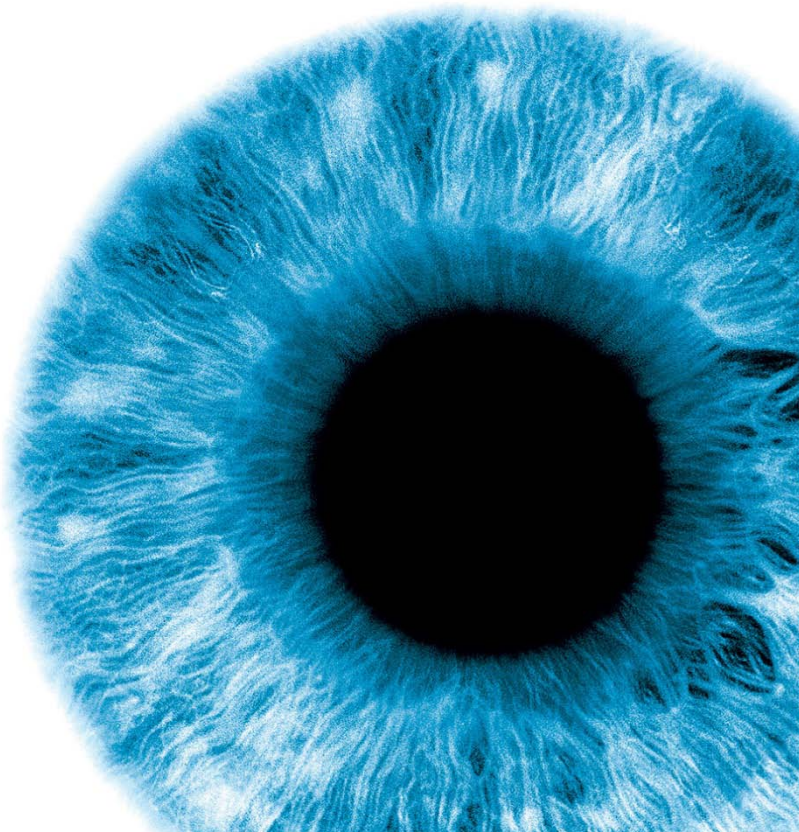
NICE National Institute for Health and Care Excellence

Preventing type 2 diabetes: population and community-level interventions

Evidence Update October 2014

A summary of selected new evidence relevant to NICE public health guidance 35 'Preventing type 2 diabetes: population and community-level interventions' (2011)

Evidence Update 66



Contents

Introduction

Evidence Updates are intended to increase awareness of new evidence – they do not replace current NICE guidance and do not provide formal practice recommendations.

Evidence Updates reduce the need for individuals, managers and commissioners to search for new evidence. For contextual information, this Evidence Update should be read in conjunction with the relevant public health guidance.

This Evidence Update provides a summary of selected new evidence published since the literature search was last conducted for the following NICE guidance:

[1] **Preventing type 2 diabetes: population and community-level interventions. NICE public health guidance 35 (2011)**

A search was conducted for new evidence from 1 November 2009 to 24 March 2014. A total of 6673 pieces of evidence were initially identified. After removal of duplicates, a series of automated and manual sifts were conducted to produce a list of the most relevant references. The remaining 28 references underwent a rapid critical appraisal process and then were reviewed by an Evidence Update Advisory Group (EUAG) which advised on the final list of 12 items selected for the Evidence Update. See Appendix A for details of the evidence search and selection process.

Evidence selected for inclusion in this Evidence Update may highlight a potential impact on guidance: that is, a high-quality study, systematic review or meta-analysis with results that suggest a change in practice. Evidence that has no impact on guidance may be a key read, or may substantially strengthen the evidence base underpinning a recommendation in the NICE guidance.

The Evidence Update gives a preliminary assessment of changes in the evidence base and a final decision on whether the guidance should be updated will be made by NICE according to its published processes and methods.

This Evidence Update was developed to help inform the review proposal on whether or not to update NICE public health guidance 35 (NICE PH35). The evidence identified, and feedback from the Evidence Update Advisory group, informed a decision about updating the guidance, which was subject to public consultation. For further information about the review decision see the NICE PH35 webpage. The process of updating NICE guidance is separate from both the process of an Evidence Update and the review proposal.

See the NICE public health process guide for further information about updating public health guidelines.

