adj1 (people or population* or communit* or neighbourhood* or neighborhood* or group* or area* or demograph*)).ti,ab. (116)

15 ((arab* or somali* or yemini* or Vietnamese or Chinese or Punjabi* or Somali* or Gujarati* or Japanese or Bengali* or Afghanistani* or Turkish or Kurdish or Yemeni* or Albanian* or German* or American* or Jamaican* or Nigerian* or Kenyan* or Zimbabwean* or Philippin* or Filipino* or "Sri Lankan*" or French or Chinese or Cantonese or Australia* or Somalia* or Portugues* or Canadian* or Ghanaian* or Lithuanian* or "Hong Kong" or Spanish or Iranian* or "New Zealand" or Kiwi* or Iraqi* or Turkish or Cypriot* or Malaysian* or Dutch or Ugandan* or Bulgarian* or Afghan* or Brazilian* or Slovak* or Mauritan* or Singapore* or Nepales* or Hungarian* or Latvian* or Russian* or Tanzanian* or Thai* or Swedish or Greek or Zambia* or Czech or Egyptia* or Trinidad* or Tobago* or Maltese or Austrian* or Belgian* or Libyan* or Korean* or Danish or Swiss) adj3 (cultur* or men or women or male* or female* or people* or population* or communit* or neighbourhood* or neighborhood* or group* or area* or demograph*)).ti,ab. (4803)

16 eh.fs. (0)

17 exp "Emigrants and Immigrants"/ (0)

18 exp Ethnic Groups/ (0)

19 Minority Groups/ (0)

20 exp Continental Population Groups/ (0)

21 Refugees/ (0)

22 "Transients and Migrants"/ (0)

23 cross-cultural comparison/ or cultural characteristics/ or cultural diversity/ or ethnology/ (0)

24 exp Human Migration/ (0)

25 or/10-24 (30195)

26 9 and 25 (286)

27 Glomerular Filtration Rate/ (0)

28 (glomerul* or GFR* or eGFR* or e-GFR*).tw. (2300)

29 27 or 28 (2300)

30 26 and 29 (65)

31 limit 30 to english language (64)

32 animals/ not humans/ (0)

33 31 not 32 (64)

34 limit 33 to abstracts (64)

35 limit 34 to (editorial or letter or news) (0)

36 34 not 35 (64)

Database: Embase <1974 to 2020 Week 16>

Search Strategy:

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1 exp kidney failure/ (354306)

2 ((chronic* or progressi*) adj1 (renal* or kidney*)).tw. (124074)

3 ((kidney* or renal*) adj1 insufficien*).tw. (30110)

4 ckd*.tw. (50492)

5 ((kidney* or renal*) adj1 fail*).tw. (132656)

6 ((endstage* or end-stage* or "end stage*") adj1 (renal* or kidney*)).tw. (58735)

7 (esrd* or eskd*).tw. (27656)

8 or/1-7 (447105)

9 (diaspor* or multicultural* or multi-cultural* or crosscultural* or cross-cultural* or transcultural* or trans-cultural* or ethn* or multiethn* or minorit* or race or races or racial* or multiracial* or biracial* or migrant* or immigrant* or refugee* or cultural* divers* or multilingual* or multi-lingual* or traveller* or Gyps* or Romany or Romani* or Rroma* or Roma or asylum seek* or seeking asylum or sociocultural or diversity or "diverse population*" or indigenous or ancestry group* or cultur* difference* or heritage* or foreign*).ti,ab. (874212)

10 (black* or Afrocaribbean* or caribbean* or african* or African American* or Asia* or South American* or Hispanic* or Central American* or latina* or latino* or Jew* or sikh* or hindu* or muslim* or islam* or indian* or bangladeshi* or pakistani* or Eastern Europe* or Balkan* or Polish or Romanian* or white* or nonwhite* or Caucasian* or noncaucasian* or Irish or Italian* or BME or BAME).ti,ab. (1345815)

11 ((displaced or alien*) adj2 (people* or person*)).ti,ab. (1071)

12 (born adj2 overseas).ti,ab. (484)

13 ((marginal* or transient or undocumented) adj1 (people or population* or communit* or neighbourhood* or neighborhood* or group* or area* or demograph*)).ti,ab. (4522)

14 ((arab* or somali* or yemini* or Vietnamese or Chinese or Punjabi* or Somali* or Gujarati* or Japanese or Bengali* or Afghanistani* or Turkish or Kurdish or Yemeni* or Albanian* or German* or American* or Jamaican* or Nigerian* or Kenyan* or Zimbabwean* or Philippin* or Filipino* or "Sri Lankan*" or French or Chinese or Cantonese or Australia* or Somalia* or Portugues* or Canadian* or Ghanaian* or Lithuanian* or "Hong Kong" or Spanish or Iranian* or "New Zealand" or Kiwi* or Iraqi* or Turkish or Cypriot* or Malaysian* or Dutch or Ugandan* or Bulgarian* or Afghan* or Brazilian* or Slovak* or Mauritan* or Singapore* or Nepales* or Hungarian* or Latvian* or Russian* or Tanzanian* or Thai* or Swedish or Greek or Zambia* or Czech or Egyptia* or Trinidad* or Tobago* or Maltese or Austrian* or Belgian* or Libyan* or Korean* or Danish or Swiss) adj3 (cultur* or men or women or male* or female* or people* or population* or communit* or neighbourhood* or neighborhood* or group* or area* or demograph*)).ti,ab. (339260)

15 exp population group/ (956283)

16 cultural diversity/ (1658)

17 exp "ethnic or racial aspects"/ (258695)

18 ethnology/ (72266)

19 exp migration/ (44107)

20 or/9-19 (2825876)

21 8 and 20 (50200)

22 exp glomerulus filtration rate/ (99133)

23 (glomerul* or GFR* or eGFR* or e-GFR*).tw. (266303)

24 22 or 23 (295198)

25 21 and 24 (12396)

26 limit 25 to english language (12158)

27 nonhuman/ not human/ (4607670)

28 26 not 27 (11986)

29 limit 28 to abstracts (11720)

30 limit 29 to (books or chapter or conference abstract or conference paper or "conference review" or editorial or letter or note or tombstone) (5449)

31 29 not 30 (6271)

#1 MeSH descriptor: [Renal Insufficiency, Chronic] explode all trees 6493

#2 (((chronic* or progressi*) near/1 (renal* or kidney*))):ti,ab,kw 9938

#3 (((kidney* or renal*) near/1 insufficien*)):ti,ab,kw 5244

#4 (ckd*):ti,ab,kw 4694

#5 (((kidney* or renal*) near/1 fail*)):ti,ab,kw 15735

#6 (((endstage* or end-stage* or "end stage*") near/1 (renal* or kidney*))):ti,ab,kw 4309

#7 ((esrd* or eskd*)):ti,ab,kw 1967

#8 MeSH descriptor: [Chronic Kidney Disease-Mineral and Bone Disorder] this term only 86

#9 #1 or #2 or #3 or #4 or #5 or #6 or #7 or #8 25083

#10 (diaspor* or multicultural* or multi-cultural* or crosscultural* or cross-cultural* or transcultural* or trans-cultural* or ethn* or multiethn* or minorit* or race or races or racial* or multiracial* or biracial* or migrant* or immigrant* or refugee* or cultural* divers* or multilingual* or multi-lingual* or traveller* or Gyps* or Romany or Romani* or Rroma* or Roma or asylum seek* or seeking asylum or sociocultural or diversity or "diverse population*" or indigenous or ancestry group* or cultur* difference* or heritage* or foreign*):ti,ab,kw 38499

#11 (black* or Afrocaribbean* or caribbean* or african* or African American* or Asia* or South American* or Hispanic* or Central American* or latina* or latino* or Jew* or sikh* or hindu* or muslim* or islam* or indian* or bangladeshi* or pakistani* or Eastern Europe* or Balkan* or Polish or Romanian* or white* or nonwhite* or Caucasian* or noncaucasian* or Irish or Italian* or BME or BAME):ti,ab,kw 64621

#12 ((displaced or alien*) near/2 (people* or person*)):ti,ab,kw 34

#13 (born near/2 overseas):ti,ab,kw 5

#14 ((marginal* or transient or undocumented) near/1 (people or population* or communit* or neighbourhood* or neighborhood* or group* or area* or demograph*)):ti,ab,kw 327

#15 ((arab* or somali* or yemini* or Vietnamese or Chinese or Punjabi* or Somali* or Gujarati* or Japanese or Bengali* or Afghanistani* or Turkish or Kurdish or Yemeni* or Albanian* or German* or American* or Jamaican* or Nigerian* or Kenyan* or Zimbabwean* or Philippin* or Filipino* or "Sri Lankan*" or French or Chinese or Cantonese or Australia* or Somalia* or Portugues* or Canadian* or Ghanaian* or Lithuanian* or "Hong Kong" or Spanish or Iranian* or "New Zealand" or Kiwi* or Iraqi* or Turkish or Cypriot* or Malaysian* or Dutch or Ugandan* or Bulgarian* or Afghan* or Brazilian* or Slovak* or Mauritan* or Singapore* or Nepales* or Hungarian* or Latvian* or Russian* or Tanzanian* or Thai* or Swedish or Greek or Zambia* or Czech or Egyptia* or Trinidad* or Tobago* or Maltese or Austrian* or Belgian* or Libyan* or Korean* or Danish or Swiss) near/3 (cultur* or men or women or male* or female* or people* or population* or communit* or neighbourhood* or neighborhood* or group* or area* or demograph*)):ti,ab,kw 24377

#16 MeSH descriptor: [] explode all trees and with qualifier(s): [ethnology - EH] 3851

#17 MeSH descriptor: [Emigrants and Immigrants] explode all trees 157

#18 MeSH descriptor: [Ethnic Groups] explode all trees 4128

#19 MeSH descriptor: [Minority Groups] this term only 329

#20 MeSH descriptor: [Continental Population Groups] explode all trees 6316

#21 MeSH descriptor: [Refugees] this term only 102

#22 MeSH descriptor: [Transients and Migrants] this term only 66

#23 MeSH descriptor: [Cross-Cultural Comparison] this term only 206

#24 MeSH descriptor: [Cultural Characteristics] this term only 162

#25 MeSH descriptor: [Cultural Diversity] this term only 67

#26 MeSH descriptor: [Ethnology] this term only 8

#27 MeSH descriptor: [Human Migration] explode all trees 64

#28 #10 or #11 or #12 or #13 or #14 or #15 or #16 or #17 or #18 or #19 or #20 or #21 or #22 or #23 or #24 or #25 or #26 or #27 107802

#29 #9 and #28 1978

#30 MeSH descriptor: [Glomerular Filtration Rate] this term only 2612

#31 (glomerul* or GFR* or eGFR* or e-GFR*):ti,ab,kw 17658

#32 #30 or #31 17658

#33 #29 and #32 575

#34 "conference":pt or (clinicaltrials or trialsearch):so 484088

#35 #33 not #34 353 (4 in CDSR)

CRD databases

1 (MeSH DESCRIPTOR Renal Insufficiency, Chronic EXPLODE ALL TREES) 538 Delete

2 ((chronic* or progressi*) near1 (renal* or kidney*)) 489 Delete

3 (ckd*) 93 Delete

4 ((kidney* or renal*) near1 fail*) 836 Delete

5 ((endstage* or end-stage* or "end stage*") near1 (renal* or kidney)) 354 Delete

6 (esrd* or eskd*) 150 Delete

7 ((kidney* or renal*) near1 insufficien*) 320 Delete

8 (MeSH DESCRIPTOR Chronic Kidney Disease-Mineral and Bone Disorder) 0 Delete

9 (#1 or #2 or #3 or #4 or #5 or #6 or #7 or #8) 1407 Delete

10 (diaspor* or multicultural* or multi-cultural* or crosscultural* or cross-cultural* or transcultural* or trans-cultural* or ethn* or multiethn* or minorit* or race or races or racial* or multiracial* or biracial* or migrant* or immigrant* or refugee* or cultural* divers* or multilingual*

or multi-lingual* or traveller* or Gyps* or Romany or Romani* or Rroma* or Roma or asylum seek* or seeking asylum or sociocultural or diversity or "diverse population*" or indigenous or ancestry group* or cultur* difference* or heritage* or foreign*) 3205 Delete

11 (black* or Afrocaribbean* or caribbean* or african* or African American* or Asia* or South American* or Hispanic* or Central American* or latina* or latino* or Jew* or sikh* or hindu* or muslim* or islam* or indian* or bangladeshi* or pakistani* or Eastern Europe* or Balkan* or Polish or Romanian* or white* or nonwhite* or Caucasian* or noncaucasian* or Irish or Italian* or BME or BAME) 4608 Delete

12 (((displaced or alien*) near2 (people* or person*))) 2 Delete

13 (born near2 overseas) 1 Delete

14 (((marginal* or transient or undocumented) near1 (people or population* or communit* or neighbourhood* or neighborhood* or group* or area* or demograph*))) 5 Delete

15 (((arab* or somali* or yemini* or Vietnamese or Chinese or Punjabi* or Somali* or Gujarati* or Japanese or Bengali* or Afghanistani* or Turkish or Kurdish or Yemeni* or Albanian* or German* or American* or Jamaican* or Nigerian* or Kenyan* or Zimbabwean* or Philippin* or Filipino* or "Sri Lankan*" or French or Chinese or Cantonese or Australia* or Somalia* or Portugues* or Canadian* or Ghanaian* or Lithuanian* or "Hong Kong" or Spanish or Iranian* or "New Zealand" or Kiwi* or Iraqi* or Turkish or Cypriot* or Malaysian* or Dutch or Ugandan* or Bulgarian* or Afghan* or Brazilian* or Slovak* or Mauritan* or Singapore* or Nepales* or Hungarian* or Latvian* or Russian* or Tanzanian* or Thai* or Swedish or Greek or Zambia* or Czech or Egyptia* or Trinidad* or Tobago* or Maltese or Austrian* or Belgian* or Libyan* or Korean* or Danish or Swiss) near3 (cultur* or men or women or male* or female* or people* or population* or communit* or neighbourhood* or neighborhood* or group* or area* or demograph*))) 891 Delete

16 MeSH DESCRIPTOR Emigrants and Immigrants EXPLODE ALL TREES 25 Delete

17 MeSH DESCRIPTOR Ethnic Groups EXPLODE ALL TREES 228 Delete

18 MeSH DESCRIPTOR Minority Groups 61 Delete

19 MeSH DESCRIPTOR Continental Population Groups EXPLODE ALL TREES 488 Delete

20 MeSH DESCRIPTOR Refugees 11 Delete

21 MeSH DESCRIPTOR Transients and Migrants 11 Delete

22 MeSH DESCRIPTOR Cross-Cultural Comparison 17 Delete

23 MeSH DESCRIPTOR Cultural Characteristics 9 Delete

24 MeSH DESCRIPTOR Cultural Diversity 14 Delete

25 MeSH DESCRIPTOR Ethnology 1 Delete

26 MeSH DESCRIPTOR Human Migration EXPLODE ALL TREES 22 Delete

27 #10 OR #11 OR #12 OR #13 OR #14 OR #15 OR #16 OR #17 OR #18 OR #19 OR #20 OR #21 OR #22 OR #23 OR #24 OR #25 OR #26 7480 Delete

28 #9 AND #27 184 Delete

29	(MeSH DESCRIPTOR Glomerular Filtration Rate)	92	Delete
30	(glomerul* or GFR* or eGFR* or e-GFR*)	416	Delete
31	#29 OR #30	416	Delete
32	#28 AND #31	24	Delete
33	(#28 AND #31) IN DARE	13	Delete
34	(#28 AND #31) IN NHSEED	8	Delete
35	(#28 AND #31) IN HTA	3	Delete

Cost-effectiveness searches

Databases	Date searched	Version/files	No. retrieved
MEDLINE (Ovid)	23rd Apr 2020	Ovid MEDLINE(R) <1946 to April 22, 2020>	272
MEDLINE in Process (Ovid)	23rd Apr 2020	Ovid MEDLINE(R) In-Process & Other Non-Indexed Citations <1946 to April 22, 2020>	45
MEDLINE epub (Ovid)	23rd Apr 2020	Ovid MEDLINE(R) Epub Ahead of Print <April 22, 2020>	2
Embase (Ovid)	23rd Apr 2020	Embase <1974 to 2020 Week 16>	575
EconLit (Ovid)	23rd Apr 2020	Econlit <1886 to April 16, 2020>	0
NHS Economic Evaluation Database (NHS EED) (legacy database)	23rd Apr 2020	Up to 2015	9
CRD HTA	23rd Apr 2020	Up to 2018	9

The following search filters were applied to the search strategies in MEDLINE and Embase to identify cost-effectiveness studies:

- Glanville J et al. (2009) Development and Testing of Search Filters to Identify Economic Evaluations in MEDLINE and EMBASE. Alberta: Canadian Agency for Drugs and Technologies in Health (CADTH)

  Several modifications have been made to these filters over the years that are standard NICE practice.

Search strategies

Database: Ovid MEDLINE(R) <1946 to April 22, 2020>

Search Strategy:

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1 exp Renal Insufficiency, Chronic/ (113392)

2 ((chronic* or progressi*) adj1 (renal* or kidney*)).tw. (73232)

3 ((kidney* or renal*) adj1 insufficien*).tw. (21299)

4 ckd*.tw. (23299)

5 ((kidney* or renal*) adj1 fail*).tw. (86568)

6 ((endstage* or end-stage* or "end stage*") adj1 (renal* or kidney*)).tw. (35469)

7 (esrd* or eskd*).tw. (14335)

8 "Chronic Kidney Disease-Mineral and Bone Disorder"/ (3458)

9 or/1-8 (214059)

10 (diaspor* or multicultural* or multi-cultural* or crosscultural* or cross-cultural* or transcultural* or trans-cultural* or ethn* or multiethn* or minorit* or race or races or racial* or multiracial* or biracial* or migrant* or immigrant* or refugee* or cultural* divers* or multilingual* or multi-lingual* or traveller* or Gyps* or Romany or Romani* or Rroma* or Roma or asylum seek* or seeking asylum or sociocultural or diversity or "diverse population*" or indigenous or ancestry group* or cultur* difference* or heritage* or foreign*).ti,ab. (596438)

11 (black* or Afrocaribbean* or caribbean* or african* or African American* or Asia* or South American* or Hispanic* or Central American* or latina* or latino* or Jew* or sikh* or hindu* or muslim* or islam* or indian* or bangladeshi* or pakistani* or Eastern Europe* or Balkan* or Polish or Romanian* or white* or nonwhite* or Caucasian* or noncaucasian* or Irish or Italian* or BME or BAME).ti,ab. (789110)

12 ((displaced or alien*) adj2 (people* or person*)).ti,ab. (815)

13 (born adj2 overseas).ti,ab. (308)

14 ((marginal* or transient or undocumented) adj1 (people or population* or communit* or neighbourhood* or neighborhood* or group* or area* or demograph*)).ti,ab. (3143)

15 ((arab* or somali* or yemini* or Vietnamese or Chinese or Punjabi* or Somali* or Gujarati* or Japanese or Bengali* or Afghanistani* or Turkish or Kurdish or Yemeni* or Albanian* or German* or American* or Jamaican* or Nigerian* or Kenyan* or Zimbabwean* or Philippin* or Filipino* or "Sri Lankan*" or French or Chinese or Cantonese or Australia* or Somalia* or Portugues* or Canadian* or

Ghanaian* or Lithuanian* or "Hong Kong" or Spanish or Iranian* or "New Zealand" or Kiwi* or Iraqi* or Turkish or Cypriot* or Malaysian* or Dutch or Ugandan* or Bulgarian* or Afghan* or Brazilian* or Slovak* or Mauritan* or Singapore* or Nepales* or Hungarian* or Latvian* or Russian* or Tanzanian* or Thai* or Swedish or Greek or Zambia* or Czech or Egyptia* or Trinidad* or Tobago* or Maltese or Austrian* or Belgian* or Libyan* or Korean* or Danish or Swiss) adj3 (cultur* or men or women or male* or female* or people* or population* or communit* or neighbourhood* or neighborhood* or group* or area* or demograph*)).ti,ab. (223136)

16 eh.fs. (160449)

17 exp "Emigrants and Immigrants"/ (12134)

18 exp Ethnic Groups/ (151161)

19 Minority Groups/ (13637)

20 exp Continental Population Groups/ (217270)

21 Refugees/ (10008)

22 "Transients and Migrants"/ (11431)

23 cross-cultural comparison/ or cultural characteristics/ or cultural diversity/ or ethnology/ (52633)

24 exp Human Migration/ (26169)

25 or/10-24 (1569266)

26 9 and 25 (15967)

27 Glomerular Filtration Rate/ (43611)

28 (glomerul* or GFR* or eGFR* or e-GFR*).tw. (158675)

29 27 or 28 (172071)

30 26 and 29 (4280)

31 Economics/ (27171)

32 exp "Costs and Cost Analysis"/ (234439)

33 Economics, Dental/ (1911)

34 exp Economics, Hospital/ (24371)

35 exp Economics, Medical/ (14174)

36 Economics, Nursing/ (3997)

37 Economics, Pharmaceutical/ (2926)

38 Budgets/ (11264)

39 exp Models, Economic/ (14861)

40 Markov Chains/ (14124)

41 Monte Carlo Method/ (28036)

42 Decision Trees/ (11009)

43 econom$.tw. (234404)

44 cba.tw. (9721)

45 cea.tw. (20363)

46 cua.tw. (984)

47 markov$.tw. (17671)

48 (monte adj carlo).tw. (29572)

49 (decision adj3 (tree$ or analys$)).tw. (13144)

50 (cost or costs or costing$ or costly or costed).tw. (453143)

51 (price$ or pricing$).tw. (32981)

52 budget$.tw. (23395)

53 expenditure$.tw. (48667)

54 (value adj3 (money or monetary)).tw. (2063)

55 (pharmacoeconomic$ or (pharmaco adj economic$)).tw. (3458)

56 or/31-55 (913097)

57 "Quality of Life"/ (190988)

58 quality of life.tw. (225303)

59 "Value of Life"/ (5695)

60 Quality-Adjusted Life Years/ (11972)

61 quality adjusted life.tw. (10556)

62 (qaly$ or qald$ or qale$ or qtime$).tw. (8661)

63 disability adjusted life.tw. (2622)

64 daly$.tw. (2389)

65 Health Status Indicators/ (23285)

66 (sf36 or sf 36 or short form 36 or shortform 36 or sf thirtysix or sf thirty six or shortform thirtysix or shortform thirty six or short form thirtysix or short form thirty six).tw. (22200)

67 (sf6 or sf 6 or short form 6 or shortform 6 or sf six or sfsix or shortform six or short form six).tw. (1309)

68 (sf12 or sf 12 or short form 12 or shortform 12 or sf twelve or sftwelve or shortform twelve or short form twelve).tw. (4802)

69 (sf16 or sf 16 or short form 16 or shortform 16 or sf sixteen or sfsixteen or shortform sixteen or short form sixteen).tw. (28)