Other relevant NICE guidance

The focus of the Evidence Update is on the guidance stated above. However, overlap with other NICE guidance has been outlined as part of the Evidence Update process. Where relevant, this Evidence Update therefore makes reference to the following guidance:

[1] **Preventing type 2 diabetes: risk identification and interventions for individuals at high risk. NICE public health guidance 38 (2012)**

[1] NICE-accredited guidance

NICE Pathways

NICE pathways bring together all related NICE guidance and associated products on the condition in a set of interactive topic-based diagrams. The following NICE Pathways cover advice and recommendations related to this Evidence Update:

- Preventing type 2 diabetes. NICE Pathway

Feedback

If you would like to comment on this Evidence Update, please email contactus@evidence.nhs.uk

Key points

The following table summarises the key points for this Evidence Update and indicates whether the new evidence may have a potential impact on NICE PH35. Please see the full commentaries for details of the evidence informing these key points.

The section headings used in the table below are taken from NICE PH35.

Evidence Updates do not replace current NICE guidance and do not provide formal practice recommendations.

	Potential impact on guidance	
Key point	**Yes**	**No**
Introduction • Diabetes prevalence is likely to increase substantially over the next 2 decades – for reasons including increases in the development of new cases (related to increasing risk factors and an ageing population), increases in case detection, and reduced mortality through improved treatment. However, diabetes prevention strategies – particularly those combining interventions aimed at the whole population (such as economic policies) with those targeting individuals at increased risk (such as lifestyle programmes) – may slow the rate of increase.		✓
Interventions for communities at high risk of type 2 diabetes • Communication, relationships, beliefs and environment are important considerations when trying to increase exercise and physical activity among older people of South Asian origin. • Reductions in weight and cardiovascular risk factors through diet and lifestyle changes are achievable among black people of African ancestry.		✓ ✓
Conveying messages to the whole population • Well-designed mass media campaigns to promote physical activity can bring about positive changes in physical activity behaviour.		✓
Promoting a healthy diet: national action • Raising the price of foods and drinks such as sugar-sweetened beverages and fast food at a population level (for example, through taxation) appears to reduce their overall consumption, whereas nationally subsidising healthier foods such as fruits and vegetables appears to increase consumption of these foods. Fiscal and regulatory measures also appear to be cost effective in the long term for preventing obesity.	✓*	
Promoting a healthy diet: local action • Local subsidies (such as price discounts and vouchers) for healthier foods such as fruits and vegetables can increase purchase and consumption of these products.		✓

* Evidence Updates are intended to increase awareness of new evidence and do not change the recommended practice as set out in current guidance. Decisions on how the new evidence may impact guidance will not be possible until the guidance is reviewed by NICE according to its published processes and methods. For further details of this evidence in the context of current guidance, please see the full commentary.

Key point	Potential impact on guidance	
	Yes	No
• Workplace health promotion programmes appear to have some effect on sickness absence, self-perceived health, work productivity, and work ability – particularly among people aged under 40 years, and when the intervention is at least weekly.		✓
Promoting physical activity: local action • Inconsistent findings among studies of limited quality suggest that the effect of multi-component community interventions on increasing population levels of physical activity is uncertain. • Limited evidence suggests that interventions to promote physical activity that include a group delivery component could increase physical activity among women with socioeconomic disadvantage.		✓ ✓
Training those involved in promoting healthy lifestyles • Providing trained lay health workers appears to be cost-effective for improving lifestyles related to heart health among people in deprived communities at risk of cardiovascular disease.		✓

1 Commentary on new evidence

These commentaries focus on the 'key references' identified through the search process and prioritised by the EUAG for inclusion in the Evidence Update, which are shown in bold text. Section headings are taken from NICE PH35.

Introduction

Modelling diabetes prevention policies: population-based and high-risk strategies

NICE public health guidance on prevention of type 2 diabetes comprises 2 aspects: 'Population and community-level interventions' (NICE PH35) and 'Risk identification and interventions for individuals at high risk' (NICE PH38).

Two studies investigated the effects of diabetes prevention strategies targeting the whole population, high-risk individuals, or both, on future population prevalence of diabetes.

A modelling study set in the USA by **Gregg et al. (2013)** predicted the effect of hypothetical prevention policies on future rates of diabetes in adults. A dynamic model was created based on national data for diabetes prevalence and incidence, migration, mortality rates, and intervention effectiveness. Data were taken from the US Census Bureau, National Diabetes Surveillance System, National Health and Nutrition Examination Survey, and from published findings from selected epidemiological studies and meta-analyses.

Effects on diabetes rates between 2007 and 2030 were examined for 5 hypothetical policies:

- No prevention strategy.
  - Future diabetes incidence was predicted with logistic growth curves and Bayesian estimation.
- A high-risk strategy of structured lifestyle intervention for adults with both impaired fasting glucose (IFG) by US criteria (fasting plasma glucose ≥5.5–<7.0 mmol/litre) and impaired glucose tolerance (IGT; 2-hour post-load glucose of ≥7.8–<11.1 mmol/litre).
  - Reduction of 12.5% in the annual diabetes incidence among the 8.3% of the population with both IFG and IGT by 2030 was assumed – based on a hypothetical scenario in which 50% of the population was identified, 50% subsequently participated and 1-year incidence was reduced by 50% among participants.
- A moderate-risk strategy of structured lifestyle intervention for adults with IFG only.
  - Reduction of 12.5% in annual diabetes incidence among the 26.7% of the population with IFG was assumed – based on the same hypothetical scenario for identification and participation rates as for the high-risk strategy above.
- A population strategy in which the whole population was exposed to environmental and economic policies aimed at reducing risk factors for diabetes.
  - A 2% reduction in annual diabetes incidence in the whole US population was assumed. No data were available for population approaches to diabetes prevention, therefore assumptions were based on data for cardiovascular disease prevention: a meta-analysis of community interventions, and the North Karelia Project.
- A combined strategy in which both the moderate-risk and population-wide strategies were deployed.

The model predicted that without intervention, diabetes prevalence would rise from 12.9% (27.8 million cases) in 2007 to 22.7% (60.7 million cases) in 2030. The model was then used to predict the number of cases of diabetes prevented by the various strategies by 2030:

- The high-risk strategy would prevent 1.6 million new cases of diabetes and reduce overall prevalence by 1.2 million cases (attenuating the increase in prevalence by 5%).
- The moderate-risk strategy would prevent 4.0 million new cases and reduce overall prevalence by 3.1 million cases (attenuating the increase in prevalence by 12%).
- The population strategy would prevent 0.9 million new cases and reduce overall prevalence by 0.7 million cases (attenuating the increase in prevalence by 3%).
- The combined strategy would prevent 4.6 million new cases and reduce overall prevalence by 3.6 million cases (attenuating the increase in prevalence by 14%).

However, the authors noted that even with the most effective strategy (the combined strategy), it was predicted that the number of people with diabetes in the USA would still increase from 27.8 million in 2007 to 57.1 million in 2030 (with prevalence increasing from 12.9% to 21.3% over the same period – an increase of about 65%).

A modelling study set in Australia by **Backholer et al. (2013)** estimated the impact of several diabetes interventions on the population prevalence of diabetes in adults. The study used the Australian Diabetes Projection Model, which in turn derived data on the annual incidence of diabetes between 2000 and 2005 from the Australian Diabetes, Obesity, and Lifestyle Study (AusDiab) – a national, population-based survey of 11,247 Australian adults aged 25 years or older.

The effects on the population prevalence of diabetes between 2010 and 2025 were examined for 4 hypothetical policies:

- A population strategy in which a 10% 'junk food' tax was applied to the retail price of foods such as biscuits, cakes, and soft drinks. Linear regression was used to estimate the relationship between fasting plasma glucose and 2-hour post-load glucose with BMI, and subsequent impact on diabetes incidence rates.
  - Likely scenario assumptions: BMI reduced by 1.8% in men and 2.4% in women – derived from an estimated mean reduction in BMI of 0.6 kg/m^2 in men and 0.5 kg/m^2 in women from a recent modelling study.
  - Best-case scenario assumptions: effect size doubled resulting in a reduction in BMI of 3.6% in men and 4.4% in women.
- A high-risk strategy in which a prevention programme targeting high-risk individuals (namely, people aged 25–65 years with IGT or IFT at baseline, or newly diagnosed diabetes at follow-up, with the assumption that all those with incident diabetes passed through the IGT/IFG state) reduced annual incidence of diabetes by an average of 14%.
  - Likely scenario assumptions: 35% capture and uptake of high-risk individuals into the prevention programme and a mean reduction of diabetes incidence of 40% (based on the recent Australian translational studies of the US Diabetes Prevention Program and the Finnish Diabetes Prevention Study, and on randomised controlled trial [RCT] and real-life translations of high-risk diabetes prevention programmes).
  - Best-case scenario assumptions: prevention programmme uptake increased from 35 to 50%.
- A surgical strategy in which bariatric surgery was provided for anyone aged between 25 and 60 years with a BMI of at least 35 kg/m^2 and recently diagnosed diabetes. Benefits of bariatric surgery were derived from an RCT demonstrating 73% remission of type 2 diabetes in patients with obesity and newly diagnosed diabetes after adjustable gastric banding.