70 (sf20 or sf 20 or short form 20 or shortform 20 or sf twenty or sftwenty or shortform twenty or short form twenty).tw. (379)

71 (euroqol or euro qol or eq5d or eq 5d).tw. (8732)

72 (qol or hql or hqol or hrqol).tw. (43135)

73 (hye or hyes).tw. (60)

74 health$ year$ equivalent$.tw. (38)

75 utilit$.tw. (168433)

76 (hui or hui1 or hui2 or hui3).tw. (1278)

77 disutili$.tw. (383)

78 rosser.tw. (93)

79 quality of wellbeing.tw. (13)

80 quality of well-being.tw. (379)

81 qwb.tw. (188)

82 willingness to pay.tw. (4363)

83 standard gamble$.tw. (777)

84 time trade off.tw. (1024)

85 time tradeoff.tw. (233)

86 tto.tw. (887)

87 or/57-86 (484316)

88 56 or 87 (1330258)

89 30 and 88 (282)

90 limit 89 to english language (272)

91 animals/ not humans/ (4659319)

92 90 not 91 (272)

Database: Embase <1974 to 2020 Week 16>

Search Strategy:

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1 exp kidney failure/ (354306)

2 ((chronic* or progressi*) adj1 (renal* or kidney*)).tw. (124074)

3 ((kidney* or renal*) adj1 insufficien*).tw. (30110)

4 ckd*.tw. (50492)

5 ((kidney* or renal*) adj1 fail*).tw. (132656)

6 ((endstage* or end-stage* or "end stage*") adj1 (renal* or kidney*)).tw. (58735)

7 (esrd* or eskd*).tw. (27656)

8 or/1-7 (447105)

9 (diaspor* or multicultural* or multi-cultural* or crosscultural* or cross-cultural* or transcultural* or trans-cultural* or ethn* or multiethn* or minorit* or race or races or racial* or multiracial* or biracial* or migrant* or immigrant* or refugee* or cultural* divers* or multilingual* or multi-lingual* or traveller* or Gyps* or Romany or Romani* or Rroma* or Roma or asylum seek* or seeking asylum or sociocultural or diversity or "diverse population*" or indigenous or ancestry group* or cultur* difference* or heritage* or foreign*).ti,ab. (874212)

10 (black* or Afrocaribbean* or caribbean* or african* or African American* or Asia* or South American* or Hispanic* or Central American* or latina* or latino* or Jew* or sikh* or hindu* or muslim* or islam* or indian* or bangladeshi* or pakistani* or Eastern Europe* or Balkan* or Polish or Romanian* or white* or nonwhite* or Caucasian* or noncaucasian* or Irish or Italian* or BME or BAME).ti,ab. (1345815)

11 ((displaced or alien*) adj2 (people* or person*)).ti,ab. (1071)

12 (born adj2 overseas).ti,ab. (484)

13 ((marginal* or transient or undocumented) adj1 (people or population* or communit* or neighbourhood* or neighborhood* or group* or area* or demograph*)).ti,ab. (4522)

14 ((arab* or somali* or yemini* or Vietnamese or Chinese or Punjabi* or Somali* or Gujarati* or Japanese or Bengali* or Afghanistani* or Turkish or Kurdish or Yemeni* or Albanian* or German* or American* or Jamaican* or Nigerian* or Kenyan* or Zimbabwean* or Philippin* or Filipino* or "Sri Lankan*" or French or Chinese or Cantonese or Australia* or Somalia* or Portugues* or Canadian* or Ghanaian* or Lithuanian* or "Hong Kong" or Spanish or Iranian* or "New Zealand" or Kiwi* or Iraqi* or Turkish or Cypriot* or Malaysian* or Dutch or Ugandan* or Bulgarian* or Afghan* or Brazilian* or Slovak* or Mauritan* or Singapore* or Nepales* or Hungarian* or Latvian* or Russian* or Tanzanian* or Thai* or Swedish or Greek or Zambia* or Czech or Egyptia* or Trinidad* or Tobago* or Maltese or Austrian* or Belgian* or Libyan* or Korean* or Danish or Swiss) adj3 (cultur* or men or women or male* or female* or people* or population* or communit* or neighbourhood* or neighborhood* or group* or area* or demograph*)).ti,ab. (339260)

15 exp population group/ (956283)

16 cultural diversity/ (1658)

17 exp "ethnic or racial aspects"/ (258695)

18 ethnology/ (72266)

19 exp migration/ (44107)

20 or/9-19 (2825876)

21 8 and 20 (50200)

22 exp glomerulus filtration rate/ (99133)

23 (glomerul* or GFR* or eGFR* or e-GFR*).tw. (266303)

24 22 or 23 (295198)

25 21 and 24 (12396)

26 limit 25 to english language (12158)

27 nonhuman/ not human/ (4607670)

28 26 not 27 (11986)

29 limit 28 to abstracts (11720)

30 limit 29 to (books or chapter or conference abstract or conference paper or "conference review" or editorial or letter or note or tombstone) (5449)

31 29 not 30 (6271)

32 exp Health Economics/ (835500)

33 exp "Health Care Cost"/ (288038)

34 exp Pharmacoeconomics/ (200645)

35 Monte Carlo Method/ (39707)

36 Decision Tree/ (12513)

37 econom$.tw. (360368)

38 cba.tw. (12667)

39 cea.tw. (34270)

40 cua.tw. (1478)

41 markov$.tw. (29811)

42 (monte adj carlo).tw. (47649)

43 (decision adj3 (tree$ or analys$)).tw. (22776)

44 (cost or costs or costing$ or costly or costed).tw. (756380)

45 (price$ or pricing$).tw. (56308)

46 budget$.tw. (37988)

47 expenditure$.tw. (73490)

48 (value adj3 (money or monetary)).tw. (3394)

49 (pharmacoeconomic$ or (pharmaco adj economic$)).tw. (8559)

50 or/32-49 (1729531)

51 "Quality of Life"/ (460346)

52 Quality Adjusted Life Year/ (26053)

53 Quality of Life Index/ (2755)

54 Short Form 36/ (28265)

55 Health Status/ (125764)

56 quality of life.tw. (429285)

57 quality adjusted life.tw. (19260)

58 (qaly$ or qald$ or qale$ or qtime$).tw. (19702)

59 disability adjusted life.tw. (3963)

60 daly$.tw. (3891)

61 (sf36 or sf 36 or short form 36 or shortform 36 or sf thirtysix or sf thirty six or shortform thirtysix or shortform thirty six or short form thirtysix or short form thirty six).tw. (40783)

62 (sf6 or sf 6 or short form 6 or shortform 6 or sf six or sfsix or shortform six or short form six).tw. (2370)

63 (sf12 or sf 12 or short form 12 or shortform 12 or sf twelve or sftwelve or shortform twelve or short form twelve).tw. (9234)

64 (sf16 or sf 16 or short form 16 or shortform 16 or sf sixteen or sfsixteen or shortform sixteen or short form sixteen).tw. (59)

65 (sf20 or sf 20 or short form 20 or shortform 20 or sf twenty or sftwenty or shortform twenty or short form twenty).tw. (445)

66 (euroqol or euro qol or eq5d or eq 5d).tw. (19953)

67 (qol or hql or hqol or hrqol).tw. (94714)

68 (hye or hyes).tw. (134)

69 health$ year$ equivalent$.tw. (41)

70 utilit$.tw. (283653)

71 (hui or hui1 or hui2 or hui3).tw. (2232)

72 disutili$.tw. (904)

73 rosser.tw. (121)

74 quality of wellbeing.tw. (42)

75 quality of well-being.tw. (474)

76 qwb.tw. (244)

77 willingness to pay.tw. (8546)

78 standard gamble$.tw. (1096)

79 time trade off.tw. (1679)

80 time tradeoff.tw. (288)

81 tto.tw. (1646)

82 or/51-81 (969495)

83 50 or 82 (2545306)

84 31 and 83 (575)

atabase: Ovid MEDLINE(R) In-Process & Other Non-Indexed Citations <1946 to April 22, 2020>

Search Strategy:

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1 exp Renal Insufficiency, Chronic/ (0)

2 ((chronic* or progressi*) adj1 (renal* or kidney*)).tw. (9539)

3 ((kidney* or renal*) adj1 insufficien*).tw. (1122)

4 ckd*.tw. (4563)

5 ((kidney* or renal*) adj1 fail*).tw. (6416)

6 ((endstage* or end-stage* or "end stage*") adj1 (renal* or kidney*)).tw. (4948)

7 (esrd* or eskd*).tw. (2029)

8 "Chronic Kidney Disease-Mineral and Bone Disorder"/ (0)

9 or/1-8 (18714)

10 (diaspor* or multicultural* or multi-cultural* or crosscultural* or cross-cultural* or transcultural* or trans-cultural* or ethn* or multiethn* or minorit* or race or races or racial* or multiracial* or biracial* or migrant* or immigrant* or refugee* or cultural* divers* or multilingual* or multi-lingual* or traveller* or Gyps* or Romany or Romani* or Rroma* or Roma or asylum seek* or seeking asylum or sociocultural or diversity or "diverse population*" or indigenous or ancestry group* or cultur* difference* or heritage* or foreign*).ti,ab. (95106)

11 (black* or Afrocaribbean* or caribbean* or african* or African American* or Asia* or South American* or Hispanic* or Central American* or latina* or latino* or Jew* or sikh* or hindu* or muslim* or islam* or indian* or bangladeshi* or pakistani* or Eastern Europe* or Balkan* or Polish or Romanian* or white* or nonwhite* or Caucasian* or noncaucasian* or Irish or Italian* or BME or BAME).ti,ab. (130634)

12 ((displaced or alien*) adj2 (people* or person*)).ti,ab. (167)

13 (born adj2 overseas).ti,ab. (22)

14 ((marginal* or transient or undocumented) adj1 (people or population* or communit* or neighbourhood* or neighborhood* or group* or area* or demograph*)).ti,ab. (660)

15 ((arab* or somali* or yemini* or Vietnamese or Chinese or Punjabi* or Somali* or Gujarati* or Japanese or Bengali* or Afghanistani* or Turkish or Kurdish or Yemeni* or Albanian* or German* or American* or Jamaican* or Nigerian* or Kenyan* or Zimbabwean* or Philippin* or Filipino* or "Sri Lankan*" or French or Chinese or Cantonese or Australia* or Somalia* or Portugues* or Canadian* or Ghanaian* or Lithuanian* or "Hong Kong" or Spanish or Iranian* or "New Zealand" or Kiwi* or Iraqi*

or Turkish or Cypriot* or Malaysian* or Dutch or Ugandan* or Bulgarian* or Afghan* or Brazilian* or Slovak* or Mauritan* or Singapore* or Nepales* or Hungarian* or Latvian* or Russian* or Tanzanian* or Thai* or Swedish or Greek or Zambia* or Czech or Egyptia* or Trinidad* or Tobago* or Maltese or Austrian* or Belgian* or Libyan* or Korean* or Danish or Swiss) adj3 (cultur* or men or women or male* or female* or people* or population* or communit* or neighbourhood* or neighborhood* or group* or area* or demograph*)).ti,ab. (29641)

16 eh.fs. (0)

17 exp "Emigrants and Immigrants"/ (0)

18 exp Ethnic Groups/ (0)

19 Minority Groups/ (0)

20 exp Continental Population Groups/ (0)

21 Refugees/ (0)

22 "Transients and Migrants"/ (0)

23 cross-cultural comparison/ or cultural characteristics/ or cultural diversity/ or ethnology/ (0)

24 exp Human Migration/ (0)

25 or/10-24 (228718)

26 9 and 25 (1928)

27 Glomerular Filtration Rate/ (0)

28 (glomerul* or GFR* or eGFR* or e-GFR*).tw. (16530)

29 27 or 28 (16530)

30 26 and 29 (497)

31 Economics/ (0)

32 exp "Costs and Cost Analysis"/ (0)

33 Economics, Dental/ (0)

34 exp Economics, Hospital/ (0)

35 exp Economics, Medical/ (0)

36 Economics, Nursing/ (0)

37 Economics, Pharmaceutical/ (0)

38 Budgets/ (0)

39 exp Models, Economic/ (0)

40 Markov Chains/ (0)

41 Monte Carlo Method/ (0)

42 Decision Trees/ (0)

43 econom$.tw. (44767)

44 cba.tw. (432)

45 cea.tw. (1920)

46 cua.tw. (200)

47 markov$.tw. (5714)

48 (monte adj carlo).tw. (16865)

49 (decision adj3 (tree$ or analys$)).tw. (2402)

50 (cost or costs or costing$ or costly or costed).tw. (95958)

51 (price$ or pricing$).tw. (5771)

52 budget$.tw. (4954)

53 expenditure$.tw. (6300)

54 (value adj3 (money or monetary)).tw. (350)

55 (pharmacoeconomic$ or (pharmaco adj economic$)).tw. (487)

56 or/31-55 (165638)

57 "Quality of Life"/ (0)

58 quality of life.tw. (38373)

59 "Value of Life"/ (0)

60 Quality-Adjusted Life Years/ (0)

61 quality adjusted life.tw. (1694)

62 (qaly$ or qald$ or qale$ or qtime$).tw. (1427)

63 disability adjusted life.tw. (550)

64 daly$.tw. (496)

65 Health Status Indicators/ (0)

66 (sf36 or sf 36 or short form 36 or shortform 36 or sf thirtysix or sf thirty six or shortform thirtysix or shortform thirty six or short form thirtysix or short form thirty six).tw. (2619)

67 (sf6 or sf 6 or short form 6 or shortform 6 or sf six or sfsix or shortform six or short form six).tw. (758)

68 (sf12 or sf 12 or short form 12 or shortform 12 or sf twelve or sftwelve or shortform twelve or short form twelve).tw. (729)

69 (sf16 or sf 16 or short form 16 or shortform 16 or sf sixteen or sfsixteen or shortform sixteen or short form sixteen).tw. (5)

70 (sf20 or sf 20 or short form 20 or shortform 20 or sf twenty or sftwenty or shortform twenty or short form twenty).tw. (17)

71 (euroqol or euro qol or eq5d or eq 5d).tw. (1588)

72 (qol or hql or hqol or hrqol).tw. (7274)

73 (hye or hyes).tw. (8)

74 health$ year$ equivalent$.tw. (2)

75 utilit$.tw. (31110)

76 (hui or hui1 or hui2 or hui3).tw. (194)

77 disutili$.tw. (64)

78 rosser.tw. (4)

79 quality of wellbeing.tw. (10)

80 quality of well-being.tw. (27)

81 qwb.tw. (15)

82 willingness to pay.tw. (934)

83 standard gamble$.tw. (57)

84 time trade off.tw. (111)

85 time tradeoff.tw. (14)

86 tto.tw. (123)

87 or/57-86 (71766)

88 56 or 87 (227894)

89 30 and 88 (45)

90 limit 89 to english language (45)

91 animals/ not humans/ (0)

92 90 not 91 (45)

Database: Ovid MEDLINE(R) Epub Ahead of Print <April 22, 2020>

Search Strategy:

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1 exp Renal Insufficiency, Chronic/ (0)

2 ((chronic* or progressi*) adj1 (renal* or kidney*)).tw. (1393)

3 ((kidney* or renal*) adj1 insufficien*).tw. (155)

4 ckd*.tw. (724)

5 ((kidney* or renal*) adj1 fail*).tw. (770)

6 ((endstage* or end-stage* or "end stage*") adj1 (renal* or kidney*)).tw. (718)

7 (esrd* or eskd*).tw. (322)

8 "Chronic Kidney Disease-Mineral and Bone Disorder"/ (0)

9 or/1-8 (2622)

10 (diaspor* or multicultural* or multi-cultural* or crosscultural* or cross-cultural* or transcultural* or trans-cultural* or ethn* or multiethn* or minorit* or race or races or racial* or multiracial* or biracial* or migrant* or immigrant* or refugee* or cultural* divers* or multilingual* or multi-lingual* or traveller* or Gyps* or Romany or Romani* or Rroma* or Roma or asylum seek* or seeking asylum or sociocultural or diversity or "diverse population*" or indigenous or ancestry group* or cultur* difference* or heritage* or foreign*).ti,ab. (14474)

11 (black* or Afrocaribbean* or caribbean* or african* or African American* or Asia* or South American* or Hispanic* or Central American* or latina* or latino* or Jew* or sikh* or hindu* or muslim* or islam* or indian* or bangladeshi* or pakistani* or Eastern Europe* or Balkan* or Polish or Romanian* or white* or nonwhite* or Caucasian* or noncaucasian* or Irish or Italian* or BME or BAME).ti,ab. (16545)

12 ((displaced or alien*) adj2 (people* or person*)).ti,ab. (20)

13 (born adj2 overseas).ti,ab. (11)

14 ((marginal* or transient or undocumented) adj1 (people or population* or communit* or neighbourhood* or neighborhood* or group* or area* or demograph*)).ti,ab. (116)

15 ((arab* or somali* or yemini* or Vietnamese or Chinese or Punjabi* or Somali* or Gujarati* or Japanese or Bengali* or Afghanistani* or Turkish or Kurdish or Yemeni* or Albanian* or German* or American* or Jamaican* or Nigerian* or Kenyan* or Zimbabwean* or Philippin* or Filipino* or "Sri Lankan*" or French or Chinese or Cantonese or Australia* or Somalia* or Portugues* or Canadian* or Ghanaian* or Lithuanian* or "Hong Kong" or Spanish or Iranian* or "New Zealand" or Kiwi* or Iraqi* or Turkish or Cypriot* or Malaysian* or Dutch or Ugandan* or Bulgarian* or Afghan* or Brazilian* or Slovak* or Mauritan* or Singapore* or Nepales* or Hungarian* or Latvian* or Russian* or Tanzanian* or Thai* or Swedish or Greek or Zambia* or Czech or Egyptia* or Trinidad* or Tobago* or Maltese or Austrian* or Belgian* or Libyan* or Korean* or Danish or Swiss) adj3 (cultur* or men or women or male* or female* or people* or population* or communit* or neighbourhood* or neighborhood* or group* or area* or demograph*)).ti,ab. (4803)

16 eh.fs. (0)

17 exp "Emigrants and Immigrants"/ (0)

18 exp Ethnic Groups/ (0)

19 Minority Groups/ (0)

20 exp Continental Population Groups/ (0)

21 Refugees/ (0)

22 "Transients and Migrants"/ (0)

23 cross-cultural comparison/ or cultural characteristics/ or cultural diversity/ or ethnology/ (0)

24 exp Human Migration/ (0)

25 or/10-24 (30195)

26 9 and 25 (286)

27 Glomerular Filtration Rate/ (0)

28 (glomerul* or GFR* or eGFR* or e-GFR*).tw. (2300)

29 27 or 28 (2300)

30 26 and 29 (65)

31 Economics/ (0)

32 exp "Costs and Cost Analysis"/ (0)

33 Economics, Dental/ (0)

34 exp Economics, Hospital/ (0)

35 exp Economics, Medical/ (0)

36 Economics, Nursing/ (0)

37 Economics, Pharmaceutical/ (0)

38 Budgets/ (0)

39 exp Models, Economic/ (0)

40 Markov Chains/ (0)

41 Monte Carlo Method/ (0)

42 Decision Trees/ (0)

43 econom$.tw. (6002)

44 cba.tw. (61)

45 cea.tw. (309)

46 cua.tw. (12)

47 markov$.tw. (694)

48 (monte adj carlo).tw. (1178)

49 (decision adj3 (tree$ or analys$)).tw. (435)

50 (cost or costs or costing$ or costly or costed).tw. (12381)

51 (price$ or pricing$).tw. (888)

52 budget$.tw. (543)

53 expenditure$.tw. (1109)

54 (value adj3 (money or monetary)).tw. (70)

55 (pharmacoeconomic$ or (pharmaco adj economic$)).tw. (51)

56 or/31-55 (20313)

57 "Quality of Life"/ (0)

58 quality of life.tw. (6944)

59 "Value of Life"/ (0)

60 Quality-Adjusted Life Years/ (0)

61 quality adjusted life.tw. (398)

62 (qaly$ or qald$ or qale$ or qtime$).tw. (351)

63 disability adjusted life.tw. (96)

64 daly$.tw. (84)

65 Health Status Indicators/ (0)

66 (sf36 or sf 36 or short form 36 or shortform 36 or sf thirtysix or sf thirty six or shortform thirtysix or shortform thirty six or short form thirtysix or short form thirty six).tw. (441)

67 (sf6 or sf 6 or short form 6 or shortform 6 or sf six or sfsix or shortform six or short form six).tw. (43)

68 (sf12 or sf 12 or short form 12 or shortform 12 or sf twelve or sftwelve or shortform twelve or short form twelve).tw. (162)

69 (sf16 or sf 16 or short form 16 or shortform 16 or sf sixteen or sfsixteen or shortform sixteen or short form sixteen).tw. (1)

70 (sf20 or sf 20 or short form 20 or shortform 20 or sf twenty or sftwenty or shortform twenty or short form twenty).tw. (5)

71 (euroqol or euro qol or eq5d or eq 5d).tw. (381)

72 (qol or hql or hqol or hrqol).tw. (1372)

73 (hye or hyes).tw. (1)

74 health$ year$ equivalent$.tw. (0)

75 utilit$.tw. (4624)

76 (hui or hui1 or hui2 or hui3).tw. (17)

77 disutili$.tw. (12)

78 rosser.tw. (1)

79 quality of wellbeing.tw. (0)

80 quality of well-being.tw. (8)

81 qwb.tw. (2)

82 willingness to pay.tw. (169)

83 standard gamble$.tw. (10)

84 time trade off.tw. (21)

85 time tradeoff.tw. (2)

86 tto.tw. (26)

87 or/57-86 (11866)

88 56 or 87 (30433)

89 30 and 88 (3)

90 limit 89 to english language (2)

91 animals/ not humans/ (0)

92 90 not 91 (2)

Database: Econlit <1886 to April 16, 2020>

Search Strategy:

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1 [exp Renal Insufficiency, Chronic/] (0)

2 ((chronic* or progressi*) adj1 (renal* or kidney*)).tw. (22)

3 ((kidney* or renal*) adj1 insufficien*).tw. (3)

4 ckd*.tw. (5)

5 ((kidney* or renal*) adj1 fail*).tw. (33)

6 ((endstage* or end-stage* or "end stage*") adj1 (renal* or kidney*)).tw. (55)

7 (esrd* or eskd*).tw. (32)

8 ["Chronic Kidney Disease-Mineral and Bone Disorder"/] (0)

9 or/1-8 (102)

10 (diaspor* or multicultural* or multi-cultural* or crosscultural* or cross-cultural* or transcultural* or trans-cultural* or ethn* or multiethn* or minorit* or race or races or racial* or multiracial* or biracial* or migrant* or immigrant* or refugee* or cultural* divers* or multilingual* or multi-lingual* or traveller* or Gyps* or Romany or Romani* or Rroma* or Roma or asylum seek* or seeking asylum or sociocultural or diversity or "diverse population*" or indigenous or ancestry group* or cultur* difference* or heritage* or foreign*).ti,ab. (112480)