  - Likely scenario assumptions: 2.5% uptake of surgery among those eligible in any given year (based on current estimated uptakes of this type of surgery in Australia).
  - Best-case scenario assumptions: uptake of surgery increased to 5% of the eligible population.
- A combined strategy in which the population-wide, high-risk and surgical strategies were sequentially applied.

Interventions were compared with a scenario in which the annual incidence of diabetes observed between 2000 and 2005 for the AusDiab cohort remained the same for all projected years. In this scenario, the number of cases of diabetes in 2025 was estimated to be 2 million.

The model was used to predict the number of cases of diabetes prevented by the various strategies in 2025:

- The population strategy prevented around 60,000 cases of diabetes in the likely scenario and around 85,000 cases in the best case scenario. The relative reductions from expected 2025 levels were 2.9% and 4.2% respectively.
- The high-risk strategy prevented around 130,000 cases in the likely scenario and around 185,000 cases in the best-case scenario. The relative reductions from expected 2025 levels were 6.4% and 9.2% respectively.
- The surgical strategy prevented around 3000 cases in the likely scenario and around 6000 cases in the best-case scenario. The relative reductions from expected 2025 levels were 0.2% and 0.3% respectively.
- The combined strategy prevented around 190,000 cases in the likely scenario and around 240,000 cases in the best-case scenario. The relative reductions from expected 2025 levels were 9.5% and 11.8% respectively.

However, the authors noted that none of the strategies reversed the increase in diabetes prevalence over the next 15 years.

Limitations common to both modelling studies included that:

- Results were based on assumptions about, for example: future rates of diabetes, the relative impact of interventions on these rates, identifying people for targeted interventions, and subsequent participation rates in targeted interventions.
- The models were constructed for US and Australian populations and may not therefore be directly relevant to the UK.
- Models did not consider cost effectiveness (which may be substantially impacted upon by, for example, the cost of identifying high-risk individuals or the cost of bariatric surgery).
- The models focused only on diabetes, but other related chronic conditions such as hypertension, cardiovascular disease, and disability could also benefit from the interventions.

The authors of both reviews concluded that diabetes prevalence is likely to increase substantially over the next 2 decades – for reasons including increases in the development of new cases (related to increasing risk factors and an ageing population), increases in case detection, and reduced mortality through improved treatment. However, diabetes prevention strategies – particularly those combining interventions aimed at the whole population (such as economic policies) with those targeting individuals at increased risk (such as lifestyle programmes) – may slow the rate of increase. This evidence is consistent with the need for diabetes prevention strategies at the population and community level (NICE PH35) in combination with interventions targeting people at high-risk (NICE PH38).

Key references

Backholer K, Peeters A, Herman WH et al. (2013) Diabetes prevention and treatment strategies: are we doing enough? Diabetes Care 36: 2714–19

Gregg EW, Boyle JP, Thompson TJ et al. (2013) Modeling the impact of prevention policies on future diabetes prevalence in the United States: 2010–2030. Population Health Metrics 11: 1–9

1.1 Integrating national strategy on non-communicable diseases

No new key evidence for this section was selected for inclusion in this Evidence Update.

1.2 Local joint strategic needs assessments

No new key evidence for this section was selected for inclusion in this Evidence Update.

1.3 Developing a local strategy

No new key evidence for this section was selected for inclusion in this Evidence Update.