11 (black* or Afrocaribbean* or caribbean* or african* or African American* or Asia* or South American* or Hispanic* or Central American* or latina* or latino* or Jew* or sikh* or hindu* or muslim* or islam* or indian* or bangladeshi* or pakistani* or Eastern Europe* or Balkan* or Polish or Romanian* or white* or nonwhite* or Caucasian* or noncaucasian* or Irish or Italian* or BME or BAME).ti,ab. (106581)

12 ((displaced or alien*) adj2 (people* or person*)).ti,ab. (158)

13 (born adj2 overseas).ti,ab. (11)

14 ((marginal* or transient or undocumented) adj1 (people or population* or communit* or neighbourhood* or neighborhood* or group* or area* or demograph*)).ti,ab. (480)

15 ((arab* or somali* or yemini* or Vietnamese or Chinese or Punjabi* or Somali* or Gujarati* or Japanese or Bengali* or Afghanistani* or Turkish or Kurdish or Yemeni* or Albanian* or German* or American* or Jamaican* or Nigerian* or Kenyan* or Zimbabwean* or Philippin* or Filipino* or "Sri Lankan*" or French or Chinese or Cantonese or Australia* or Somalia* or Portugues* or Canadian* or Ghanaian* or Lithuanian* or "Hong Kong" or Spanish or Iranian* or "New Zealand" or Kiwi* or Iraqi* or Turkish or Cypriot* or Malaysian* or Dutch or Ugandan* or Bulgarian* or Afghan* or Brazilian* or Slovak* or Mauritan* or Singapore* or Nepales* or Hungarian* or Latvian* or Russian* or Tanzanian* or Thai* or Swedish or Greek or Zambia* or Czech or Egyptia* or Trinidad* or Tobago* or Maltese or Austrian* or Belgian* or Libyan* or Korean* or Danish or Swiss) adj3 (cultur* or men or women or male* or female* or people* or population* or communit* or neighbourhood* or neighborhood* or group* or area* or demograph*)).ti,ab. (10015)

16 eh.fs. (0)

17 [exp "Emigrants and Immigrants"/] (0)

18 [exp Ethnic Groups/] (0)

19 [Minority Groups/] (0)

20 [exp Continental Population Groups/] (0)

21 [Refugees/] (0)

22 ["Transients and Migrants"/] (0)

23 [cross-cultural comparison/ or cultural characteristics/ or cultural diversity/ or ethnology/] (0)

24 [exp Human Migration/] (0)

25 or/10-24 (205567)

26 9 and 25 (8)

27 [Glomerular Filtration Rate/] (0)

28 (glomerul* or GFR* or eGFR* or e-GFR*).tw. (13)

29 27 or 28 (13)

30 26 and 29 (0)

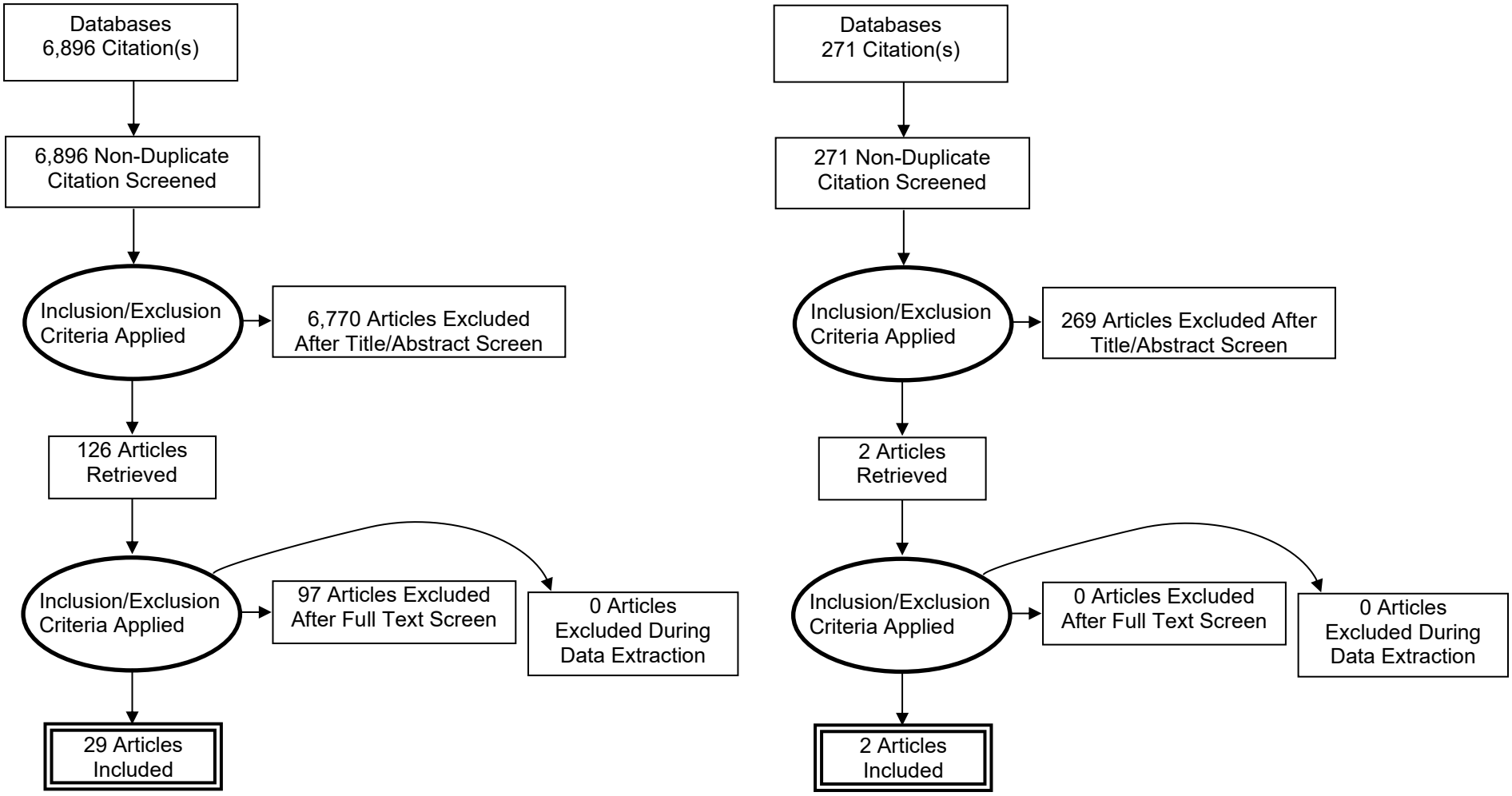
CRD databases

1 ((diaspor* or multicultural* or multi-cultural* or crosscultural* or cross-cultural* or transcultural* or trans-cultural* or ethn* or multiethn* or minorit* or race or races or racial* or multiracial* or biracial* or migrant* or immigrant* or refugee* or cultural* divers* or multilingual* or multi-lingual* or traveller* or Gyps* or Romany or Romani* or Rroma* or Roma or asylum seek*

or seeking asylum or sociocultural or diversity or "diverse population*" or indigenous or ancestry group* or cultur* difference* or heritage* or foreign*))	3205	Delete	
2	((black* or Afrocaribbean* or caribbean* or african* or African American* or Asia* or South American* or Hispanic* or Central American* or latina* or latino* or Jew* or sikh* or hindu* or muslim* or islam* or indian* or bangladeshi* or pakistani* or Eastern Europe* or Balkan* or Polish or Romanian* or white* or nonwhite* or Caucasian* or noncaucasian* or Irish or Italian* or BME or BAME))	4608	Delete
3	((((displaced or alien*) near2 (people* or person*))))	2	Delete
4	((born near2 overseas))	1	Delete
5	((((marginal* or transient or undocumented) near1 (people or population* or communit* or neighbourhood* or neighborhood* or group* or area* or demograph*))))	5	Delete
6	((((arab* or somali* or yemini* or Vietnamese or Chinese or Punjabi* or Somali* or Gujarati* or Japanese or Bengali* or Afghanistani* or Turkish or Kurdish or Yemeni* or Albanian* or German* or American* or Jamaican* or Nigerian* or Kenyan* or Zimbabwean* or Philippin* or Filipino* or "Sri Lankan*" or French or Chinese or Cantonese or Australia* or Somalia* or Portugues* or Canadian* or Ghanaian* or Lithuanian* or "Hong Kong" or Spanish or Iranian* or "New Zealand" or Kiwi* or Iraqi* or Turkish or Cypriot* or Malaysian* or Dutch or Ugandan* or Bulgarian* or Afghan* or Brazilian* or Slovak* or Mauritan* or Singapore* or Nepales* or Hungarian* or Latvian* or Russian* or Tanzanian* or Thai* or Swedish or Greek or Zambia* or Czech or Egyptia* or Trinidad* or Tobago* or Maltese or Austrian* or Belgian* or Libyan* or Korean* or Danish or Swiss) near3 (cultur* or men or women or male* or female* or people* or population* or communit* or neighbourhood* or neighborhood* or group* or area* or demograph*))))	891	Delete
7	(MeSH DESCRIPTOR Emigrants and Immigrants EXPLODE ALL TREES)	25	Delete
8	(MeSH DESCRIPTOR Ethnic Groups EXPLODE ALL TREES)	0	Delete
9	(MeSH DESCRIPTOR Minority Groups)	61	Delete
10	(MeSH DESCRIPTOR Continental Population Groups EXPLODE ALL TREES)	488	Delete
11	(MeSH DESCRIPTOR Refugees)	11	Delete
12	(MeSH DESCRIPTOR Transients and Migrants)	11	Delete
13	(MeSH DESCRIPTOR Cross-Cultural Comparison)	17	Delete
14	(MeSH DESCRIPTOR Cultural Characteristics)	9	Delete
15	(MeSH DESCRIPTOR Cultural Diversity)	14	Delete
16	(MeSH DESCRIPTOR Ethnology)	1	Delete
17	(MeSH DESCRIPTOR Human Migration)	0	Delete
18	(#1 or #2 or #3 or #4 or #5 or #6 or #7 or #8 or #9 or #10 or #11 OR #12 OR #13 OR #14 OR #15 OR #16 OR #17)	7474	Delete
19	((MeSH DESCRIPTOR Glomerular Filtration Rate))	92	Delete

20	((glomerul* or GFR* or eGFR* or e-GFR*))			416	Delete
21	(#19 or #20)	416	Delete		
22	#18 AND #21	50	Delete		
23	(#19 or #20) IN NHSEED	51	Delete		
24	(#18 AND #21) IN NHSEED	9	Delete		
25	(#18 AND #21) IN HTA	9	Delete		

Appendix D – Diagnostic evidence study selection



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Appendix E – Diagnostic evidence tables

Chen, 2014

Bibliographic Reference	Chen, Ling-I; Guh, Jinn-Yuh; Wu, Kwan-Dun; Chen, Yung-Ming; Kuo, Mei-Chuan; Hwang, Shang-Jyh; Chen, Tzu-Hui; Chen, Hung-Chun; Modification of diet in renal disease (MDRD) study and CKD epidemiology collaboration (CKD-EPI) equations for Taiwanese adults.; PloS one; 2014; vol. 9 (no. 6); e99645

Study Characteristics

Study type	Cross-sectional study
Study details	Study location Taiwan Study setting Kaohsiung Medical University Hospital and the National Taiwan University Hospital. Study dates 2008-2011 Loss to follow-up No Sources of funding Supported by the Bureau of Health Promotion (DOH99-HP-1107), Department of Health, R.O.C. (Taiwan).
Inclusion criteria	Age Adults over 18 CKD Informed consent

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Exclusion criteria	Renal replacement therapy acute renal failure, allergy to inulin, pregnancy, problems in voiding, amputation, congestive heart failure, cirrhosis with ascites, use of cimetidine or trimethoprim, oliguria, and those who had ever received any renal replacement therapy
Sample characteristics	Sample size Validation set 139, CKD <60 = 42.5% Female 49% of 139 in full validation sample. Unclear in CKD <60 sub sample Mean age (SD) 51 (SD 1) in full validation sample, unclear in sub CKD<60 sample Median age (range or interquartile range [IQR] or 95% CI) unclear Diabetes 12.2% in full validation sample, unclear in CKD<60 mGFR mL/min/1.73 m2 68.8 (SD 3) in full validation sample, unclear
Index test(s) - see Appendix M for a full description of each equation	CKD-EPI CKD-EPI creatinine 2009 Adjusted CKD-EPI Asian v2 CKD-EPI creatinine 2009; Japanese CKD-EPI creatinine 2009; Asian v3 CKD-EPI creatinine 2009; Taiwanese CKD-EPI creatinine 2009; Taiwanese Asian v1 CKD-EPI creatinine 2009
Reference standard (s)	mGFR Inulin Clearance (Cin)

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Section	Question	Answer
Patient selection: risk of bias	Was a consecutive or random sample of patients enrolled?	Unclear *(695 participants, 259 health and 436 CKD across two hospitals.)*
	Was a case-control design avoided?	Yes
	Did the study avoid inappropriate exclusions?	Yes
	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	Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear
	If a threshold was used, was it pre-specified?	Irrelevant *(Thresholds are not relevant for continuous outcome (P30))*
	Could the conduct or interpretation of the index test have introduced bias?	Unclear *(Unclear if eGFR were calculated with/without knowleldge of mGFR)*
Index tests: applicability	Are there concerns that the index test, its conduct, or interpretation differ from the review question?	Low
Reference standard: risk of bias	Is the reference standard likely to correctly classify the target condition?	Yes

-

Section	Question	Answer
	Were the reference standard results interpreted without knowledge of the results of the index test?	Unclear
	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	Was there an appropriate interval between index test(s) and reference standard?	Unclear *(Doesn't state if creatinine was measured at the same time as Cin.. Creatinine taken at the Kaohsiung Medical University Hospital whereas Cin measured at at the Kaohsiung Medical University Hospital and the National Taiwan University Hospital, suugesting Cin and Creatinine were measured at different times for some of the sample)*
	Did all patients receive a reference standard?	Yes
	Did patients receive the same reference standard?	Yes
	Were all patients included in the analysis?	Yes *(All patients in the validation set were included in the analysis, but not all patients recruited for the study which contained a 'development set')*
	Could the patient flow have introduced bias?	Unclear *(Unclear if mGFR and eGFR took place at the same time)*
Overall risk of bias and directness	Risk of Bias	Moderate *(unclear if index test and reference standard were taken on the same day.)*

-

Section	Question	Answer
	Directness	Partially applicable *(Not a UK study but population still relevant to protocol in relation to ethnicity)*

1

DU, 2012

2

Bibliographic Reference	DU, Xin; Liu, Lin; Hu, Bo; Wang, Feng; Wan, Xin; Jiang, Linglin; Zhang, Ruisheng; Cao, Changchun; Is the Chronic Kidney Disease Epidemiology Collaboration four-level race equation better than the cystatin C equation?.; Nephrology (Carlton, Vic.); 2012; vol. 17 (no. 4); 407-14

3

4

5 **Study Characteristics**

Study type	Cross-sectional study
Study details	Study location China Study setting Departments of 1Nephrology, 2Nuclear Medicine and 3Clinical Laboratory, Nanjing First Hospital Affiliated to Nanjing Medical University, Nanjing, China Study dates August 2009 to October 2010 Sources of funding Grants from the Foundation of Science and Technology Development Program, Nanjing Medical University (09NJMUM066) and the Key Medical Talent Training Program of the Jiangsu Province Health Bureau, China (RC2007013).
Inclusion criteria	Age

-

	>18 years old. Kidney damage (structural or functional kidney abnormalities) for >3 months, with or without decreased GFR, manifested by either: pathological abnormalities; or markers of kidney damage, including abnormalities in the composition of the blood, urine or abnormalities in imaging tests, or although there is no urine and (or) other evidence of renal damage, but GFR <60 mL/min per 1.73 m2 for >3 months
Exclusion criteria	Renal replacement therapy Not stated
Sample characteristics	Sample size 111 Female 46 Mean age (SD) 66 (SD 14.2) Diabetes 35 Hypertension 6 mGFR mL/min/1.73 m2 41.16 (SD 22.18)
Index test(s) - see Appendix M for a full description of each equation	Adjusted CKD-EPI Asian v1 CKD-EPI creatinine 2009; Chinese v1 CKD-EPI cystatin C 2008 Cystatin alone; Chinese v1 CKD-EPI creatinine-cystatin C 2008 v1
Reference standard (s)	mGFR (99mTc-DTPA)

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Section	Question	Answer
Patient selection: risk of bias	Was a consecutive or random sample of patients enrolled?	Unclear *(Unclear but sample likely selected by examining medical records for CKD status)*
	Was a case-control design avoided?	Yes
	Did the study avoid inappropriate exclusions?	Unclear *(Doesn't state exclusion criteria, but does state that to enhance participation, patients who were accompanied by common symptoms in nephrology department such as oedema, abdominal effusion, weight loss and obesity were not excluded.)*
	Could the selection of patients have introduced bias?	Unclear
Patient selection: applicability	Are there concerns that included patients do not match the review question?	Low
Index tests: risk of bias	Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear
	If a threshold was used, was it pre-specified?	Irrelevant
	Could the conduct or interpretation of the index test have introduced bias?	Unclear *(Unclear as study doesn't state if eGFR was calculated without knowldege of mGFR)*
Index tests: applicability	Are there concerns that the index test, its conduct, or interpretation differ from the review question?	Low
Reference standard: risk of bias	Is the reference standard likely to correctly classify the target condition?	Yes

-

Section	Question	Answer
	Were the reference standard results interpreted without knowledge of the results of the index test?	Unclear
	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?	Low
Flow and timing: risk of bias	Was there an appropriate interval between index test(s) and reference standard?	Unclear *(Doesn't state if mGFR and creatinine were collected at the same time)*
	Did all patients receive a reference standard?	Yes
	Did patients receive the same reference standard?	Yes
	Were all patients included in the analysis?	Yes
	Could the patient flow have introduced bias?	Unclear
Overall risk of bias and directness	Risk of Bias	Moderate *(Unclear if index and reference standard collected at the same time, exclusion criteria unclear)*
	Directness	Partially applicable *(Not a UK study but relevant ethnicity to UK population)*

1

Feng, 2013

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1

Bibliographic Reference	Feng, J.-F.; Qiu, L.; Zhang, L.; Li, X.-M.; Yang, Y.-W.; Zeng, P.; Guo, X.-Z.; Qin, Y.; Liu, H.-C.; Han, X.-M.; Li, Y.-P.; Xu, W.; Sun, S.-Y.; Wang, L.-Q.; Quan, H.; Xia, L.-J.; Hu, H.-Z.; Zhong, F.-C.; Duan, R.; Multicenter Study of Creatinine- and/or Cystatin C-Based Equations for Estimation of Glomerular Filtration Rates in Chinese Patients with Chronic Kidney Disease; PLoS ONE; 2013; vol. 8 (no. 3); e57240

2

3

4 **Study Characteristics**

Study type	Cross-sectional study
Study details	Study location China Study setting 6 general hospitals across North China(Jilin and Beijing, China), Central China(Henan,China), and patients from South China(Mianyang, Chendu and Neijiang, Sichuan, China) Study dates October 2010 and December 2011 Sources of funding partially supported by the Science & Technology Department of Sichuan Province, China (2009SZ0066) (http://www.scst.gov.cn/info) and Sichuan Maker Biotechnology Co., Ltd. (http://makerbio.company.lookchem.cn/).
Inclusion criteria	Age Not stated as an inclusion criteria but population chosen all adults CKD diagnostic criteria of NKFKDOQI CKD
Exclusion criteria	Renal replacement therapy Medical conditions Acute kidney disease or acute renal insufficiency; Other Patients with merger edema, pleural effusion, ascites, thyroid disease, or viral hepatitis (carriers were exceptional); (4) malnourished patients (lower than normal protein, blood urea or urine conductivity); (5) disabled patients; and (6) patients using antibacterial drugs, especially trimethoprim and cimetidine.

-

Sample characteristics	Sample size 101 - testing/validation group Female 38 Mean age (SD) 51.8 (SD 16) Median age (range or interquartile range [IQR] or 95% CI) 51.0, 22.0–86.0 mGFR mL/min/1.73 m2 54.16 SD (29.45), 47.85, 10.49–148.12
Index test(s) - see Appendix M for a full description of each equation	CKD-EPI CKD-EPI cystatin C 2008 Cystatin alone; CKD-EPI creatinine-cystatin C 2011 v2 Adjusted CKD-EPI Chinese v1 CKD-EPI cystatin C 2008 Cystatin alone; Chinese v2 CKD-EPI cystatin C 2008 Cystatin alone; Chinese v1 CKD-EPI creatinine-cystatin C 2008 v1; Chinese v2 CKD-EPI creatinine-cystatin C 2008 v1
Reference standard (s)	mGFR 99mTc-DTPA clearance

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Section	Question	Answer
Patient selection: risk of bias	Was a consecutive or random sample of patients enrolled?	Unclear
	Was a case-control design avoided?	Yes

-

Section	Question	Answer
	Did the study avoid inappropriate exclusions?	Yes
	Could the selection of patients have introduced bias?	Unclear
Patient selection: applicability	Are there concerns that included patients do not match the review question?	Low
Index tests: risk of bias	Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear
	If a threshold was used, was it pre-specified?	Irrelevant
	Could the conduct or interpretation of the index test have introduced bias?	Unclear *(Unclear if mGFR was known when calculating eGFR)*
Index tests: applicability	Are there concerns that the index test, its conduct, or interpretation differ from the review question?	Low
Reference standard: risk of bias	Is the reference standard likely to correctly classify the target condition?	Yes
	Were the reference standard results interpreted without knowledge of the results of the index test?	Unclear *(although mGFR taken on the same day as blood samples for eGFR, it's unclear if eGFR had been calculated)*
	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?	Low

-

Section	Question	Answer
Flow and timing: risk of bias	Was there an appropriate interval between index test(s) and reference standard?	Yes *(mGFR was measured on same day as blood samples for CysC and SCr)*
	Did all patients receive a reference standard?	Yes
	Did patients receive the same reference standard?	Unclear *(Although the same test Tc-DTPA was used, as the study was across 6 different geographical regions, mGFR was determined independently by different institutes)*
	Were all patients included in the analysis?	Yes *(All patients in testing/validation set)*
	Could the patient flow have introduced bias?	Low
Overall risk of bias and directness	Risk of Bias	Low
	Directness	Partially applicable *(Non-UK study but relevant BAME population)*

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Guan, 2018

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Bibliographic Reference	Guan, C.; Liang, M.; Liu, R.; Qin, S.; He, F.; Li, J.; Zhu, X.; Dai, H.; Fu, J.; Assessment of creatinine and cystatin C-based eGFR equations in Chinese older adults with chronic kidney disease; International Urology and Nephrology; 2018; vol. 50 (no. 12); 2229-2238

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5 **Study Characteristics**

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Study type	Cross-sectional study
Study details	Study location China Study setting Division of Geriatrics and Division of Nephrology, Guangzhou First People's Hospital, Guangzhou Medical University, China. Study dates January 2015 to December 2016, Sources of funding Supported in part by the National Natural Science Foundation of China (81770677), Science & Technology Planning Project of Guangzhou (201707010290), and Natural Science Foundation of Guangdong Province, China (2017A030313566).
Inclusion criteria	Age >60 CKD (NKF/ KDOQI)
Exclusion criteria	Renal replacement therapy Medical conditions unstable condition, acute kidney injury, history of allergy to iodinated contrast media, hepatic failure, congestive heart failure, renal transplanted recipient, severe malnutrition, amputation, muscular atrophy, thyroid disorders, and receiving immunosuppressant therapy.
Sample characteristics	Sample size Whole All CKD sample 368 Female 137 Mean age (SD) 74 (60–96) Diabetes 75 (20.38) Hypertension 211 (57.34)

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	mGFR mL/min/1.73 m2 47.1 (1.0–129.2)
Index test(s) - see Appendix M for a full description of each equation	CKD-EPI CKD-EPI creatinine-cystatin C 2012 Adjusted CKD-EPI Chinese v1 CKD-EPI creatinine-cystatin C 2008 v1; Chinese v2 CKD-EPI creatinine-cystatin C 2008 v1
Reference standard (s)	mGFR 99m Tc-DTPA

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Section	Question	Answer
Patient selection: risk of bias	Was a consecutive or random sample of patients enrolled?	Unclear *(Likely they were selected based on medical recording of CKD status and age)*
	Was a case-control design avoided?	Yes
	Did the study avoid inappropriate exclusions?	Yes
	Could the selection of patients have introduced bias?	Unclear
Patient selection: applicability	Are there concerns that included patients do not match the review question?	Low
Index tests: risk of bias	Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear

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Section	Question	Answer
	If a threshold was used, was it pre-specified?	Irrelevant
	Could the conduct or interpretation of the index test have introduced bias?	Low *(The index test is an objective measure)*
Index tests: applicability	Are there concerns that the index test, its conduct, or interpretation differ from the review question?	Low
Reference standard: risk of bias	Is the reference standard likely to correctly classify the target condition?	Yes
	Were the reference standard results interpreted without knowledge of the results of the index test?	Unclear
	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	Was there an appropriate interval between index test(s) and reference standard?	Yes *(Blood taken on the same day as imaging)*
	Did all patients receive a reference standard?	Yes
	Did patients receive the same reference standard?	Yes
	Were all patients included in the analysis?	Yes *(6 withdrew after selection but weren't included in the analysis)*
	Could the patient flow have introduced bias?	Low

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Section	Question	Answer
Overall risk of bias and directness	Risk of Bias	Low
	Directness	Partially applicable *(Non UK study but relevant BAME population)*

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Guo, 2014

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Bibliographic Reference Guo, Xiuzhi; Qin, Yan; Zheng, Ke; Gong, Mengchun; Wu, Jie; Shou, Weiling; Cheng, Xinqi; Xia, Liangyu; Xu, Ermu; Li, Xuemei; Qiu, Ling; Improved glomerular filtration rate estimation using new equations combined with standardized cystatin C and creatinine in Chinese adult chronic kidney disease patients.; Clinical biochemistry; 2014; vol. 47 (no. 1314); 1220-6

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5 **Study Characteristics**

Study type	Cross-sectional study
Study details	Study location China Study setting 4 medical centres in North China, Beijing; East China, Shanghai; Central China, Changsha; and Northeast China, Dalian) Study dates fromSeptember 2007 to December 2010. Sources of funding supported by the Beijing Municipal Science and Technology Commission (D09050704310901) and Sichuan Provincial Department of Science and Technology (2009sz0066).

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Inclusion criteria	Age 18-90 CKD
Exclusion criteria	Renal replacement therapy receiving haemodialysis or peritoneal dialysis Medical conditions acute kidney injury; (b) receiving haemodialysis or peritoneal dialysis; (c) general oedema, pleural effusion, ascites, or severe heart failure; (d) severe malnutrition, absence of limbs, or ketoacidosis; (e) receiving cimetidine or trimethoprim; (f) received glucocorticoid therapy in the previous 3 months; (g) hyperthyroidism or hypothyroidism; or (h) leukaemia or cancer.
Sample characteristics	Sample size 252 Female 114 Median age (range or interquartile range [IQR] or 95% CI) 43 [IQR 33- 59] Diabetes 40 (15.9) Hypertension 26 (10.3) mGFR mL/min/1.73 m2 Mean mGFR: 54 ± 35 GFR≥90 = 51 (20.2) 60–89= 50 (19.8) 30–59 = 69 (27.4) 15–29 = 45 (17.6) <15 = 37 (14.7)
Index test(s) - see Appendix M for a full description of each equation	CKD-EPI CKD-EPI creatinine 2009; CKD-EPI cystatin C 2012; CKD-EPI creatinine-cystatin C 2012 Adjusted CKD-EPI Chinese v2 CKD-EPI cystatin C 2008 Cystatin alone; Chinese v2 CKD-EPI creatinine-cystatin C 2008 v1
Reference standard (s)	mGFR 99mTc-DTPA

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Section	Question	Answer
Patient selection: risk of bias	Was a consecutive or random sample of patients enrolled?	Unclear *(likely selected based on CKD status but unclear)*
	Was a case-control design avoided?	Yes
	Did the study avoid inappropriate exclusions?	Yes
	Could the selection of patients have introduced bias?	Unclear
Patient selection: applicability	Are there concerns that included patients do not match the review question?	Low
Index tests: risk of bias	Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear
	If a threshold was used, was it pre-specified?	Irrelevant
	Could the conduct or interpretation of the index test have introduced bias?	Low *(although unclear, eGFR is an objective measure so risk of bias low)*
Index tests: applicability	Are there concerns that the index test, its conduct, or interpretation differ from the review question?	Low
Reference standard: risk of bias	Is the reference standard likely to correctly classify the target condition?	Yes
	Were the reference standard results interpreted without knowledge of the results of the index test?	Unclear

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Section	Question	Answer
	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	Was there an appropriate interval between index test(s) and reference standard?	Yes *(Blood sample collected on the same day)*
	Did all patients receive a reference standard?	Yes
	Did patients receive the same reference standard?	Unclear *(Although they all recieved 99mTc-DTPA, it was across 4 hospitals with separate staff measuring so may have been variation. It is unlikely however as they all recieved the same training.)*
	Were all patients included in the analysis?	Yes
	Could the patient flow have introduced bias?	Low
Overall risk of bias and directness	Risk of Bias	Low
	Directness	Partially applicable *(non - UK study but BAME population)*

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Holness, 2020

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Bibliographic Reference	Holness, J L; Bezuidenhout, K; Davids, M R; Warwick, J M; Validation of equations to estimate glomerular filtration rate in South Africans of mixed ancestry.; South African medical journal = Suid-Afrikaanse tydskrif vir geneeskunde; 2020; vol. 110 (no. 3); 229-234

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3 **Study Characteristics**

Study type	Cross-sectional study
Study details	Study location South Africa Study setting Nuclear Medicine Division of Tygerberg Hospital Study dates June 2015 and October 2018. Loss to follow-up N/A Sources of funding JMW received funding from the National Research Foundation, SA (grant no. 93471). JLH received funding from the South African Medical Research Council (SAMRC) through its Division of Research Capacity Development, under the Clinician Researcher Development PhD Scholarship Programme. The funding is provided by the SA National Treasury.
Inclusion criteria	Age >18 Other Self-classified as South Africans of mixed ancestry
Exclusion criteria	Medical conditions acute renal failure, concurrent illness, cancer, expanded extracellular fluid volumes (ascites, oedema or pleural effusions), pregnancy or breastfeeding.
Sample characteristics	Sample size n = 80 Female

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	50 Median age (range or interquartile range [IQR] or 95% CI) 39 (18 - 68) mGFR mL/min/1.73 m2 ≥90 = 27 (33.7) 60 - 89 = 12 (15.0) 30 - 59 = 19 (23.8) <30 = 22 (27.5)
Index test(s) - see Appendix M for a full description of each equation	CKD-EPI CKD-EPI creatinine 2009 Adjusted CKD-EPI CKD-EPI creatinine 2009 with black ethnicity factor
Reference standard (s)	mGFR 99mTc-DTPA

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Section	Question	Answer
Patient selection: risk of bias	Was a consecutive or random sample of patients enrolled?	Unclear
	Was a case-control design avoided?	Yes
	Did the study avoid inappropriate exclusions?	Yes
	Could the selection of patients have introduced bias?	Unclear
Patient selection: applicability	Are there concerns that included patients do not match the review question?	Moderate 12 of the patients (15% were either potential donors or healthy)

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Section	Question	Answer
Index tests: risk of bias	Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear
	If a threshold was used, was it pre-specified?	Irrelevant
	Could the conduct or interpretation of the index test have introduced bias?	Low
Index tests: applicability	Are there concerns that the index test, its conduct, or interpretation differ from the review question?	Low
Reference standard: risk of bias	Is the reference standard likely to correctly classify the target condition?	Yes
	Were the reference standard results interpreted without knowledge of the results of the index test?	Unclear
	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	Was there an appropriate interval between index test(s) and reference standard?	Yes *(blood sample was taken for creatinine measurement immediately prior to administration of the 99mTc-DTPA dose)*
	Did all patients receive a reference standard?	Yes
	Did patients receive the same reference standard?	Yes
	Were all patients included in the analysis?	Yes

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Section	Question	Answer
	Could the patient flow have introduced bias?	Low
Overall risk of bias and directness	Risk of Bias	Moderate
	Directness	Partially applicable

Horio, 2010

Bibliographic Reference	Horio, Masaru; Imai, Enyu; Yasuda, Yoshinari; Watanabe, Tsuyoshi; Matsuo, Seiichi; Modification of the CKD epidemiology collaboration (CKD-EPI) equation for Japanese: accuracy and use for population estimates.; American journal of kidney diseases : the official journal of the National Kidney Foundation; 2010; vol. 56 (no. 1); 32-8

Study Characteristics

Study type	Cross-sectional study See Horio 2013a for study details (Horio 2010 & 2013a/b all from Matsuo 2009 data)
Index test(s) - see Appendix M for a full	Adjusted CKD-EPI Japanese CKD-EPI creatinine 2009

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description of each equation	

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Horio, 2013a

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Bibliographic Reference	Horio, Masaru; Imai, Enyu; Yasuda, Yoshinari; Watanabe, Tsuyoshi; Matsuo, Seiichi; Performance of GFR equations in Japanese subjects.; Clinical and experimental nephrology; 2013; vol. 17 (no. 3); 352-8

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5 **Study Characteristics**

Study type	Cross-sectional study Related publications (Horio 2013a and Horio 2013b; all from Matsuo 2009 data)
Study details	Study location Japan Study setting 80 medical centres throughout Japan. Study dates December 2006 and July 2007. Further analysis done 2011. Sources of funding This study was supported by a grant from the Japanese Society of Nephrology.
Inclusion criteria	Age 18 years and older Kidney function relatively stable kidney function, assessed by using SCr level

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	Other patient's agreement to have urinary Cin measured using a continuous infusion.
Exclusion criteria	Medical conditions acute kidney injury, apparent malignancy, problems in micturition, pregnancy, inulin allergy, amputation, and individuals for whom the investigator judged that measuring Cin was inappropriate.
Sample characteristics	Sample size 350 Female 147 Mean age (SD) 53.9 (17.5) Diabetes 77 Hypertension 202 mGFR mL/min/1.73 m2 Mean 57.2 (SD 34.7)
Index test(s) - see Appendix M for a full description of each equation	CKD-EPI CKD-EPI cystatin C 2012 Adjusted CKD-EPI Japanese CKD-EPI creatinine 2009; Japanese CKD-EPI cystatin C 2008 Cystatin + age + sex; Japanese CKD-EPI creatinine-cystatin C 2012
Reference standard (s)	mGFR Serum and urine inulin clearance

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Section	Question	Answer
Patient selection: risk of bias	Was a consecutive or random sample of patients enrolled?	Unclear *(Recruited in previous study - Matsuo 2009 (likely selected by CKD status on medical records). Unclear if they were random, but split between development and validation random)*
	Was a case-control design avoided?	Yes
	Did the study avoid inappropriate exclusions?	Yes
	Could the selection of patients have introduced bias?	Unclear
Patient selection: applicability	Are there concerns that included patients do not match the review question?	Low
Index tests: risk of bias	Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear
	If a threshold was used, was it pre-specified?	Irrelevant
	Could the conduct or interpretation of the index test have introduced bias?	Low *(eGFR is an objective measure so risk of bias is low)*
Index tests: applicability	Are there concerns that the index test, its conduct, or interpretation differ from the review question?	Low
Reference standard: risk of bias	Is the reference standard likely to correctly classify the target condition?	Yes
	Were the reference standard results interpreted without knowledge of the results of the index test?	Unclear
	Could the reference standard, its conduct, or its interpretation have introduced bias?	Low

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Section	Question	Answer
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	Was there an appropriate interval between index test(s) and reference standard?	Yes *(Cin and Creatinine measured at the same time)*
	Did all patients receive a reference standard?	Yes
	Did patients receive the same reference standard?	Yes
	Were all patients included in the analysis?	Yes
	Could the patient flow have introduced bias?	Low
Overall risk of bias and directness	Risk of Bias	Low
	Directness	Partially applicable *(Not a UK study but population still relevant to protocol in relation to ethnicity.)*

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Horio, 2013b

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Bibliographic Reference	Horio, Masaru; Imai, Enyu; Yasuda, Yoshinari; Watanabe, Tsuyoshi; Matsuo, Seiichi; Collaborators Developing the Japanese Equation for Estimated, GFR; GFR estimation using standardized serum cystatin C in Japan.; American journal of kidney diseases : the official journal of the National Kidney Foundation; 2013; vol. 61 (no. 2); 197-203

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Study Characteristics

Study type	Cross-sectional study See Horio 2013a for study details (Horio 2010 & 2013a/b all from Matsuo 2009 data)
Index test(s) - see Appendix M for a full description of each equation	Adjusted CKD-EPI Japanese CKD-EPI creatinine-cystatin C 2008 v1

Hu, 2019

Bibliographic Reference	Hu, C.; Li, D.; Yin, W.; Zuo, X.; Evaluation of cystatin C-derived glomerular filtration rate equations in Chinese population; Scandinavian Journal of Clinical and Laboratory Investigation; 2019; vol. 79 (no. 8); 629-634

Study Characteristics

Study type	Cross-sectional study
Study details	Study location China Study setting Hospital Study dates July 2010 to May 2017 Sources of funding This work was supported by the National Natural Science Foundation of China and the Fundamental Research Funds for the Central Universities of Central South University

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Inclusion criteria	Age ≥18 years Other Inpatients referred for 99mTc-DTPA renal dynamic imaging
Exclusion criteria	Other missing cystatin C concentration; having incomplete mGFR data
Sample characteristics	Sample size 1,471 Female 37.3% Mean age (SD) 52.84 years (15.24) Diabetes 28.1% Hypertension 79.4% mGFR mL/min/1.73 m2 Mean 29.54 (SD 18.80)
Index test(s) - see Appendix M for a full description of each equation	CKD-EPI CKD-EPI cystatin C 2012 Adjusted CKD-EPI Chinese v2 CKD-EPI cystatin C 2008 Cystatin alone
Reference standard (s)	mGFR 99mTc-DTPA

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Section	Question	Answer
Patient selection: risk of bias	Was a consecutive or random sample of patients enrolled?	Unclear
	Was a case-control design avoided?	Yes
	Did the study avoid inappropriate exclusions?	Yes
	Could the selection of patients have introduced bias?	Unclear
Patient selection: applicability	Are there concerns that included patients do not match the review question?	Low *(Some patients were on dialysis but separate analysis for non-dialysis patients included)*
Index tests: risk of bias	Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear
	If a threshold was used, was it pre-specified?	Irrelevant
	Could the conduct or interpretation of the index test have introduced bias?	Low *(eGFR an objective measurement so risk of bias low)*
Index tests: applicability	Are there concerns that the index test, its conduct, or interpretation differ from the review question?	Low
Reference standard: risk of bias	Is the reference standard likely to correctly classify the target condition?	Yes
	Were the reference standard results interpreted without knowledge of the results of the index test?	Unclear
	Could the reference standard, its conduct, or its interpretation have introduced bias?	Low

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Section	Question	Answer
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	Was there an appropriate interval between index test(s) and reference standard?	Unclear
	Did all patients receive a reference standard?	Yes
	Did patients receive the same reference standard?	Yes
	Were all patients included in the analysis?	Yes *(All non-dialysis patients)*
	Could the patient flow have introduced bias?	Unclear *(Not clear if Cystatin recorded on same day as mGFR)*
Overall risk of bias and directness	Risk of Bias	Moderate *(Unclear if index and reference test conducted on the same day)*
	Directness	Partially applicable *(Non UK study)*

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Jeong, 2017

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Bibliographic Reference	Jeong, Tae Dong; Cho, Eun Jung; Lee, Woochang; Chun, Sail; Hong, Ki Sook; Min, Won Ki; Accuracy Assessment of Five Equations Used for Estimating the Glomerular Filtration Rate in Korean Adults.; Annals of laboratory medicine; 2017; vol. 37 (no. 5); 371-380

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1 **Study Characteristics**

Study type	Cross-sectional study
Study details	Study location Korea Study setting Medical Center Study dates July 2009 to May 2016 Sources of funding Not reported
Inclusion criteria	Age ≥20 years Other patients who underwent GFR measurements and serum creatinine concentrations measured on the same day of GFR measurement
Exclusion criteria	Other Extreme BMI; a very low serum creatinine concentration
Sample characteristics	Sample size 1,312 Female 38.3% Mean age (SD) 61.8 years (13.4) mGFR mL/min/1.73 m2 Mean 63.4 (SD 36.4)
Index test(s) - see Appendix M for a full description of each equation	CKD-EPI CKD-EPI creatinine 2009 Adjusted CKD-EPI Asian v2 CKD-EPI creatinine 2009

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Reference standard (s)	mGFR 51Cr-EDTA

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Section	Question	Answer
Patient selection: risk of bias	Was a consecutive or random sample of patients enrolled?	Unclear *(Patients likely selected by medical records)*
	Was a case-control design avoided?	Yes
	Did the study avoid inappropriate exclusions?	Yes
	Could the selection of patients have introduced bias?	Unclear
Patient selection: applicability	Are there concerns that included patients do not match the review question?	Low
Index tests: risk of bias	Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear
	If a threshold was used, was it pre-specified?	Irrelevant
	Could the conduct or interpretation of the index test have introduced bias?	Low *(eGFR an objective measurement so risk of bias low)*
Index tests: applicability	Are there concerns that the index test, its conduct, or interpretation differ from the review question?	Low

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Section	Question	Answer
Reference standard: risk of bias	Is the reference standard likely to correctly classify the target condition?	Yes
	Were the reference standard results interpreted without knowledge of the results of the index test?	Unclear
	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	Was there an appropriate interval between index test(s) and reference standard?	Yes *(eGFR and mGFR measured on the same day)*
	Did all patients receive a reference standard?	Yes
	Did patients receive the same reference standard?	Yes
	Were all patients included in the analysis?	Yes
	Could the patient flow have introduced bias?	Low
Overall risk of bias and directness	Risk of Bias	Low
	Directness	Partially applicable *(Non UK study)*

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Jessani, 2014

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Bibliographic Reference	Jessani, Saleem; Levey, Andrew S; Bux, Rasool; Inker, Lesley A; Islam, Muhammad; Chaturvedi, Nish; Mariat, Christophe; Schmid, Christopher H; Jafar, Tazeen H; Estimation of GFR in South Asians: a study from the general population in Pakistan.; American journal of kidney diseases : the official journal of the National Kidney Foundation; 2014; vol. 63 (no. 1); 49-58

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3 **Study Characteristics**

Study type	Cross-sectional study
Study details	Study location Pakistan Study setting Low- to middle-income communities in Karachi (general population) and renal clinics (adults with serum creatinine ≥2.0 mg/dL) Study dates Not reported Sources of funding The study was supported by a research award from the National Institutes of Health, Fogarty International Center.
Inclusion criteria	Age 40 years and older
Exclusion criteria	Medical conditions Concurrence of diabetes and hypertension; medical reasons (shortness of breath, severe tachycardia, osteoarthritis and minor allergic reaction following inulin infusion)
Sample characteristics	Sample size 581 Female 49.7% Mean age (SD) 50.6 years (10.0)

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	Diabetes 28.1% Hypertension 33.9% mGFR mL/min/1.73 m2 Median 91.0 (IQR 36.7)
Index test(s) - see Appendix M for a full description of each equation	CKD-EPI CKD-EPI creatinine 2009 Adjusted CKD-EPI Pakistan CKD-EPI creatinine 2009
Reference standard (s)	mGFR Urinary clearance of inulin

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Section	**Question**	**Answer**
Patient selection: risk of bias	Was a consecutive or random sample of patients enrolled?	Unclear *(Part of the sample selected from the population randomly but part selected based on Scr level)*
	Was a case-control design avoided?	Yes
	Did the study avoid inappropriate exclusions?	Unclear
	Could the selection of patients have introduced bias?	Unclear

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Section	Question	Answer
Patient selection: applicability	Are there concerns that included patients do not match the review question?	Low
Index tests: risk of bias	Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear
	If a threshold was used, was it pre-specified?	Irrelevant
	Could the conduct or interpretation of the index test have introduced bias?	Low *(eGFR an objective measure so risk of bias low)*
Index tests: applicability	Are there concerns that the index test, its conduct, or interpretation differ from the review question?	Low
Reference standard: risk of bias	Is the reference standard likely to correctly classify the target condition?	Yes *(Inulin Clearance)*
	Were the reference standard results interpreted without knowledge of the results of the index test?	Unclear
	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	Was there an appropriate interval between index test(s) and reference standard?	Unclear
	Did all patients receive a reference standard?	Yes
	Did patients receive the same reference standard?	Yes

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Section	Question	Answer
	Were all patients included in the analysis?	Yes
	Could the patient flow have introduced bias?	Unclear *(Unclear if index and reference measurements taken on the same day)*
Overall risk of bias and directness	Risk of Bias	Moderate *(Unclear if index and reference measurements taken on the same day)*
	Directness	Partially applicable *(Non UK study)*

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Kong, 2013

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Bibliographic Reference	Kong, Xianglei; Ma, Yingchun; Chen, Jianghua; Luo, Qiong; Yu, Xueqing; Li, Ying; Xu, Jinsheng; Huang, Songmin; Wang, Lining; Huang, Wen; Wang, Mei; Xu, Guobin; Zhang, Luxia; Zuo, Li; Wang, Haiyan; Chinese eGFR Investigation, Collaboration; Evaluation of the Chronic Kidney Disease Epidemiology Collaboration equation for estimating glomerular filtration rate in the Chinese population.; Nephrology, dialysis, transplantation : official publication of the European Dialysis and Transplant Association - European Renal Association; 2013; vol. 28 (no. 3); 641-51