1.4 Interventions for communities at high risk of type 2 diabetes

Barriers and facilitators to exercise among older adults of South Asian origin

For organisations providing interventions for communities at high risk of type 2 diabetes, NICE PH35 recommends:

- Physical activity, dietary and weight management interventions should take into account the religious beliefs, cultural practices, age and gender, language and literacy of black, minority ethnic and lower socioeconomic groups.
- Identifying and addressing barriers to participation. This includes developing communication strategies that are sensitive to the target audience's language and information requirements.
- Where they exist, using community links, outreach projects and lay or peer workers (from black and minority ethnic communities and from lower socioeconomic groups) to deliver interventions.
- Where necessary, training lay and peer workers in how to plan, design and deliver community-based health promotion activities. Training should be based on proven training models and evaluation techniques. It should give participants the chance to practice their new skills in the community. It should also encourage them to pass on their knowledge to their peers.

See NICE PH35 for the full recommendation on interventions for communities at high risk of type 2 diabetes.

A systematic review by **Horne and Tierney (2012)** assessed barriers and facilitators to uptake of and adherence to exercise and physical activity among older adults of South Asian origin. Qualitative studies sampling a population of first, second or third generation immigrants of South Asian ethnicity (with a mean age of 60 years or older), looking at exercise or physical activity, were included. Papers were included only if they achieved at least half of the available marks on a modified version of the Critical Appraisal Skills Programme qualitative checklist. A total of 11 articles reporting on 10 separate studies (n=345), all of which were from the UK and Canada, were identified. Population groups represented included Indian Sikh, Indian Hindu, and Pakistani Muslim, but there were no individuals from Bangladesh or Sri Lanka. Participants were all undertaking physical activity to improve health as part of managing coronary heart disease, diabetes or osteoporosis, or to help prevent falls. Data were qualitatively synthesised using a 'framework analysis' comprising 5 stages: familiarisation, developing a thematic framework, indexing, charting, and mapping and interpretation.

The evidence synthesis revealed the following themes (in terms of their empowering and disempowering influences on exercise and physical activity):

- Communication:
  - Not speaking English and illiteracy in the native language were barriers to adequate information provision. Clinicians providing information was empowering, but advice was often given only after illness was diagnosed.
- Relationships:
  - Family and community were seen to provide support, but could also discourage physical activity if the person felt they were being gossiped about. Some women thought that physical activity was not culturally appropriate, or reported feeling uncomfortable walking unaccompanied.
- Beliefs:
  - The notion that reduced activity levels and increased illness was a normal part of ageing, or that illness was not under an individual's control, had a negative effect on uptake of physical activity.
- Environment:
  - Preference for single-sex gym facilities and possible negative views from peers about reducing community activities to make time for exercise were seen as barriers to physical activity.

Limitations of the evidence included that:

- The review focused on a 'South Asian' population, but within this grouping there was heterogeneity of nationality, religion and language; no sub-group analysis was performed.
- The review was concerned with older adults rather than a general population (although the studies included a range of ages from people in their 30s to those in their 80s).
- Data from people with and without chronic conditions were synthesised as a single group.
- Barriers to exercise (particularly language barriers) may be less relevant to people of South Asian origin who were born and raised in the UK (second or third generation immigrants).
- Grey literature was not searched.

The evidence suggests that communication, relationships, beliefs and environment are important considerations when trying to increase exercise and physical activity among older people of South Asian origin. These data are consistent with recommendations in NICE PH35 to take into account religious beliefs, cultural practices, age and gender, language and literacy of minority ethnic groups when developing interventions, and to use community links and lay or peer workers to deliver interventions.

Key reference

Horne M, Tierney S (2012) What are the barriers and facilitators to exercise and physical activity uptake and adherence among South Asian older adults: a systematic review of qualitative studies. Preventive Medicine 55: 276–84

Dietary interventions for weight loss and cardiovascular risk reduction in black people of African ancestry

For organisations providing interventions for communities at high risk of type 2 diabetes, NICE PH35 recommends:

- Working in partnership to develop cost-effective physical activity, dietary and weight management interventions. Interventions should take into account the religious beliefs, cultural practices, age and gender, language and literacy of black, minority ethnic and

lower socioeconomic groups. (Interventions costing up to £10 per head would need to achieve an average weight loss of about 0.25 kg per head to be cost effective. Those costing up to £100 per head would need to achieve an average weight loss of about 1 kg per head).

- Commissioning culturally appropriate and financially accessible weight management programmes either from the NHS or non-NHS providers, based on the guiding principles for effective weight-loss programmes. These should be provided in community settings in areas where populations at high risk of type 2 diabetes live. (For example, they could be provided in religious venues or community and social clubs.)