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5 **Study Characteristics**

Study type	Cross-sectional study
Study details	Study location China

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	Study setting Nine renal institutes of tertiary hospitals located in different geographic regions of China Study dates June 2004 to September 2005 Sources of funding The Beijing Science and Technology Committee and the Program for New Century Excellent Talents in University, the Ministry of Education of the People's Republic of China, the grants for the Early Detection and Prevention of Non-communicable Chronic Diseases from the International Society of Nephrology Research Committee, and the grants from the China Health and Medical Development Foundation
Inclusion criteria	Age Older than 18 years CKD CKD was diagnosed and classified according to the Kidney Disease Outcome Quality Initiatives (K/DOQI) clinical practice guideline
Exclusion criteria	Renal replacement therapy Medical conditions Acute kidney injury, severe edema, skeletal muscle atrophy, pleural effusion or ascites, malnutrition, amputation, heart failure or ketoacidosis, and those who were taking cimetidine
Sample characteristics	Sample size 682 Female 48.7% Mean age (SD) 50.0 years (15.8) Diabetes 5.4% Hypertension 15.0%
Index test(s) - see Appendix M for a full description of each equation	CKD-EPI CKD-EPI creatinine 2009 Adjusted CKD-EPI Asian v1 CKD-EPI creatinine 2009

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Reference standard (s)	mGFR 99mTc-DTPA

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Section	**Question**	**Answer**
Patient selection: risk of bias	Was a consecutive or random sample of patients enrolled?	Unclear *(9 renal institutes in differnt locations selected on a volntary basis. CKD patients selected)*
	Was a case-control design avoided?	Yes
	Did the study avoid inappropriate exclusions?	Yes
	Could the selection of patients have introduced bias?	Unclear
Patient selection: applicability	Are there concerns that included patients do not match the review question?	Low
Index tests: risk of bias	Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear
	If a threshold was used, was it pre-specified?	Yes *(Sensitivity and Specificity included for different GFR categories G1 – G5 used as the threshold)*
	Could the conduct or interpretation of the index test have introduced bias?	Low

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Section	Question	Answer
Index tests: applicability	Are there concerns that the index test, its conduct, or interpretation differ from the review question?	Low
Reference standard: risk of bias	Is the reference standard likely to correctly classify the target condition?	Yes
	Were the reference standard results interpreted without knowledge of the results of the index test?	Unclear
	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	Was there an appropriate interval between index test(s) and reference standard?	Unclear
	Did all patients receive a reference standard?	Yes
	Did patients receive the same reference standard?	Yes
	Were all patients included in the analysis?	Yes
	Could the patient flow have introduced bias?	Unclear
Overall risk of bias and directness	Risk of Bias	Moderate *(Unclear if GFR and eGFR done one same day)*
	Directness	Partially applicable *(Non -UK study)*

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Li, 2017

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Bibliographic Reference	Li, F.; Pei, X.; Ye, X.; Liu, X.; Song, D.; Zhang, X.; Zhu, B.; Wei, L.; Zhu, J.; Zhao, W.; Modification of the 2012 CKD-EPI equations for the elderly Chinese; International Urology and Nephrology; 2017; vol. 49 (no. 3); 467-473

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4 **Study Characteristics**

Study type	Cross-sectional study
Study details	Study location China Study setting Four hospitals Study dates October 2009 to December 2014 Sources of funding This work was supported by the grants from the Major State Basic Research Development Program of China, the National Natural Science Foundation of China, the Chinese Medical Association of Clinical Medicine Research Special Funds, the Innovation of Science and Technology Achievement Transformation Fund of Jiangsu Province and a Project Funded by the Priority Academic Program Development of Jiangsu Higher Education Institutions
Inclusion criteria	Other Stable status: outpatients had no condition changes, and inpatients gradually recovering to discharge from hospital or ahead of operation
Exclusion criteria	Renal replacement therapy Medical conditions Acute renal failure, skeletal muscle atrophy, edema, ascites, pleural effusion, malnutrition, amputation, severe heart failure, ketoacidosis, use of cimetidine or trimethoprim
Sample characteristics	Sample size 839

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	Female 37.4% Mean age (SD) 70.05 years (7.19) Diabetes 16.0% Hypertension 21.0% mGFR mL/min/1.73 m2 Mean 51.88 (SD 22.60)
Index test(s) - see Appendix M for a full description of each equation	CKD-EPI CKD-EPI cystatin C 2012; CKD-EPI creatinine-cystatin C 2012 Adjusted CKD-EPI Chinese v1 CKD-EPI cystatin C 2012; Chinese v1 CKD-EPI creatinine-cystatin C 2012
Reference standard (s)	mGFR 9mTc-DTPA

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Section	Question	Answer
Patient selection: risk of bias	Was a consecutive or random sample of patients enrolled?	Unclear *(Older participants (aged 60 years and older) were included from four hospitals either outpatients and inpatients)*
	Was a case-control design avoided?	Yes

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Section	Question	Answer
	Did the study avoid inappropriate exclusions?	Yes
	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	Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear
	If a threshold was used, was it pre-specified?	Irrelevant
	Could the conduct or interpretation of the index test have introduced bias?	Low
Index tests: applicability	Are there concerns that the index test, its conduct, or interpretation differ from the review question?	Low
Reference standard: risk of bias	Is the reference standard likely to correctly classify the target condition?	Yes
	Were the reference standard results interpreted without knowledge of the results of the index test?	Unclear
	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	Was there an appropriate interval between index test(s) and reference standard?	Unclear

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Section	Question	Answer
	Did all patients receive a reference standard?	Yes
	Did patients receive the same reference standard?	Yes
	Were all patients included in the analysis?	Yes
	Could the patient flow have introduced bias?	Unclear
Overall risk of bias and directness	Risk of Bias	Moderate *(Unclear if mGFR and eGFR took place at the same time)*
	Directness	Partially applicable *(Not a UK study but population still relevant to protocol in relation to ethnicity)*

1

Li, 2010

2

Bibliographic Reference	Li, Hai-xia; Xu, Guo-bin; Wang, Xue-jing; Zhang, Xu-chu; Yang, Jian-mei; Diagnostic accuracy of various glomerular filtration rates estimating equations in patients with chronic kidney disease and diabetes.; Chinese medical journal; 2010; vol. 123 (no. 6); 745-51

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5 **Study Characteristics**

Study type	Cross-sectional study
Study details	Study location China

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	Study setting Hospital Study dates December 2006 to January 2008 Sources of funding Not reported
Inclusion criteria	None reported
Exclusion criteria	Medical conditions Complications relating to acute kidney function deterioration, severe cardiac insufficiency, pleural or abdominal effusion, edema, malnutrition, skeletal muscle atrophy, ketoacidosis or patients who recently received dexamethasone therapy, who had disabled limbs or amputation, patients with GFR <15, patients with malignancies or who were receiving corticosteroid treatment (which can cause changes in serum cystatin C)
Index test(s) - see Appendix M for a full description of each equation	CKD-EPI CKD-EPI creatinine-cystatin C 2008 v1 Adjusted CKD-EPI Chinese v1 CKD-EPI creatinine-cystatin C 2008 v1
Reference standard (s)	mGFR 99mTc-DTPA

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2 **Study arms**

Adults without diabetes (N = 166)	
Sample characteristics	Female 41.5% Mean age (SD) 54 years (16) mGFR mL/min/1.73 m2 Mean 66.12 (SD 33.11)

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Adults with diabetes (N = 91)	
Sample characteristics	Female 41.7% Mean age (SD) 59 years (11) mGFR mL/min/1.73 m2 Mean 86.71 (SD 27.52)

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Section	**Question**	**Answer**
Patient selection: risk of bias	Was a consecutive or random sample of patients enrolled?	Unclear
	Was a case-control design avoided?	Yes
	Did the study avoid inappropriate exclusions?	Yes
	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	Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear
	If a threshold was used, was it pre-specified?	Irrelevant
	Could the conduct or interpretation of the index test have introduced bias?	Low

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Section	Question	Answer
Index tests: applicability	Are there concerns that the index test, its conduct, or interpretation differ from the review question?	Low
Reference standard: risk of bias	Is the reference standard likely to correctly classify the target condition?	Yes
	Were the reference standard results interpreted without knowledge of the results of the index test?	Unclear
	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	Was there an appropriate interval between index test(s) and reference standard?	Unclear
	Did all patients receive a reference standard?	Yes
	Did patients receive the same reference standard?	Yes
	Were all patients included in the analysis?	Yes
	Could the patient flow have introduced bias?	Unclear
Overall risk of bias and directness	Risk of Bias	Moderate *(Unclear if mGFR and eGFR took place at the same time)*
	Directness	Partially applicable *(Not a UK study but population still relevant to protocol in relation to ethnicity)*

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1

Liu, 2014

2

Bibliographic Reference	Liu, Xun; Gan, Xiaoliang; Chen, Jinxia; Lv, Linsheng; Li, Ming; Lou, Tanqi; A new modified CKD-EPI equation for Chinese patients with type 2 diabetes.; PloS one; 2014; vol. 9 (no. 10); e109743

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5 **Study Characteristics**

Study type	Cross-sectional study
Study details	Study location China Study setting Hospital Study dates Jan 2010 to Dec 2012 Sources of funding This work was supported by the National Natural Science Foundation of China, the China Postdoctoral Science Foundation, Guangdong Science and Technology Plan, the Fundamental Research Funds for the Central Universities, the National Project of Scientific and Technical Supporting Programs Funded by Ministry of Science & Technology of China and China Scholarship Council
Inclusion criteria	Age 18 years and older
Exclusion criteria	Medical conditions Type 1 diabetes, or type 2 diabetes with known non-diabetic renal disease
Sample characteristics	Sample size 210 (sample characteristics were not reported for the validation data set)

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Index test(s) - see Appendix M for a full description of each equation	CKD-EPI CKD-EPI creatinine 2009 Adjusted CKD-EPI Asian v1 CKD-EPI creatinine 2009; Asian v5 CKD-EPI creatinine 2009
Reference standard (s)	mGFR 99 mTc-DTPA

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Section	Question	Answer
Patient selection: risk of bias	Was a consecutive or random sample of patients enrolled?	Yes
	Was a case-control design avoided?	Yes
	Did the study avoid inappropriate exclusions?	Yes
	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	Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear
	If a threshold was used, was it pre-specified?	Irrelevant
	Could the conduct or interpretation of the index test have introduced bias?	Low

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Section	Question	Answer
Index tests: applicability	Are there concerns that the index test, its conduct, or interpretation differ from the review question?	Low
Reference standard: risk of bias	Is the reference standard likely to correctly classify the target condition?	Yes
	Were the reference standard results interpreted without knowledge of the results of the index test?	Unclear
	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	Was there an appropriate interval between index test(s) and reference standard?	Unclear
	Did all patients receive a reference standard?	Yes
	Did patients receive the same reference standard?	Yes
	Were all patients included in the analysis?	Yes
	Could the patient flow have introduced bias?	Unclear
Overall risk of bias and directness	Risk of Bias	Moderate *(Unclear if mGFR and eGFR took place at the same time)*
	Directness	Partially applicable *(Not a UK study but population still relevant to protocol in relation to ethnicity)*

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1

Ma, 2007

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Bibliographic Reference	Ma, Y-C; Zuo, L; Chen, J-H; Luo, Q; Yu, X-Q; Li, Y; Xu, J-S; Huang, S-M; Wang, L-N; Huang, W; Wang, M; Xu, G-B; Wang, H-Y; Chinese eGFR Investigation, Collaboration; Improved GFR estimation by combined creatinine and cystatin C measurements.; Kidney international; 2007; vol. 72 (no. 12); 1535-42

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5 **Study Characteristics**

Study type	Cross-sectional study
Study details	Study location China Study setting Nine renal institutes of university hospital located in nine different geographic regions of China Study dates June 2004 to September 2005 Sources of funding National '211 Project' Peking University Evidence Based Medicine Group
Inclusion criteria	Age >18 years CKD Diagnosed and classified according to Kidney Disease Outcome Quality Initiatives clinical practice guideline
Exclusion criteria	Renal replacement therapy Medical conditions

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	Acute kidney function deterioration, edema, skeletal muscle atrophy, pleural effusion or ascites, malnutrition, amputation, heart failure, ketoacidosis, hypothyroidism or hyperthyroidism, malignant tumor, and acute inflammatory conditions, those who were currently taking high-dose steroids, cimetidine, trimethoprim
Sample characteristics	Sample size 567 Female 47.4% Mean age (SD) 49.8 years (16.3) Diabetes 4.7% Hypertension 13.4% mGFR mL/min/1.73 m2 Mean 57.9 (SD 36.4)
Index test(s) - see Appendix M for a full description of each equation	Adjusted CKD-EPI Chinese v1 CKD-EPI cystatin C 2008 Cystatin alone; Chinese v3 CKD-EPI creatinine-cystatin C 2008 v1
Reference standard (s)	mGFR 99mTc-DTPA

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Section	Question	Answer
Patient selection: risk of bias	Was a consecutive or random sample of patients enrolled?	Unclear

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Section	Question	Answer
	Was a case-control design avoided?	Yes
	Did the study avoid inappropriate exclusions?	Yes
	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	Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear
	If a threshold was used, was it pre-specified?	Irrelevant
	Could the conduct or interpretation of the index test have introduced bias?	Low
Index tests: applicability	Are there concerns that the index test, its conduct, or interpretation differ from the review question?	Low
Reference standard: risk of bias	Is the reference standard likely to correctly classify the target condition?	Yes
	Were the reference standard results interpreted without knowledge of the results of the index test?	Unclear
	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

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Section	Question	Answer
Flow and timing: risk of bias	Was there an appropriate interval between index test(s) and reference standard?	Unclear
	Did all patients receive a reference standard?	Yes
	Did patients receive the same reference standard?	Yes
	Were all patients included in the analysis?	Yes
	Could the patient flow have introduced bias?	Unclear
Overall risk of bias and directness	Risk of Bias	Moderate *(Unclear if mGFR and eGFR took place at the same time)*
	Directness	Partially applicable *(Not a UK study but population still relevant to protocol in relation to ethnicity)*

1

Pei, 2013

2

Bibliographic Reference	Pei, Xiaohua; Bao, Lihua; Xu, Zhaoqiang; Yan, Chengjing; He, Juan; Zhu, Bei; Wu, Jianqing; Zhao, Weihong; Diagnostic value of cystatin C and glomerular filtration rate formulae in Chinese nonelderly and elderly populations.; Journal of nephrology; 2013; vol. 26 (no. 3); 476-84

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5 **Study Characteristics**

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Study type	Cross-sectional study
Study details	Study location China Study setting Hospital Study dates December 2009 to November 2011 Sources of funding This work was supported by the Scientific Research Program of the Health Department of Jiangsu Providence and the Blue Project Fund 2010 of Jiangsu Province
Inclusion criteria	Age Adults CKD According to the Kidney Disease Outcomes Quality Initiative (K/DOQI) guidelines
Exclusion criteria	Medical conditions Severe heart failure, acute renal failure, pleural abdominal effusion, serious edema or malnutrition, skeletal muscle atrophy, amputation or ketoacidosis or who had recently received glucocorticoid therapy
Sample characteristics	Sample size 534 Female 41.3% Mean age (SD) 54.9 years (15.7) mGFR mL/min/1.73 m2 Mean 72.7 (SD 24.9)
Index test(s) - see Appendix M for a full description of each equation	CKD-EPI CKD-EPI creatinine 2009 Adjusted CKD-EPI Chinese CKD-EPI creatinine-cystatin C 2008 v1

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Reference standard (s)	mGFR 99mTc-DTPA

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Section	Question	Answer
Patient selection: risk of bias	Was a consecutive or random sample of patients enrolled?	Unclear
	Was a case-control design avoided?	Yes
	Did the study avoid inappropriate exclusions?	Yes
	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	Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear
	If a threshold was used, was it pre-specified?	Irrelevant
	Could the conduct or interpretation of the index test have introduced bias?	Low
Index tests: applicability	Are there concerns that the index test, its conduct, or interpretation differ from the review question?	Low

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Section	Question	Answer
Reference standard: risk of bias	Is the reference standard likely to correctly classify the target condition?	Yes
	Were the reference standard results interpreted without knowledge of the results of the index test?	Unclear
	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	Was there an appropriate interval between index test(s) and reference standard?	Unclear
	Did all patients receive a reference standard?	Yes
	Did patients receive the same reference standard?	Yes
	Were all patients included in the analysis?	Yes
	Could the patient flow have introduced bias?	Unclear
Overall risk of bias and directness	Risk of Bias	Moderate *(Unclear if mGFR and eGFR took place at the same time)*
	Directness	Partially applicable *(Not a UK study but population still relevant to protocol in relation to ethnicity)*

1

Pei, 2012

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1

Bibliographic Reference	Pei, Xiao-Hua; He, Juan; Liu, Qiao; Zhu, Bei; Bao, Li-Hua; Yan, Chen-Jing; Wu, Jian-Qing; Zhao, Wei-Hong; Evaluation of serum creatinine- and cystatin C-based equations for the estimation of glomerular filtration rate in a Chinese population.; Scandinavian journal of urology and nephrology; 2012; vol. 46 (no. 3); 223-31

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4 **Study Characteristics**

Study type	Cross-sectional study
Study details	Study location China Study setting Hospital Study dates December 2009 to December 2011 Sources of funding This work was supported by the Scientific Research Program of the Health Department of Jiangsu Province and the blue project fund 2010 of Jiangsu province
Inclusion criteria	Other GFR measurements taken by 99mTc-DTPA clearance when SCr concentrations were stable and patients had steady status
Exclusion criteria	Medical conditions Severe heart failure, acute renal failure, pleural abdominal effusion, serious oedema or malnutrition, skeletal muscle atrophy, amputation or ketoacidosis, and those who had recently received glucocorticoid therapy, haemodialysis Other Children aged <15 years
Sample characteristics	Sample size 569 Female

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	41.6% Mean age (SD) 53.5 years (16.9) mGFR mL/min/1.73 m2 Mean 74.80 (SD 26.10)
Index test(s) - see Appendix M for a full description of each equation	CKD-EPI CKD-EPI creatinine 2009 Adjusted CKD-EPI Chinese v1 CKD-EPI creatinine-cystatin C 2008 v1
Reference standard (s)	mGFR 99mTc-DTPA

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Section	Question	Answer
Patient selection: risk of bias	Was a consecutive or random sample of patients enrolled?	Yes
	Was a case-control design avoided?	Yes
	Did the study avoid inappropriate exclusions?	Yes
	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

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Section	Question	Answer
Index tests: risk of bias	Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear
	If a threshold was used, was it pre-specified?	Irrelevant
	Could the conduct or interpretation of the index test have introduced bias?	Low
Index tests: applicability	Are there concerns that the index test, its conduct, or interpretation differ from the review question?	Low
Reference standard: risk of bias	Is the reference standard likely to correctly classify the target condition?	Yes
	Were the reference standard results interpreted without knowledge of the results of the index test?	Unclear
	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	Was there an appropriate interval between index test(s) and reference standard?	Unclear
	Did all patients receive a reference standard?	Yes
	Did patients receive the same reference standard?	Yes
	Were all patients included in the analysis?	Yes
	Could the patient flow have introduced bias?	Unclear

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Section	Question	Answer
Overall risk of bias and directness	Risk of Bias	Moderate *(Unclear if mGFR and eGFR took place at the same time)*
	Directness	Partially applicable *(Not a UK study but population still relevant to protocol in relation to ethnicity)*

1

Pei, 2012

2

Bibliographic Reference	Pei, Xiaohua; Liu, Qiao; He, Juan; Bao, Lihua; Yan, Chengjing; Wu, Jianqing; Zhao, Weihong; Are cystatin C-based equations superior to creatinine-based equations for estimating GFR in Chinese elderly population?.; International urology and nephrology; 2012; vol. 44 (no. 6); 1877-84

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5 **Study Characteristics**

Study type	Cross-sectional study
Study details	Study location China Study setting Hospital Study dates December 2009 to December 2010 Sources of funding

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	This work was supported by the National Natural Science Foundation of China, the Scientific Research Program of the Health Department of Jiangsu Province and the Blue Project Fund 2010 of Jiangsu Province
Inclusion criteria	Age 60 years and older Other Patients in clinic or hospitalised
Exclusion criteria	Renal replacement therapy Medical conditions Severe heart failure, acute renal failure, ascites, serious edema or malnutrition, skeletal muscle atrophy, amputation, ketoacidosis or recently received glucocorticoid therapy
Sample characteristics	Sample size 110 Female 44.5% Mean age (SD) 71.05 years (SD 7.62) Diabetes 10.9% mGFR mL/min/1.73 m2 Mean 60.39 (SD 19.87)
Index test(s) - see Appendix M for a full description of each equation	CKD-EPI CKD-EPI creatinine 2009; CKD-EPI cystatin C 2011 equations re-expressed for standardized Scys v1; CKD-EPI cystatin C 2008 Cystatin + age + race + sex; CKD-EPI creatinine-cystatin C 2008 v1 Adjusted CKD-EPI Chinese v1 CKD-EPI creatinine-cystatin C 2008 v1
Reference standard (s)	mGFR 99mTc-DTPA

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Section	Question	Answer
Patient selection: risk of bias	Was a consecutive or random sample of patients enrolled?	Unclear
	Was a case-control design avoided?	Yes
	Did the study avoid inappropriate exclusions?	Yes
	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	Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear
	If a threshold was used, was it pre-specified?	Irrelevant
	Could the conduct or interpretation of the index test have introduced bias?	Low
Index tests: applicability	Are there concerns that the index test, its conduct, or interpretation differ from the review question?	Low
Reference standard: risk of bias	Is the reference standard likely to correctly classify the target condition?	Yes
	Were the reference standard results interpreted without knowledge of the results of the index test?	Unclear
	Could the reference standard, its conduct, or its interpretation have introduced bias?	Low

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Section	Question	Answer
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	Was there an appropriate interval between index test(s) and reference standard?	Unclear
	Did all patients receive a reference standard?	Yes
	Did patients receive the same reference standard?	Yes
	Were all patients included in the analysis?	Yes
	Could the patient flow have introduced bias?	Unclear
Overall risk of bias and directness	Risk of Bias	Moderate *(Unclear if mGFR and eGFR took place at the same time)*
	Directness	Partially applicable *(Not a UK study but population still relevant to protocol in relation to ethnicity)*

1

Pei, 2013

2

Bibliographic Reference	Pei, Xiaohua; Yang, Wanyuan; Wang, Shengnan; Zhu, Bei; Wu, Jianqing; Zhu, Jin; Zhao, Weihong; Using mathematical algorithms to modify glomerular filtration rate estimation equations.; PloS one; 2013; vol. 8 (no. 3); e57852

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1 **Study Characteristics**

Study type	Cross-sectional study
Study details	Study location China Study setting Hospital Study dates December 2009 and October 2012 Sources of funding This work was supported by the Innovation of Science and Technology Achievement Transformation Fund of Jiangsu Province, the National Natural Science Foundation of China, and the grants from the Major State Basic Research Development Program of China, a Project Funded by the Priority Academic Program Development of Jiangsu Higher Education Institutions
Inclusion criteria	None reported
Exclusion criteria	Medical conditions Severe heart failure, acute renal failure, pleural or abdominal effusion, serious edema or malnutrition, skeletal muscle atrophy, amputation, ketoacidosis, those who recently received glucocorticoid and hemodialysis therapy
Sample characteristics	Sample size 703 Female 40.0% Mean age (SD) 52.3 years (16.8) Diabetes 5.8% Hypertension 7.8% mGFR mL/min/1.73 m2 Mean 77.1 (SD 25.9)

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Index test(s) - see Appendix M for a full description of each equation	CKD-EPI CKD-EPI creatinine 2009 Adjusted CKD-EPI Chinese v1 CKD-EPI creatinine 2009
Reference standard (s)	mGFR 99mTc-DTPA

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Section	Question	Answer
Patient selection: risk of bias	Was a consecutive or random sample of patients enrolled?	Unclear
	Was a case-control design avoided?	Yes
	Did the study avoid inappropriate exclusions?	Yes
	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	Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear
	If a threshold was used, was it pre-specified?	Irrelevant
	Could the conduct or interpretation of the index test have introduced bias?	Low

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Section	Question	Answer
Index tests: applicability	Are there concerns that the index test, its conduct, or interpretation differ from the review question?	Low
Reference standard: risk of bias	Is the reference standard likely to correctly classify the target condition?	Yes
	Were the reference standard results interpreted without knowledge of the results of the index test?	Unclear
	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	Was there an appropriate interval between index test(s) and reference standard?	Unclear
	Did all patients receive a reference standard?	Yes
	Did patients receive the same reference standard?	Yes
	Were all patients included in the analysis?	Yes
	Could the patient flow have introduced bias?	Unclear
Overall risk of bias and directness	Risk of Bias	Moderate *(Unclear if mGFR and eGFR took place at the same time)*
	Directness	Partially applicable *(Not a UK study but population still relevant to protocol in relation to ethnicity)*

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1

Rocha, 2020

2

Bibliographic Reference	Rocha, A.D.; Garcia, S.; Santos, A.B.; Eduardo, J.C.C.; Mesquita, C.T.; Lugon, J.R.; Strogoff-De-Matos, J.P.; No Race-Ethnicity Adjustment in CKD-EPI Equations Is Required for Estimating Glomerular Filtration Rate in the Brazilian Population; International Journal of Nephrology; 2020; vol. 2020; 2141038

3

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5 **Study Characteristics**

Study type	Cross-sectional study
Study details	Study location Brazil Study setting Nephrology Division, Department of Medicine, Fluminense Federal University (UFF), Study dates Unclear - study published July 2020 Loss to follow-up N/A Sources of funding financially supported by the Coordenação de Aperfeiçoamento de Pessoal de N´ıvel Superior (CAPES), Ministry of Education, Brazil.
Inclusion criteria	Age >18 CKD

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Exclusion criteria	Medical conditions pregnancy, liver cirrhosis, metastatic cancer, paraplegia, quadriplegia, or limb amputation.
Sample characteristics	Sample size n=100 (61 African Brazillian Female 54 Mean age (SD) 58 (SD 14) Diabetes 19 Hypertension 31 mGFR mL/min/1.73 m2 46.7 (±29.2) in whole popultation 49.8 (±32.2) in African Brazilian
Index test(s) - see Appendix M for a full description of each equation	CKD-EPI CKD-EPI creatinine 2009 CKD-EPI creatinine-cystatin C 2012 Adjusted CKD-EPI CKD-EPI creatinine 2009 with ethnicity adjustment CKD-EPI creatinine-cystatin C 2012 with ethnicity adjustment

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Section	Question	Answer
Patient selection: risk of bias	Was a consecutive or random sample of patients enrolled?	Unclear
	Was a case-control design avoided?	Yes

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Section	Question	Answer
	Did the study avoid inappropriate exclusions?	Yes
	Could the selection of patients have introduced bias?	Unclear
Patient selection: applicability	Are there concerns that included patients do not match the review question?	Low
Index tests: risk of bias	Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear
	If a threshold was used, was it pre-specified?	Irrelevant
	Could the conduct or interpretation of the index test have introduced bias?	Low
Index tests: applicability	Are there concerns that the index test, its conduct, or interpretation differ from the review question?	Low
Reference standard: risk of bias	Is the reference standard likely to correctly classify the target condition?	Yes
	Were the reference standard results interpreted without knowledge of the results of the index test?	Unclear
	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	Was there an appropriate interval between index test(s) and reference standard?	Yes *(Blood sample for eGFR taken directly before injection for mGFR)*

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Section	Question	Answer
	Did all patients receive a reference standard?	Yes
	Did patients receive the same reference standard?	Yes
	Were all patients included in the analysis?	Yes
	Could the patient flow have introduced bias?	Low
Overall risk of bias and directness	Risk of Bias	Low
	Directness	Partially applicable

1

Stevens, 2011

2

Bibliographic Reference Stevens, Lesley A; Claybon, Marcie A; Schmid, Christopher H; Chen, Jing; Horio, Masaru; Imai, Enyu; Nelson, Robert G; Van Deventer, Manuel; Wang, Hai-Yan; Zuo, Li; Zhang, Yaping Lucy; Levey, Andrew S; Evaluation of the Chronic Kidney Disease Epidemiology Collaboration equation for estimating the glomerular filtration rate in multiple ethnicities.; Kidney international; 2011; vol. 79 (no. 5); 555-62

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4

5 **Study Characteristics**

Study type	Cross-sectional study Cross-sectional analysis of pooled data from research studies and clinical populations
Study details	Study location

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	US, Europe, Asia and South Africa Study setting Internal and external validation of CKD-EPI equations Study dates Not reported Sources of funding Funded by the National Institute of Diabetes, Digestive and Kidney Diseases
Inclusion criteria	None reported
Exclusion criteria	None reported
Index test(s) - see Appendix M for a full description of each equation	Adjusted CKD-EPI CKD-EPI creatinine 2009 ethnicity adjusted versions: Asian v1; Black race v1; Black race v2; Hispanic and Native American race; White and other race v1 and v2
Reference standard (s)	mGFR Urinary clearance of iothalamate

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2 **Study arms**

White & other (US & Europe) (N = 3378)	
Sample characteristics	Female 45% Mean age (SD) 49 years (15) Diabetes 29% mGFR mL/min/1.73 m2

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	Mean 69 (SD 36)

Black (US & Europe) (N = 384)

Sample characteristics	Female 48% Mean age (SD) 50 years (15) Diabetes 25% mGFR mL/min/1.73 m2 Mean 62 (SD 34)

Asian (US & Europe) (N = 67)

Sample characteristics	Female 48% Mean age (SD) 51 years (15) Diabetes 21% mGFR mL/min/1.73 m2 Mean 53 (SD 31)

Native American & Hispanic (US & Europe) (N = 185)

Sample characteristics	Female 70% Mean age (SD) 45 years (12) Diabetes

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	64% mGFR mL/min/1.73 m2 Mean 105 (SD 47)

Asian study 1 (non-US & non-Europe) (N = 248)

Sample characteristics	Female 45% Mean age (SD) 50 years (18) Diabetes 14% mGFR mL/min/1.73 m2 Mean 53 (SD 31)

Asian study 2 (non-US & non-Europe) (N = 675)

Sample characteristics	Female 49% Mean age (SD) 50 years (15) Diabetes 3% mGFR mL/min/1.73 m2 Mean 55 (SD 35)

Black (non-US & non-Europe) (N = 99)

Sample characteristics	Female 49% Mean age (SD)

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	47 years (17) Diabetes 6% mGFR mL/min/1.73 m2 Mean 61 (SD 32)

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Section	Question	Answer
Patient selection: risk of bias	Was a consecutive or random sample of patients enrolled?	Unclear
	Was a case-control design avoided?	Yes
	Did the study avoid inappropriate exclusions?	Yes
	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	Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear
	If a threshold was used, was it pre-specified?	Irrelevant
	Could the conduct or interpretation of the index test have introduced bias?	Low
Index tests: applicability	Are there concerns that the index test, its conduct, or interpretation differ from the review question?	Low

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Section	Question	Answer
Reference standard: risk of bias	Is the reference standard likely to correctly classify the target condition?	Yes
	Were the reference standard results interpreted without knowledge of the results of the index test?	Unclear
	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	Was there an appropriate interval between index test(s) and reference standard?	Unclear
	Did all patients receive a reference standard?	Yes
	Did patients receive the same reference standard?	Yes
	Were all patients included in the analysis?	Yes
	Could the patient flow have introduced bias?	Unclear
Overall risk of bias and directness	Risk of Bias	Moderate *(Unclear if mGFR and eGFR took place at the same time)*
	Directness	Partially applicable *(Not a UK study but population still relevant to protocol in relation to ethnicity)*

1

Teo, 2012

-

1

Bibliographic Reference	Teo, Boon Wee; Xu, Hui; Wang, Danhua; Li, Jialiang; Sinha, Arvind Kumar; Shuter, Borys; Sethi, Sunil; Lee, Evan J C; Estimating glomerular filtration rates by use of both cystatin C and standardized serum creatinine avoids ethnicity coefficients in Asian patients with chronic kidney disease.; Clinical chemistry; 2012; vol. 58 (no. 2); 450-7

2

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4 **Study Characteristics**

Study type	Cross-sectional study
Study details	Study location Singapore Study setting Nephrology clinics in the National University Hospital Study dates Not reported Sources of funding The Asian Kidney Disease Study was funded in part by the National Medical Research Council and the National Kidney Foundation of Singapore
Inclusion criteria	Age >21 years CKD Stable CKD defined as 2 serum creatinines measured >60 days apart of <20% difference and the definition of CKD followed the clinical practice guidelines Kidney function Serum creatinine with an estimated or measured GFR (MDRD, Cockcroft–Gault, or creatinine clearance) of 10 –90 mL/min
Exclusion criteria	Medical conditions Acute kidney function deterioration, amputation, edema, pleural effusion or ascites, skeletal muscle atrophy, or any condition that potentially interferes with the accuracy of the measurement of GFR Other Inability to consent, physical conditions that render phlebotomy for blood samples difficult, or inability to collect urine samples successfully

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Index test(s) - see Appendix M for a full description of each equation	CKD-EPI CKD-EPI creatinine 2009; CKD-EPI cystatin C 2011 equations re-expressed for standardized Scys v1; CKD-EPI cystatin C 2011 equations re-expressed for standardized Scys v2; CKD-EPI creatinine-cystatin C 2011 v2 Adjusted CKD-EPI Chinese v1 CKD-EPI cystatin C 2008 Cystatin alone; Chinese v3 CKD-EPI creatinine-cystatin C 2008 v1; Chinese v1 CKD-EPI creatinine-cystatin C 2008 v1
Reference standard (s)	mGFR 99mTc-DTPA

1

2 **Study arms**

Chinese (N = 94)

Sample characteristics	Female 48.9% Mean age (SD) 58.1 years (13.5) Diabetes 17.0% Hypertension 49.6% mGFR mL/min/1.73 m2 Mean 51.7 (SD 27.5)

Malay (N = 74)

Sample characteristics	Female 48.6% Mean age (SD) 59.8 years (12.3)

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	Diabetes 24.3% Hypertension 59.5% mGFR mL/min/1.73 m2 Mean 47.6 (SD 27.1)
Indian and others (N = 64)	
Sample characteristics	Female 46.9% Mean age (SD) 57.3 years (12.2) Diabetes 31.3% Hypertension 40.6% mGFR mL/min/1.73 m2 Mean 52.7 (SD 25.9)

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Section	Question	Answer
Patient selection: risk of bias	Was a consecutive or random sample of patients enrolled?	Unclear *(Participants were recruited from outpatient nephrology clinics when presenting with CKD)*
	Was a case-control design avoided?	Yes

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Section	Question	Answer
	Did the study avoid inappropriate exclusions?	Yes
	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	Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear
	If a threshold was used, was it pre-specified?	Irrelevant
	Could the conduct or interpretation of the index test have introduced bias?	Low
Index tests: applicability	Are there concerns that the index test, its conduct, or interpretation differ from the review question?	Low
Reference standard: risk of bias	Is the reference standard likely to correctly classify the target condition?	Yes
	Were the reference standard results interpreted without knowledge of the results of the index test?	Unclear
	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	Was there an appropriate interval between index test(s) and reference standard?	Yes *(GFR measurement and blood samples were collected at the same time)*

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Section	Question	Answer
	Did all patients receive a reference standard?	Yes
	Did patients receive the same reference standard?	Yes
	Were all patients included in the analysis?	Yes
	Could the patient flow have introduced bias?	Low
Overall risk of bias and directness	Risk of Bias	Low
	Directness	Partially applicable *(Not a UK study but population still relevant to protocol in relation to ethnicity)*

1

Tong, 2017

2

Bibliographic Reference	Tong, Yingna; Liu, Xiaobin; Guan, Mingxiu; Wang, Meng; Zhang, Lufang; Dong, Dong; Niu, Ruifang; Zhang, Fei; Zhou, Yunli; Evaluation of Serological Indicators and Glomerular Filtration Rate Equations in Chinese Cancer Patients.; Medical science monitor : international medical journal of experimental and clinical research; 2017; vol. 23; 2949-2960

3

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5 **Study Characteristics**

Study type	Cross-sectional study
Study details	Study location

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	China Study setting Medical University Cancer Institute and Hospital Study dates October 2012 to December 2014 Sources of funding This work was funded by grants from the National Natural Science foundation of China and the Natural Science Foundation of Tianjin, the National Natural Science foundation of China, and the National Natural Science foundation of China
Inclusion criteria	CKD Patients with cancer (after chemotherapy) and CKD according to the KDIGO 2012
Exclusion criteria	Medical conditions Acute kidney function deterioration, severe cardiac insufficiency, pleural or abdominal, effusion, edema, diabetes, primary kidney disease, and disabled limbs or amputation
Sample characteristics	Sample size 545 Female 40.3% Age groups <55 years (20.5%); 55 to 65 years (37.7%); ≥65 years (41.6%) mGFR mL/min/1.73 m2 Mean 62.36 (SD 21.90)
Index test(s) - see Appendix M for a full description of each equation	CKD-EPI CKD-EPI creatinine 2009; CKD-EPI cystatin C 2012; CKD-EPI creatinine-cystatin C 2012 Adjusted CKD-EPI Asian v4 CKD-EPI creatinine 2009; Chinese v1 CKD-EPI creatinine-cystatin C 2008 v1
Reference standard (s)	mGFR 99mTc-DTPA

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Section	Question	Answer
Patient selection: risk of bias	Was a consecutive or random sample of patients enrolled?	Unclear
	Was a case-control design avoided?	Yes
	Did the study avoid inappropriate exclusions?	Yes
	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	Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear
	If a threshold was used, was it pre-specified?	Irrelevant
	Could the conduct or interpretation of the index test have introduced bias?	Low
Index tests: applicability	Are there concerns that the index test, its conduct, or interpretation differ from the review question?	Low
Reference standard: risk of bias	Is the reference standard likely to correctly classify the target condition?	Yes
	Were the reference standard results interpreted without knowledge of the results of the index test?	Unclear

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Section	Question	Answer
	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	Was there an appropriate interval between index test(s) and reference standard?	Yes *(99mTc-DTPA dual-plasma clearance was applied to measure GFR on the same day as serum collection for creatinine and cystatin-C)*
	Did all patients receive a reference standard?	Yes
	Did patients receive the same reference standard?	Yes
	Were all patients included in the analysis?	Yes
	Could the patient flow have introduced bias?	Low
Overall risk of bias and directness	Risk of Bias	Low
	Directness	Partially applicable *(Not a UK study but population still relevant to protocol in relation to ethnicity)*

1

van Deventer, 2011

2

Bibliographic Reference	van Deventer, Hendrick E; Paiker, Janice E; Katz, Ivor J; George, Jaya A; A comparison of cystatin C- and creatinine-based prediction equations for the estimation of glomerular filtration rate in black South Africans.; Nephrology, dialysis, transplantation : official publication of the European Dialysis and Transplant Association - European Renal Association; 2011; vol. 26 (no. 5); 1553-8

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3 **Study Characteristics**

Study type	Cross-sectional study
Study details	Study location South Africa Study setting Participants were either inpatients or being followed up at the renal unit outpatient department at the hospital Study dates 2006 Sources of funding Not reported
Inclusion criteria	Age Older than 18 years CKD At risk for the development of CKD or established CKD
Exclusion criteria	Medical conditions Pregnancy, acute kidney injury and oedema
Sample characteristics	Sample size 50 (test dataset group) Female Not reported for the test dataset group Mean age (SD) Not reported Diabetes Not reported for the test dataset group

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	Hypertension Not reported for the test dataset group mGFR mL/min/1.73 m2 Not reported
Index test(s) - see Appendix M for a full description of each equation	Adjusted CKD-EPI CKD-EPI creatinine 2009 without ethnicity factor
Reference standard (s)	mGFR 51Cr-EDTA plasma clearance

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Section	**Question**	**Answer**
Patient selection: risk of bias	Was a consecutive or random sample of patients enrolled?	Unclear *(Participants were either inpatients or being followed up at the renal unit outpatient department at the hospital)*
	Was a case-control design avoided?	Yes
	Did the study avoid inappropriate exclusions?	Yes
	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

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Section	Question	Answer
Index tests: risk of bias	Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear
	If a threshold was used, was it pre-specified?	Yes
	Could the conduct or interpretation of the index test have introduced bias?	Low
Index tests: applicability	Are there concerns that the index test, its conduct, or interpretation differ from the review question?	Low
Reference standard: risk of bias	Is the reference standard likely to correctly classify the target condition?	Yes
	Were the reference standard results interpreted without knowledge of the results of the index test?	Unclear
	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	Was there an appropriate interval between index test(s) and reference standard?	Yes *(A blood sample for serum creatinine and cystatin-C measurements were collected on the same day when 51Cr-EDTA was performed)*
	Did all patients receive a reference standard?	Yes
	Did patients receive the same reference standard?	Yes
	Were all patients included in the analysis?	Yes

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Section	Question	Answer
	Could the patient flow have introduced bias?	Low
Overall risk of bias and directness	Risk of Bias	Low
	Directness	Partially applicable *(Not a UK study but population still relevant to protocol in relation to ethnicity)*

1

Wang, 2016

2

Bibliographic Reference	Wang, Jinghua; Xie, Peng; Huang, Jian-Min; Qu, Yan; Zhang, Fang; Wei, Ling-Ge; Fu, Peng; Huang, Xiao-Jie; The new Asian modified CKD-EPI equation leads to more accurate GFR estimation in Chinese patients with CKD.; International urology and nephrology; 2016; vol. 48 (no. 12); 2077-2081

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5 **Study Characteristics**

Study type	Cross-sectional study
Study details	Study location China Study setting Not reported Study dates Not reported

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	Sources of funding No current external funding sources for this study
Inclusion criteria	Age 18 years or older CKD Diagnostic standard for CKD was achieved according to the National Kidney Foundation-Kidney Disease Outcomes Quality Initiative (K/DOQI) clinical practice guidelines
Exclusion criteria	Renal replacement therapy Medical conditions Complications related to acute kidney function deterioration; with edema, cardiac insufficiency, pleural effusion or abdomen effusion; with disabled limb; with treatment of cimetidine or trimethoprim that could affect the concentration of serum creatinine
Sample characteristics	Sample size 170 Female 60% Mean age (SD) 55.46 years (15.36) Diabetes 24.6% Hypertension 11.2% mGFR mL/min/1.73 m2 Mean 63.42 (SD 38.25)
Index test(s) - see Appendix M for a full description of each equation	CKD-EPI CKD-EPI creatinine 2009 Adjusted CKD-EPI Asian v1 CKD-EPI creatinine 2009
Reference standard (s)	mGFR 99mTc-DTPA dual plasma sample clearance

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Section	Question	Answer
Patient selection: risk of bias	Was a consecutive or random sample of patients enrolled?	Unclear
	Was a case-control design avoided?	Yes
	Did the study avoid inappropriate exclusions?	Yes
	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	Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear
	If a threshold was used, was it pre-specified?	Irrelevant
	Could the conduct or interpretation of the index test have introduced bias?	Low
Index tests: applicability	Are there concerns that the index test, its conduct, or interpretation differ from the review question?	Low
Reference standard: risk of bias	Is the reference standard likely to correctly classify the target condition?	Yes
	Were the reference standard results interpreted without knowledge of the results of the index test?	Yes

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Section	Question	Answer
	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	Was there an appropriate interval between index test(s) and reference standard?	Unclear
	Did all patients receive a reference standard?	Yes
	Did patients receive the same reference standard?	Yes
	Were all patients included in the analysis?	Yes
	Could the patient flow have introduced bias?	Unclear
Overall risk of bias and directness	Risk of Bias	Moderate *(Unclear if mGFR and eGFR took place at the same time)*
	Directness	Partially applicable *(Not a UK study but population still relevant to protocol in relation to ethnicity)*

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Xie, 2017

2

Bibliographic Reference	Xie, Peng; Huang, Jian-Min; Li, Ying; Liu, Huai-Jun; Qu, Yan; The modified CKD-EPI equation may be not more accurate than CKD-EPI equation in determining glomerular filtration rate in Chinese patients with chronic kidney disease.; Journal of nephrology; 2017; vol. 30 (no. 3); 397-402

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3 **Study Characteristics**

Study type	Cross-sectional study
Study details	Study location China Study setting Not reported Study dates Not reported Sources of funding Not reported
Inclusion criteria	Age 18 years or older CKD Diagnostic criteria for CKD according to the National Kidney Foundation-Kidney Disease Outcomes Quality Initiative (K/DOQI) clinical practice guidelines
Exclusion criteria	Renal replacement therapy Medical conditions Complications related to acute kidney function deterioration, with edema, cardiac insufficiency, pleural or abdomen effusion, with a disabled limb, or on treatment with cimetidine or trimethoprim
Sample characteristics	Sample size 170 Female 51.7% Mean age (SD) 56 years (SD 16)

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	Diabetes 21.1% Hypertension 11.1% mGFR mL/min/1.73 m2 Mean 58 (SD 37)
Index test(s) - see Appendix M for a full description of each equation	CKD-EPI CKD-EPI creatinine 2009 Adjusted CKD-EPI Asian v5 CKD-EPI creatinine 2009
Reference standard (s)	mGFR 99mTc-DTPA dual plasma sample clearance

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Section	Question	Answer
Patient selection: risk of bias	Was a consecutive or random sample of patients enrolled?	Unclear
	Was a case-control design avoided?	Yes
	Did the study avoid inappropriate exclusions?	Yes
	Could the selection of patients have introduced bias?	Low

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Section	Question	Answer
Patient selection: applicability	Are there concerns that included patients do not match the review question?	Low
Index tests: risk of bias	Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear
	If a threshold was used, was it pre-specified?	Irrelevant
	Could the conduct or interpretation of the index test have introduced bias?	Low
Index tests: applicability	Are there concerns that the index test, its conduct, or interpretation differ from the review question?	Low
Reference standard: risk of bias	Is the reference standard likely to correctly classify the target condition?	Yes
	Were the reference standard results interpreted without knowledge of the results of the index test?	Unclear
	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	Was there an appropriate interval between index test(s) and reference standard?	Unclear
	Did all patients receive a reference standard?	Yes
	Did patients receive the same reference standard?	Yes

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Section	Question	Answer
	Were all patients included in the analysis?	Yes
	Could the patient flow have introduced bias?	Unclear
Overall risk of bias and directness	Risk of Bias	Moderate *(Unclear if mGFR and eGFR took place at the same time)*
	Directness	Partially applicable *(Not a UK study but population still relevant to protocol in relation to ethnicity)*

1

Yang, 2017

2

Bibliographic Reference	Yang, Min; Xu, Guang; Ling, Lilu; Niu, Jianying; Lu, Tong; Du, Xin; Gu, Yong; Performance of the creatinine and cystatin C-based equations for estimation of GFR in Chinese patients with chronic kidney disease.; Clinical and experimental nephrology; 2017; vol. 21 (no. 2); 236-246

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5 **Study Characteristics**

Study type	Cross-sectional study
Study details	Study location China Study setting 2 general hospitals

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	Study dates January 2011 and October 2015 Sources of funding This work was supported by grants from Chinese Society of Nephrology, Natural Science Foundation of Shanghai, Shanghai Minhang Committee of Science and Technology.
Inclusion criteria	CKD Diagnostic criteria of CKD according to National Kidney Foundation Kidney Disease Outcomes Quality Initiative (K/DOQI) clinical practice guidelines
Exclusion criteria	Medical conditions Severe heart failure, acute renal failure, pleural or abdominal effusion, serious edema or malnutrition, skeletal muscle atrophy, amputation, ketoacidosis, those who were taking trimethoprim or cimetidine or ACEI/ARB and those who had recently received glucocorticoid and hemodialysis therapy
Sample characteristics	Sample size 632 Female 44.1% Mean age (SD) 61.6 years (12.3) Diabetes 27.7% Hypertension 9.3% mGFR mL/min/1.73 m2 Mean 64.8 (SD 31.9)
Index test(s) - see Appendix M for a full description of each equation	CKD-EPI CKD-EPI creatinine 2009; CKD-EPI cystatin C 2012; CKD-EPI creatinine-cystatin C 2012 Adjusted CKD-EPI Chinese v1 CKD-EPI cystatin C 2008 Cystatin alone; Chinese v1 CKD-EPI creatinine-cystatin C 2008 v1
Reference standard (s)	mGFR 99mTc-DTPA

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Section	Question	Answer
Patient selection: risk of bias	Was a consecutive or random sample of patients enrolled?	Unclear *(Participants with CKD were selected from two general hospitals)*
	Was a case-control design avoided?	Yes
	Did the study avoid inappropriate exclusions?	Yes
	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	Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear
	If a threshold was used, was it pre-specified?	Yes
	Could the conduct or interpretation of the index test have introduced bias?	Low
Index tests: applicability	Are there concerns that the index test, its conduct, or interpretation differ from the review question?	Low
Reference standard: risk of bias	Is the reference standard likely to correctly classify the target condition?	Yes
	Were the reference standard results interpreted without knowledge of the results of the index test?	Unclear

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Section	Question	Answer
	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	Was there an appropriate interval between index test(s) and reference standard?	Unclear
	Did all patients receive a reference standard?	Yes
	Did patients receive the same reference standard?	Yes
	Were all patients included in the analysis?	Yes
	Could the patient flow have introduced bias?	Unclear
Overall risk of bias and directness	Risk of Bias	Moderate *(Unclear if mGFR and eGFR took place at the same time)*
	Directness	Partially applicable *(Not a UK study but population still relevant to protocol in relation to ethnicity)*

1

Yang, 2019

2

Bibliographic Reference	Yang, Min; Zou, Yonghua; Lu, Tong; Nan, Yule; Niu, Jianying; Du, Xin; Gu, Yong; Revised Equations to Estimate Glomerular Filtration Rate from Serum Creatinine and Cystatin C in China.; Kidney & blood pressure research; 2019; vol. 44 (no. 4); 553-564

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3 **Study Characteristics**

Study type	Cross-sectional study
Study details	Study location China Study setting 2 general hospitals Study dates August 2009 to December 2017 Sources of funding This work was supported by grants from Chinese Society of Nephrology, High-level Talents of the Fifteenth “Six Talents Peaks” in Jiangsu Province, and National Natural Science Foundation of China.
Inclusion criteria	CKD Diagnostic criteria of CKD according to National Kidney Foundation Kidney Disease Outcomes Quality Initiative (K/DOQI) clinical practice guidelines
Exclusion criteria	Medical conditions Severe heart failure, acute renal failure, pleural or abdominal effusion, serious edema or malnutrition, skeletal muscle atrophy, amputation, ketoacidosis, those who were taking trimethoprim or cimetidine or ACEI/ARB and those who had recently received glucocorticoid and hemodialysis therapy
Sample characteristics	Sample size 313 (validation dataset) Female 42.5% (validation dataset) Median age (range or interquartile range [IQR] or 95% CI) 66 years (95% CI 24.6 to 89) (validation dataset) mGFR mL/min/1.73 m2 Median 38.8 (95% CI 9.4 to 95.4) (validation dataset)

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Index test(s) - see Appendix M for a full description of each equation	CKD-EPI CKD-EPI creatinine 2009; CKD-EPI cystatin C 2012; CKD-EPI creatinine-cystatin C 2012 Adjusted CKD-EPI Chinese v2 CKD-EPI creatinine 2009; Chinese v2 CKD-EPI cystatin C 2012; Chinese v2 CKD-EPI creatinine-cystatin C 2012
Reference standard (s)	mGFR 99mTc-DTPA renal dynamic imaging

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Section	Question	Answer
Patient selection: risk of bias	Was a consecutive or random sample of patients enrolled?	Unclear *(Participants were included from 2 general hospitals)*
	Was a case-control design avoided?	Yes
	Did the study avoid inappropriate exclusions?	Yes
	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	Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear
	If a threshold was used, was it pre-specified?	Irrelevant
	Could the conduct or interpretation of the index test have introduced bias?	Low

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Section	Question	Answer
Index tests: applicability	Are there concerns that the index test, its conduct, or interpretation differ from the review question?	Low
Reference standard: risk of bias	Is the reference standard likely to correctly classify the target condition?	Yes
	Were the reference standard results interpreted without knowledge of the results of the index test?	Unclear
	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	Was there an appropriate interval between index test(s) and reference standard?	Unclear
	Did all patients receive a reference standard?	Yes
	Did patients receive the same reference standard?	Yes
	Were all patients included in the analysis?	Yes
	Could the patient flow have introduced bias?	Unclear
Overall risk of bias and directness	Risk of Bias	Moderate *(Unclear if mGFR and eGFR took place at the same time)*
	Directness	Partially applicable *(Not a UK study but population still relevant to protocol in relation to ethnicity)*

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1

Ye, 2016

2

Bibliographic Reference	Ye, Xiaoshuang; Liu, Xun; Song, Dan; Zhang, Xiaoxuan; Zhu, Bei; Wei, Lu; Pei, Xiaohua; Wu, Jianqing; Lou, Tanqi; Zhao, Weihong; Estimating glomerular filtration rate by serum creatinine or/and cystatin C equations: An analysis of multi-centre Chinese subjects.; Nephrology (Carlton, Vic.); 2016; vol. 21 (no. 5); 372-8

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5 **Study Characteristics**

Study type	Cross-sectional study
Study details	Study location China Study setting Four hospitals located in different geographic regions of China Study dates Not reported Sources of funding Supported by the Innovation of Science and Technology Achievement Transformation Fund of Jiangsu Province, a Project Funded by the Priority Academic Program Development of Jiangsu Higher Education Institutions, the National Natural Science Foundation of China, the grants from the Major State Basic Research Development Program of China
Inclusion criteria	Age Adults
Exclusion criteria	Renal replacement therapy Haemodialysis therapy Medical conditions Severe heart failure, acute renal failure, pleural or abdominal effusion, serious oedema or malnutrition, skeletal muscle atrophy, amputation, ketoacidosis, or on cimetidine or trimethoprim

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Sample characteristics	Sample size 1522 Female 39.4% Median age (range or interquartile range [IQR] or 95% CI) 56 years (IQR 44 to 67) mGFR mL/min/1.73 m2 Median 69.6 (IQR 45.4 to 88.7)
Index test(s) - see Appendix M for a full description of each equation	CKD-EPI CKD-EPI creatinine 2009; CKD-EPI cystatin C 2012; CKD-EPI creatinine-cystatin C 2012 Adjusted CKD-EPI CKD-EPI creatinine 2009 (Chinese v1); CKD-EPI cystatin C 2008 Cystatin alone (Chinese v1 and Chinese v2); CKD-EPI creatinine-cystatin C 2008 v1 (Chinese v1 and Chinese v2)
Reference standard (s)	mGFR 99mTc-DTPA

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Section	**Question**	**Answer**
Patient selection: risk of bias	Was a consecutive or random sample of patients enrolled?	Unclear *(Participants were recruited from a hospitalised population, including both clinics and inpatients.)*
	Was a case-control design avoided?	Yes
	Did the study avoid inappropriate exclusions?	Yes
	Could the selection of patients have introduced bias?	Low

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Section	Question	Answer
Patient selection: applicability	Are there concerns that included patients do not match the review question?	Low
Index tests: risk of bias	Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear
	If a threshold was used, was it pre-specified?	Irrelevant
	Could the conduct or interpretation of the index test have introduced bias?	Low
Index tests: applicability	Are there concerns that the index test, its conduct, or interpretation differ from the review question?	Low
Reference standard: risk of bias	Is the reference standard likely to correctly classify the target condition?	Yes
	Were the reference standard results interpreted without knowledge of the results of the index test?	Unclear
	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	Was there an appropriate interval between index test(s) and reference standard?	Unclear
	Did all patients receive a reference standard?	Yes
	Did patients receive the same reference standard?	Yes

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Section	Question	Answer
	Were all patients included in the analysis?	Yes
	Could the patient flow have introduced bias?	Unclear
Overall risk of bias and directness	Risk of Bias	Moderate *(Unclear if mGFR and eGFR took place at the same time)*
	Directness	Partially applicable *(Not a UK study but population still relevant to protocol in relation to ethnicity)*

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Appendix F – Forest plots

None of the included studies could be combined to produce a pooled effect estimate.

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Appendix G – GRADE tables

GRADE tables were not used in this evidence review.

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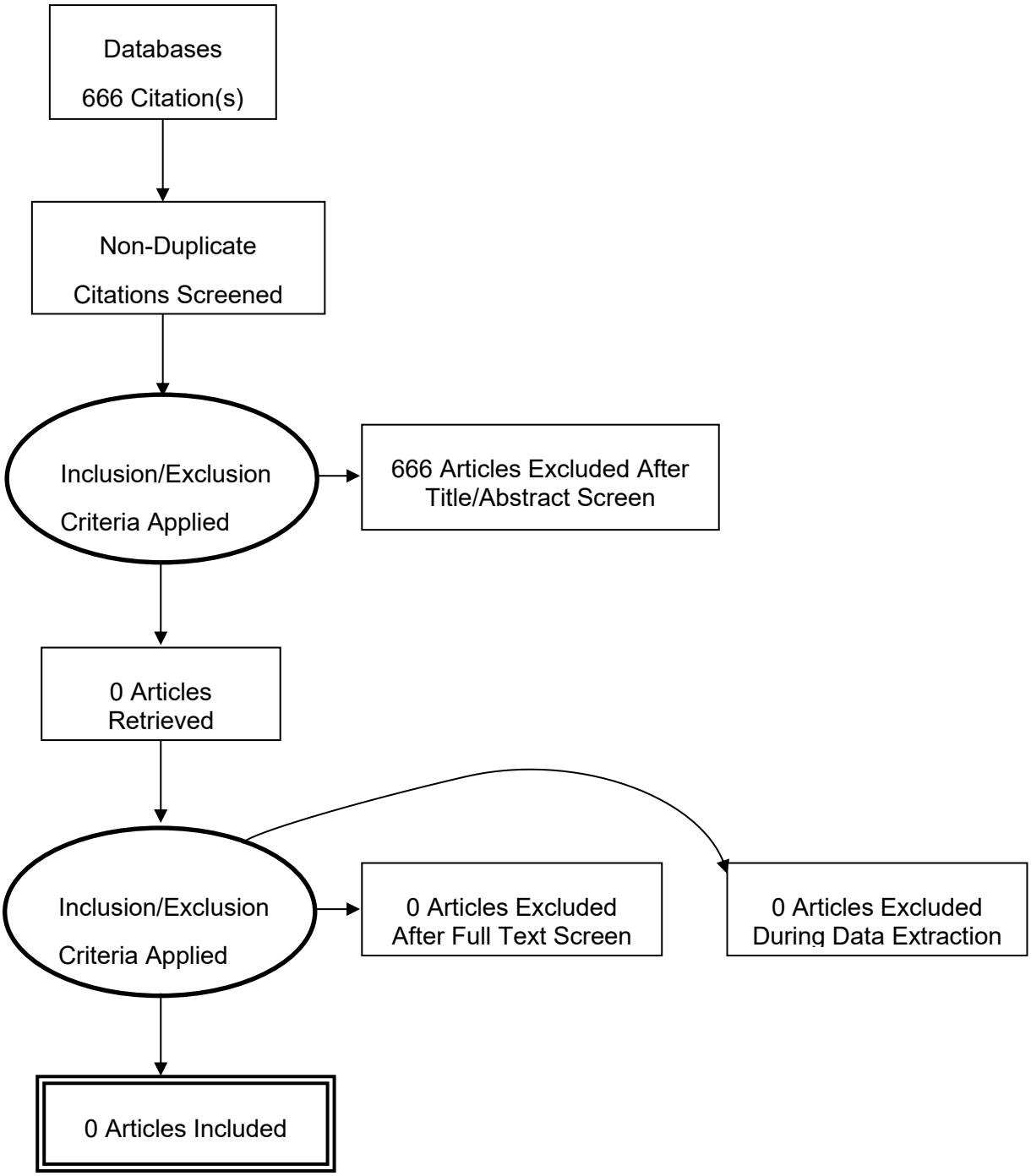
Appendix H – Economic evidence study selection



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Appendix I – Economic evidence tables

No published economic studies were included in this review.

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Appendix J – Health economic model

This review was not prioritised for economic modelling.

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Appendix K – Excluded studies

Study	Code [Reason]
Al Wakeel, Jamal S, Hammad, Durdana, Al Suwaida, Abdulkareem et al. (2009) Validation of predictive equations for glomerular filtration rate in the Saudi population. Saudi journal of kidney diseases and transplantation : an official publication of the Saudi Center for Organ Transplantation, Saudi Arabia 20(6): 1030-7	- Outcome does not match those specified in the protocol Exclude: Outcome does not match those specified in the protocol Study reports Correlation and Bland and Altman plots
Anderson, Amanda Hyre, Yang, Wei, Hsu, Chi-yuan et al. (2012) Estimating GFR among participants in the Chronic Renal Insufficiency Cohort (CRIC) Study. American journal of kidney diseases : the official journal of the National Kidney Foundation 60(2): 250-61	- Study does not contain any relevant index tests Development of eGFR equation for internal use in the CRIC study.
Arlet, Jean-Benoit, Ribeil, Jean-Antoine, Chatellier, Gilles et al. (2012) Determination of the best method to estimate glomerular filtration rate from serum creatinine in adult patients with sickle cell disease: a prospective observational cohort study. BMC nephrology 13: 83	- Outcome does not match those specified in the protocol Exclude: Outcome does not match those specified in the protocol Study reports Bland and Altman plots
Arreola-Guerra, Jose M, Rincon-Pedrero, Rodolfo, Cruz-Rivera, Cristino et al. (2014) Performance of MDRD-IDMS and CKD-EPI equations in Mexican individuals with normal renal function. Nefrologia : publicacion oficial de la Sociedad Espanola Nefrologia 34(5): 591-8	- Population does not match that specified in the protocol Exclude: Population does not match that specified in the protocol Study includes healthy participants (P30 reported without 95%CIs)
Bhuvanakrishna, Thakshyanee, Blake, Glen M, Hilton, Rachel et al. (2015) Comparison of estimated GFR and measured GFR in prospective living kidney donors. International urology and nephrology 47(1): 201-8	- Outcome does not match those specified in the protocol None of the outcomes listed in the protocol were reported by race
Bukabau, Justine B, Sumaili, Ernest K, Cavalier, Etienne et al. (2018) Performance of glomerular filtration rate estimation equations in Congolese healthy adults: The inopportunity of the ethnic correction. PloS one 13(3): e0193384	- Population does not match that specified in the protocol Healthy population
Chen, M., Xia, J., Pei, G. et al. (2016) A more accurate method acquirement by a comparison of the prediction equations for estimating glomerular filtration rate in Chinese patients with obstructive nephropathy. BMC Nephrology 17(1): 1-10	- Retrospective study
Chi, Xiao-Hua, Li, Gui-Ping, Wang, Quan-Shi et al. (2017) CKD-EPI creatinine-cystatin C glomerular filtration rate estimation equation seems more suitable for Chinese patients with chronic kidney disease than other equations. BMC nephrology 18(1): 226	- Retrospective study
Coresh, Josef, Inker, Lesley A, Sang, Yingying et al. (2019) Metabolomic profiling to improve glomerular filtration rate estimation: a proof-of-concept study. Nephrology, dialysis, transplantation : official publication of the	- Assessment tool do not match that specified in the protocol study about improving accuracy of eGFR

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Study	Code [Reason]
European Dialysis and Transplant Association - European Renal Association 34(5): 825-833	
Delanaye, Pierre, Mariat, Christophe, Maillard, Nicolas et al. (2011) Are the creatinine-based equations accurate to estimate glomerular filtration rate in African American populations?. Clinical journal of the American Society of Nephrology : CJASN 6(4): 906-12	- Review article but not a systematic review
Earley, Amy, Miskulin, Dana, Lamb, Edmund J et al. (2012) Estimating equations for glomerular filtration rate in the era of creatinine standardization: a systematic review. Annals of internal medicine 156(11): 785-278	- Systematic review used as source of primary studies
Ebert, Natalie, Delanaye, Pierre, Shlipak, Michael et al. (2016) Cystatin C standardization decreases assay variation and improves assessment of glomerular filtration rate. Clinica chimica acta; international journal of clinical chemistry 456: 115-121	- Assessment tool do not match that specified in the protocol Study about standardisation of measurement for eGFR not a comparison of eFGR to mGFR
Gotoh, Y., Uemura, O., Ishikura, K. et al. (2018) Validation of estimated glomerular filtration rate equations for Japanese children. Clinical and Experimental Nephrology 22(4): 931-937	- Retrospective study
Hojs, R., Bevc, S., Ekart, R. et al. (2011) Kidney function estimating equations in patients with chronic kidney disease. International Journal of Clinical Practice 65(4): 458-464	- Population does not match that specified in the protocol Caucasian
Inker, Lesley A, Levey, Andrew S, Tighiouart, Hocine et al. (2018) Performance of glomerular filtration rate estimating equations in a community-based sample of Blacks and Whites: the multiethnic study of atherosclerosis. Nephrology, dialysis, transplantation : official publication of the European Dialysis and Transplant Association - European Renal Association 33(3): 417-425	- Population does not match that specified in the protocol Mean GFR above 60 so healthy. Subgroub analysis of <60 done but only bias reported. P30 reported for subgroups of race and gender but only in the full GFR range, not race and <60
Inker, Lesley A, Tighiouart, Hocine, Coresh, Josef et al. (2016) GFR Estimation Using beta-Trace Protein and beta2-Microglobulin in CKD. American journal of kidney diseases : the official journal of the National Kidney Foundation 67(1): 40-8	- Data not reported in an extractable format P30 only reported in graph
Jeong, T.-D., Cho, E.-J., Lee, W. et al. (2017) Efficient reporting of the estimated glomerular filtration rate without height in pediatric patients with cancer. Clinical Chemistry and Laboratory Medicine 55(12): 1891-1897	- Retrospective study
Jeong, Tae-Dong, Lee, Woochang, Yun, Yeo-Min et al. (2016) Development and validation of the Korean version of CKD-EPI equation to estimate glomerular filtration rate. Clinical biochemistry 49(9): 713-719	- Retrospective study
Kakde, S., Alexander, S., David, V. et al. (2018) Relationship of creatinine and cystatin C-based estimated glomerular filtration rates with	- Retrospective study

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Study	Code [Reason]
measured glomerular filtration rate in healthy kidney donors from South Asia. Indian Journal of Nephrology 28(5): 345-350	- Population does not match that specified in the protocol Healthy adults
Kumar, Vivek, Yadav, Ashok Kumar, Yasuda, Yoshinari et al. (2018) Existing creatinine-based equations overestimate glomerular filtration rate in Indians. BMC nephrology 19(1): 22	- Retrospective study
Kumaresan, Ramanathan and Giri, Padmanaban (2011) A comparison of serum cystatin C and creatinine with glomerular filtration rate in Indian patients with chronic kidney disease. Oman medical journal 26(6): 421-5	- Not possible to calculate a contingency table from the data specified in the protocol Only reports sensitivity without confidence intervals
Kwong, Yuen-Ting Diana, Stevens, Lesley A, Selvin, Elizabeth et al. (2010) Imprecision of urinary iothalamate clearance as a gold-standard measure of GFR decreases the diagnostic accuracy of kidney function estimating equations. American journal of kidney diseases : the official journal of the National Kidney Foundation 56(1): 39-49	- Outcome does not match those specified in the protocol The focus of this study was to evaluate imprecision of urinary iothalamate clearance as a gold-standard measure of GFR
Li, Dai-Yang, Yin, Wen-Jun, Yi, Yi-Hu et al. (2019) Development and validation of a more accurate estimating equation for glomerular filtration rate in a Chinese population. Kidney international 95(3): 636-646	- Study does not contain any relevant index tests Derviation study.
Ma, Ying-Chun, Zuo, Li, Zhang, Chun-Li et al. (2007) Comparison of 99mTc-DTPA renal dynamic imaging with modified MDRD equation for glomerular filtration rate estimation in Chinese patients in different stages of chronic kidney disease. Nephrology, dialysis, transplantation : official publication of the European Dialysis and Transplant Association - European Renal Association 22(2): 417-23	- Secondary publication of an included study that does not provide any additional relevant information Related to Ma 2006
Marwyne, M N Norli, Loo, C Y, Halim, A G et al. (2011) Estimation of glomerular filtration rate using serum cystatin C in overweight and obese subjects. The Medical journal of Malaysia 66(4): 313-7	- Population does not match that specified in the protocol Healthy participants
Mindikoglu, Ayse L, Dowling, Thomas C, Magder, Laurence S et al. (2016) Estimation of Glomerular Filtration Rate in Patients With Cirrhosis by Using New and Conventional Filtration Markers and Dimethylarginines. Clinical gastroenterology and hepatology : the official clinical practice journal of the American Gastroenterological Association 14(4): 624-632e2	- Population does not match that specified in the protocol
Moodley, Nareshni, Hariparshad, Sudesh, Peer, Fozy et al. (2018) Evaluation of the CKD-EPI creatinine based glomerular filtration rate estimating equation in Black African and Indian adults in KwaZulu-Natal, South Africa. Clinical biochemistry 59: 43-49	- Retrospective study

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Study	Code [Reason]
Niwa, Naoya, Yoshida, Tadashi, Mizuno, Ryuichi et al. (2018) Pre-operative and post-operative estimated glomerular filtration rate in Japanese patients with urological malignancies. Clinical and experimental nephrology 22(5): 1205-1212	- Retrospective study
Padala, Smita, Tighiouart, Hocine, Inker, Lesley A et al. (2012) Accuracy of a GFR estimating equation over time in people with a wide range of kidney function. American journal of kidney diseases : the official journal of the National Kidney Foundation 60(2): 217-24	- Outcome does not match those specified in the protocol P30 was mentioned as one of the methods but results were not reported
Praditpornsilpa, Kearkiat, Avihingsanon, Anchalee, Chaiwatanarat, Tawatchai et al. (2012) Comparisons between validated estimated glomerular filtration rate equations and isotopic glomerular filtration rate in HIV patients. AIDS (London, England) 26(14): 1781-8	- Secondary publication of an included study that does not provide any additional relevant information Related to Praditpornsilpa 2011
Rampursat, Y., Bhimma, R., Naicker, E. et al. (2018) Evaluation of the revised Schwartz creatinine-based glomerular filtration rate estimating equation in Black African children in KwaZulu-Natal, South Africa. Annals of Clinical Biochemistry 55(4): 505-508	- Population does not match that specified in the protocol Only 29% of participants had CKD. Results were not reported for this subgroup. Most of the participants had an indication for GFR measurement for dose adjustment.
Sagou Yayo, E., Aye, M., Konan, J.-L. et al. (2016) Inadequacy of the African-American ethnic factor to estimate glomerular filtration rate in an African general population: Results from Cote d'Ivoire. Nephrologie et Therapeutique 12(6): 454-459	- Study not reported in English French
Serezlija, Elma; Serdarevic, Nafija; Begic, Lejla (2017) The Estimation of Glomerular Filtration Rate Based on the Serum Cystatin C and Creatinine Values. Clinical laboratory 63(7): 1099-1106	- Population does not match that specified in the protocol
Shaharudin, N.H., Gafor, A.H.A., Zainudin, S. et al. (2011) Estimating glomerular filtration rate in overweight and obese malaysian subjects. Nephro-Urology Monthly 3(1): 15-22	- Population does not match that specified in the protocol Healthy participants - Outcome does not match those specified in the protocol None of the outcomes listed in the protocol were reported
Silva, Alan Castro Azevedo E, Gomez, Juan Fidel Bencomo, Lugon, Jocemir Ronaldo et al. (2016) Creatinine measurement on dry blood spot sample for chronic kidney disease screening. Jornal brasileiro de nefrologia : 'orgao oficial de Sociedades Brasileira e Latino-Americana de Nefrologia 38(1): 15-21	- Study does not contain any relevant index tests
Sinha, A., Dutta, D., Shrivastav, A. et al. (2012) Association of different EGFR methods, calcium metabolism and anemia in diabetic chronic kidney disease: An Indian perspective	- Not possible to calculate a contingency table from the data specified in the protocol

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Study	Code [Reason]
(experience). Diabetologia Croatica 41(4): 129-136	
Stevens, Lesley A, Coresh, Josef, Feldman, Harold I et al. (2007) Evaluation of the modification of diet in renal disease study equation in a large diverse population. Journal of the American Society of Nephrology : JASN 18(10): 2749-57	- Population does not match that specified in the protocol This population was selected for model development and internal validation
Stevens, Lesley A, Coresh, Josef, Schmid, Christopher H et al. (2008) Estimating GFR using serum cystatin C alone and in combination with serum creatinine: a pooled analysis of 3,418 individuals with CKD. American journal of kidney diseases : the official journal of the National Kidney Foundation 51(3): 395-406	- Study does not contain any relevant index tests Original CKD-EPI creatinine and cystatin-C equation
Stevens, Lesley A, Schmid, Christopher H, Greene, Tom et al. (2010) Comparative performance of the CKD Epidemiology Collaboration (CKD-EPI) and the Modification of Diet in Renal Disease (MDRD) Study equations for estimating GFR levels above 60 mL/min/1.73 m2. American journal of kidney diseases : the official journal of the National Kidney Foundation 56(3): 486-95	- Outcome to be predicted do not match that specified in the protocol
Sudchada, Patcharaporn and Laehn, Spencer (2016) Comparisons of GFR estimation using the CKD Epidemiology Collaboration (CKD-EPI) equation and other creatinine-based equations in Asian population: a systematic review. International urology and nephrology 48(9): 1511-7	- Systematic review used as source of primary studies
Teo, Boon Wee, Bagchi, Soumita, Xu, Hui et al. (2014) Dietary sodium intake in a multiethnic Asian population of healthy participants and chronic kidney disease patients. Singapore medical journal 55(12): 652-5	- Outcome does not match those specified in the protocol
Teo, Boon Wee, Xu, Hui, Koh, Yun Yin et al. (2014) Glomerular filtration rates in healthy Asians without kidney disease. Nephrology (Carlton, Vic.) 19(2): 72-9	- Population does not match that specified in the protocol Healthy participants without possible kidney dysfunction
Teo, Boon Wee, Zhang, Luxia, Guh, Jinn-Yuh et al. (2018) Glomerular Filtration Rates in Asians. Advances in chronic kidney disease 25(1): 41-48	- Review article but not a systematic review
Wei, Lu, Ye, Xiaoshuang, Pei, Xiaohua et al. (2015) Diagnostic accuracy of serum cystatin C in chronic kidney disease: a meta-analysis. Clinical nephrology 84(2): 86-94	- Population does not match that specified in the protocol Some studies included renal transplant patients; ethnicity not reported; most of the studies were retrospective
Werner, Karin, Pihlsgard, Mats, Elmstahl, Solve et al. (2017) Combining Cystatin C and Creatinine Yields a Reliable Glomerular Filtration Rate Estimation in Older Adults in Contrast to beta-Trace Protein and beta2-Microglobulin. Nephron 137(1): 29-37	- Population does not match that specified in the protocol Older adults in southern Sweden without ethnicity reported

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Study	Code [Reason]
Wyatt, Christina M, Schwartz, George J, Owino Ong'or, Willis et al. (2013) Estimating kidney function in HIV-infected adults in Kenya: comparison to a direct measure of glomerular filtration rate by iohexol clearance. PloS one 8(8): e69601	- Population does not match that specified in the protocol Adults with HIV without suspected or diagnosed CKD
Xie, Peng, Li, Huan-Li, Huang, Jian-Min et al. (2019) Validation of the full-age spectrum equation in the approximation of glomerular filtration rate in Chinese patients with chronic kidney disease. Renal failure 41(1): 467-472	- Study does not contain any relevant index tests
Xu, Q, Li, X, Gao, B et al. (2013) Comparative performance of four equations estimating glomerular filtration rate in adult Chinese diabetics. Journal of endocrinological investigation 36(5): 293-7	- Not possible to calculate a contingency table from the data specified in the protocol
Ye, Xiaoshuang, Wei, Lu, Pei, Xiaohua et al. (2014) Application of creatinine- and/or cystatin C-based glomerular filtration rate estimation equations in elderly Chinese. Clinical interventions in aging 9: 1539-49	- Secondary publication of an included study that does not provide any additional relevant information Included study (Ye 2015)
Yong, Zhenzhu, Li, Fen, Pei, Xiaohua et al. (2019) A comparison between 2017 FAS and 2012 CKD-EPI equations: a multi-center validation study in Chinese adult population. International urology and nephrology 51(1): 139-146	- Retrospective study
Zanocco, Juliana A, Nishida, Sonia K, Passos, Michelle Tiveron et al. (2012) Race adjustment for estimating glomerular filtration rate is not always necessary. Nephron extra 2(1): 293-302	- Population does not match that specified in the protocol Exclude: population was mixed (healthy participants and people with CKD)

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Appendix L – Research recommendations – full details

L.1 Research recommendations

1. In adults, children, and young people from black, Asian and other minority ethnic groups with CKD living in the UK, what biomarkers, other than ethnicity, improve the diagnostic accuracy of eGFR calculations?

2. In adults, children, and young people from black, Asian and other minority ethnic groups with CKD living in the UK, which existing eGFR calculations are the most accurate.

L.2 Why this is important

Estimated GFR (eGFR) equations and ethnicity adjustments are used as a tool for diagnosis, patient monitoring and prescribing in black, Asian and other minority ethnic groups with CKD living in the UK. There is a lack of data on the diagnostic accuracy (in terms of matching eGFR equations to the measured GFR) of these equations and ethnicity adjustments in these groups which may lead to a disadvantage in the care they receive. Biomarkers other than self-identified ethnicity may improve the accuracy of these equations given there are many different ethnic and mixed-ethnic groups living in the UK. These might include anthropometric or bioimpedance measures and calculations of lean body mass or biochemical markers of muscle such as creatine kinase or myostatin.

L.3 Rationale for research recommendation

Importance to 'patients' or the population	Little is known about the accuracy of eGFR equations and ethnicity adjustments in black, Asian and other minority ethnic groups with CKD living in the UK which could lead to a disadvantage in the care they receive.
Relevance to NICE guidance	eGFR equations and ethnicity adjustments have been considered in this guideline for this population and there was a lack of data in these groups to update the recommendation. This will inform future updates.
Relevance to the NHS	More accurate equations would affect the care this population received from the NHS in relation to diagnosis, monitoring and prescribing. The effect on resources and cost might depend on whether the accuracy of these equations lead to diagnose more or fewer people with CKD.
National priorities	High.
Current evidence base	No data for these groups.
Equality considerations	Research should consider all ethnic groups living in the UK.

L.4 Modified PICO table (research recommendation 1)

Population	Adults, children, and young people from black, Asian and other minority ethnic groups with CKD living in the UK
Intervention	Different eGFR equations using biomarkers other than ethnicity such anthropometric or bioimpedance measures and calculations of

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	lean body mass or biochemical markers of muscle such as creatine kinase or myostatin.
Comparator	Measured GFR • urinary or plasma clearance of inulin, iohexol, iothalamate, para aminohippurate (PAH), diethylenetriaminepentaacetic acid (DTPA) or ethylenediaminetetraacetic acid (EDTA).
Outcome	P5 values
Study design	Cross-sectional study design
Timeframe	Long term
Additional information	Subgroups by age

L.1.5 Modified PICO table (research recommendation 2)

Population	Adults, children, and young people from black, Asian and other minority ethnic groups with CKD living in the UK
Intervention	Existing eGFR equations
Comparator	Measured GFR • urinary or plasma clearance of inulin, iohexol, iothalamate, para aminohippurate (PAH), diethylenetriaminepentaacetic acid (DTPA) or ethylenediaminetetraacetic acid (EDTA).
Outcome	P5 values
Study design	Cross-sectional study design
Timeframe	Long term
Additional information	Subgroups by age

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1 Appendix M– List of CKD-EPI equations

List of CKD-EPI equations and ethnicity adjusted CKD-EPI equations
CKD-EPI creatinine 2009 141 X min(Scr/κ,1)α X max(Scr/κ,1)-1.209 X 0.993Age X 1.018[if female] X 1.159 [if Black] κ = 0.7 if female; κ = 0.9 if male; α = -0.329 if female; α = -0.411 if male
CKD-EPI creatinine 2009 without ethnicity factor 141 X min(Scr/κ,1)α X max(Scr/κ,1)-1.209 X 0.993Age X 1.018[if female] κ = 0.7 if female; κ = 0.9 if male; α = -0.329 if female; α = -0.411 if male
Asian v1 CKD-EPI creatinine 2009 Female ≤0.7 151 x (0.993)Age x (Scr/0.7)-0.328 Female >0.7 151 x (0.993)Age x (Scr/0.7)-1.210 Male ≤0.9 149 x (0.993)Age x (Scr/0.9)-0.412 Male >0.9 149 x (0.993)Age x (Scr/0.9)-1.210
Asian v2 CKD-EPI creatinine 2009 141xmin (SCr/k,1)x x max (SCr/k,1) -1.210 x 0.993Age x 0.993 (if female) x1.05(if asian) where k is 0.7 for females and 0.9 for males, x is -0.328 for females and -0.412 for males
Asian v3 CKD-EPI creatinine 2009 (= 1.049 x CKD-EPI)
Asian v4 CKD-EPI creatinine 2009 = 141 × min(SCr/k, 1)a × max(SCr/k, 1)–1.210 × 0.993Age × 0.993 [if female] × 1.16 [if Black] × 1.05 [if Asian] × 1.01 [if Hispanic and Native American] (k is 0.7 for females and 0.9 for males, a is –0.412 for females and –0.328 for males)
Asian v5 CKD-EPI creatinine 2009 Female ≤0.7 mg/dl 94x(SC/0.7)-0.511x0.998Age Female >0.7 mg/dl 128x(SC/0.7)-0.543x0.992Age Male ≤0.9 mg/dl 117x(SC/0.9)-0.277x0.994Age Male >0.9 mg/dl 102x(SC/0.9)-0.558x0.994Age
Japanese CKD-EPI creatinine 2009 (= 0.813 x CKD-EPI)
Taiwanese CKD-EPI creatinine 2009 1.262 x CKD-EPI0.914
Taiwanese Asian v1 CKD-EPI creatinine 2009 1.205 x four level CKD-EPI0.914
Pakistan CKD-EPI creatinine 2009 0.686×CKD-EPI1.059
Chinese v1 CKD-EPI creatinine 2009 Female ≤62 (µmol/L) 144x(Scr/0.7)0.156x(0.993) age Female ≥62 (µmol/L) 144x(Scr/0.7)-1.057x(0.993) age Male ≤80 (µmol/L) 141x(Scr/0.9)0.074x(0.993) age Male ≥80 (µmol/L) 141x(Scr/0.9)-1.057x(0.993) age
Chinese v2 CKD-EPI creatinine 2009 Female ≤0.7 125 × (Scr/0.7)–0.329 × 0.993age Female >0.7 125 × (Scr/0.7)–1.209 × 0.993age Male ≤0.9 123 × (Scr/0.9)–0.411 × 0.993age Male >0.9 123 × (Scr/0.9)–1.209 × 0.993age
Black race v1 CKD-EPI creatinine 2009 Female ≤0.7 mg/dl 161 × (0.993)Age × (Scr/0.7)−0329 Female >0.7 mg/dl 161 × (0.993)Age × (Scr/0.7)−1.209 Male ≤ 0.9 mg/dl 163 × (0.993)Age × (Scr/0.9)−0.411 Male >0.9 mg/dl 163 × (0.993)Age × (Scr/0.9)−1.209
Black race v2 CKD-EPI creatinine 2009 Female ≤0.7 167 × (0.993)Age × (Scr/0.7)−0.328 Female >0.7 167 × (0.993)Age × (Scr/0.7)−1.210

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List of CKD-EPI equations and ethnicity adjusted CKD-EPI equations
Male ≤ 0.9 164 × (0.993)Age × (Scr/0.7)−0.415 Male >0.9 164 × (0.993)Age × (Scr/0.7)−1.210
White and other race v1 CKD-EPI creatinine 2009 Female ≤0.7 mg/dl 139 × (0.993)Age × (Scr/0.7)−0.329 Female >0.7 mg/dl 139 × (0.993)Age × (Scr/0.7)−1209 Male ≤ 0.9 mg/dl 141 × (0.993)Age × (Scr/0.9)−0.411 Male >0.9 mg/dl 141 × (0.993)Age × (Scr/0.9)−1.209
White and other race v2 CKD-EPI creatinine 2009 Female ≤0.7 mg/dl 139 × (0.993)Age × (Scr/0.7)−0.329 Female >0.7 mg/dl 139 × (0.993)Age × (Scr/0.7)−1209 Male ≤ 0.9 mg/dl 141 × (0.993)Age × (Scr/0.9)−0.411 Male >0.9 mg/dl 141 × (0.993)Age × (Scr/0.9)−1.209
Hispanic and Native American race CKD-EPI creatinine 2009 Female ≤0.7 145 × (0.993)Age × (Scr/0.7)−0.328 Female >0.7 145 × (0.993)Age × (Scr/0.7)−1.210 Male ≤ 0.9 143 × (0.993)Age × (Scr/0.7)−0.415 Male >0.9 143 × (0.993)Age × (Scr/0.7)−1.210
CKD-EPI cystatin C 2008 Cystatin alone 76.7xCysC−1.19
Chinese v1 CKD-EPI cystatin C 2008 Cystatin alone 86 x CysC-1.132
Chinese v2 CKD-EPI cystatin C 2008 Cystatin alone 78.64 x CysC -0.964
CKD-EPI cystatin C 2008 Cystatin + age + race + sex 127.7xCysC−1.17xage−0.13x(0.91 if female)x(1.06 if black)
Japanese CKD-EPI cystatin C 2008 Cystatin + age + sex {104 x SCysC-1.019 x 0.996Age x 0.929 [if female]} -8
CKD-EPI cystatin C 2011 equations re-expressed for standardized Scys v1 76.7 (−0.105 + 1.13 standardized Scys)−1.19
CKD-EPI cystatin C 2011 equations re-expressed for standardized Scys v2 127.7 (−0.105 + 1.13 standardized Scys)−1.17 age−0.13 (0.91 if female) (1.06 if black)
CKD-EPI cystatin C 2012 Female or male ≤0.8 133 × (Scys/0.8)−0.499 × 0.996Age [× 0.932 if female] Female or male >0.8 133 × (Scys/0.8)−1.328 × 0.996Age [× 0.932 if female]
Chinese v1 CKD-EPI cystatin C 2012 Female ≤0.8 133 × (sCys/0.8)−0.499 × 0.996age × 0.932 Female >0.8 134 × (sCys/0.8)−0.899 × 0.996age × 0.874 Male ≤0.8 133 × (sCys/0.8)−0.499 × 0.996age Male >0.8 120 × (sCys/0.8)−0.825 × 0.996age
Chinese v2 CKD-EPI cystatin C 2012 ≤0.8 117 × (Scys/0.8)–0.499 × 0.996age >0.8 117 × (Scys/0.8)–1.328 × 0.996age
CKD-EPI creatinine-cystatin C 2008 v1 177.6xSCr−0.65xCysC−0.57xage−0.20x(0.82 if female)x(1.11 if black)
Chinese v1 CKD-EPI creatinine-cystatin C 2008 v1 169 x Scr-0.608 x CysC-0.63 x Age-0.157 x (0.83 if female)
Chinese v2 CKD-EPI creatinine-cystatin C 2008 v1 173.9XCysC-0.725 xCr -0.184 x age - 0.193 x (0.89 if female)
Chinese v3 CKD-EPI creatinine-cystatin C 2008 v1 176xScr-0.607xcysC-0.638xAge-0.171 (Femalex0.85)
Japanese CKD-EPI creatinine-cystatin C 2008 v1 92 x SCysC-0.575 x SCr-0.670 x 0.995Age x 0.784 (if female)

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List of CKD-EPI equations and ethnicity adjusted CKD-EPI equations
CKD-EPI creatinine-cystatin C 2011 v2 177.6xstandardizedScr−0.65x(−0.105+1.13standardizedScys)−0 57xage−0.20x(0.82 if female)x(1.11 if black)
CKD-EPI creatinine-cystatin C 2012 Female ≤0.7 ≤0.8=130 × (Scr/0.7)−0.248 × (Scys/0.8)−0.375 × 0.995Age [× 1.08 if black] Female ≤0.7 >0.8=130 × (Scr/0.7)−0.248 × (Scys/0.8)−0.711 × 0.995Age [× 1.08 if black] Female >0.7 ≤0.8=130 × (Scr/0.7)−0.601 × (Scys/0.8)−0.375 × 0.995Age [× 1.08 if black] Female >0.7 >0.8=130 × (Scr/0.7)−0.601 × (Scys/0.8)−0.711 × 0.995Age [× 1.08 if black] Male ≤0.9 ≤0.8=135 × (Scr/0.9)−0.207 × (Scys/0.8)−0.375 × 0.995Age [× 1.08 if black] Male ≤0.9 >0.8=135 × (Scr/0.9)−0.207 × (Scys/0.8)−0.711 × 0.995Age [× 1.08 if black] Male >0.9 ≤0.8=135 × (Scr/0.9)−0.601 × (Scys/0.8)−0.375 × 0.995Age [× 1.08 if black] Male >0.9 >0.8=135 × (Scr/0.9)−0.601 × (Scys/0.8)−0.711 × 0.995Age [× 1.08 if black]
Japanese CKD-EPI creatinine-cystatin C 2012 (0.908 x CKDEPIcr-cys)
Chinese v1 CKD-EPI creatinine-cystatin C 2012 Female Cr≤0.7 Cys≤0.8 130 × (sCr/0.7)−0.248 × (sCys/0.8)−0.375 × 0.995age Female Cr≤0.7 Cys>0.8 129 × (sCr/0.7)0.158 × (sCys/0.8)−0.692 × 0.996age Female Cr>0.7 Cys≤0.8 130 × (sCr/0.7)−0.601 × (sCys/0.8)−0.375 × 0.995age Female Cr>0.7 Cys>0.8 119 × (sCr/0.7)−0.424 × (sCys/0.8)−0.463 × 0.995age Male Cr≤0.9 Cys≤0.8 135 × (sCr/0.9)−0.207 × (sCys/0.8)−0.375 × 0.995age Male Cr≤0.9 Cys>0.8 127 × (sCr/0.9)−0.232 × (sCys/0.8)−0.414 × 0.995age Male Cr>0.9 Cys≤0.8 135 × (sCr/0.9)−0.601 × (sCys/0.8)−0.375 × 0.995age Male Cr>0.9 Cys>0.8 129 × (sCr/0.9)−0.358 × (sCys/0.8)−0.459 × 0.995age
Chinese v2 CKD-EPI creatinine-cystatin C 2012 Female ≤0.7 ≤0.8 116 × (Scr/0.7)–0.248 × (Scys/0.8)–0.375 × 0.995age Female ≤0.7 >0.8 116 × (Scr/0.7)–0.248 × (Scys/0.8)–0.711 × 0.995age Female >0.7 ≤0.8 116 × (Scr/0.7)–0.601 × (Scys/0.8)–0.375 × 0.995age Female >0.7 >0.8 116 × (Scr/0.7)–0.601 × (Scys/0.8)–0.711 × 0.995age Male ≤0.9 ≤0.8 120 × (Scr/0.9)–0.207 × (Scys/0.8)–0.375 × 0.995age Male ≤0.9 >0.8 120 × (Scr/0.9)–0.207 × (Scys/0.8)–0.711 ×0.995age Male >0.9 ≤0.8 120 × (Scr/0.9)–0.601 × (Scys/0.8)–0.375 × 0.995age Male >0.9 >0.8 120 × (Scr/0.9)–0.601 × (Scys/0.8)–0.711 × 0.995age

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