See NICE PH35 for the full recommendation on interventions for communities at high risk of type 2 diabetes.

A systematic review by **Osei-Assibey and Boachie (2011)** investigated diet and lifestyle changes for reducing weight and cardiovascular risk among black people of African ancestry. Randomised and non-randomised controlled trials of dietary interventions with or without other lifestyle changes, of at least 3 months' duration, were eligible. Only studies that reported weight or BMI changes along with change in at least one of the following were included: waist circumference, systolic and diastolic blood pressure, fasting plasma lipids and glucose, and glycated haemoglobin (HbA1c).

A total of 18 studies (n=3918) were identified: 7 among healthy obese participants, 10 in people with diabetes, and 1 in people with hypertension. All studies were from the USA, all used dietary interventions or advice with lifestyle modifications (behaviour change and physical activity), and most were in a clinic or community setting (3 were church-based). Intervention duration ranged from 3.5 to 12 months (median 6 months). Data could not be formally pooled because of differences between the dietary interventions; therefore the average mean difference in effect between intervention and control was calculated.

The average mean difference in weight loss across all studies was −2.66 kg (−2.63 kg for healthy participants and −2.76 kg for patients with type 2 diabetes). Weight loss was associated with net improvements in waist circumference (−2.95 cm), fasting blood glucose (−0.82 mmol/litre), HbA1c (−0.51%), systolic (−1.4 mmHg) and diastolic (−0.6 mmHg) blood pressures, low-density lipoprotein cholesterol (−0.06 mmol/litre), high-density lipoprotein cholesterol (+0.31 mmol/litre) and triglycerides (−0.29 mmol/litre), but not in total cholesterol. No significant difference was detected between all studies and studies of healthy participants or those with type 2 diabetes for any outcome.

Limitations of the evidence included that:

- All studies took place in the USA which may reduce their relevance to the UK.
- No trials explicitly stated randomisation methods or details of allocation concealment.
- Half of the trials recruited less than 100 participants, and the review authors noted a lack of power to detect significant changes and high attrition rates in several studies.
- The review authors also stated that the clinical significance of the results was not fully determined.

The evidence suggests that reductions in weight and cardiovascular risk factors through diet and lifestyle changes are achievable among black people of African ancestry. This is consistent with recommendations in NICE PH35 to provide culturally appropriate physical activity, dietary and weight management interventions in community settings in areas where populations at high risk of type 2 diabetes live. However, the authors further concluded that the review highlighted a deficiency of published research in this area, and that more studies are needed.

Key reference

Osei-Assibey G, Boachie C (2011) Dietary interventions for weight loss and cardiovascular risk reduction in people of African ancestry (blacks): a systematic review. Public Health Nutrition 15: 110–5

1.5 Conveying messages to the whole population

Mass media campaigns to promote physical activity

For public health services involved in campaigns for the whole population, NICE PH35 recommends:

- Ensuring healthier lifestyle messages to prevent non-communicable diseases (including type 2 diabetes, cardiovascular disease and some cancers) are consistent, clear and culturally appropriate. It should be ensured that they are integrated within other health promotion campaigns or interventions.
- Ensuring any national media (for example, television and online social media) used to convey messages or information is culturally appropriate for the target audience.
- Identifying and making use of existing campaign materials, messages and resources, including those from other countries, where appropriate.

See NICE PH35 for the full recommendation on conveying messages to the whole population.

A systematic review by **Leavy at al. (2011)** examined the use of mass media campaigns to promote physical activity. Articles were included that looked at mass media or social marketing campaigns (paid or unpaid media) aimed specifically at increasing physical activity, fitness or exercise in adults at the population level. Clinical populations were excluded. The review assessed evaluation designs, theory used, formative evaluation, campaign effects and outcomes.

A total of 22 articles discussing 18 mass media campaigns were identified (n>31,200; not all studies stated number of participants). The campaigns were based in the USA (8 campaigns), Australia (3 campaigns), Canada (3 campaigns), Belgium, New Zealand, Columbia and Brazil (1 campaign each). Campaign duration was 8–13 weeks in 6 campaigns, around 6 months in 3 campaigns, 12–24 months in 4 campaigns, and greater than 2 years in 5 campaigns.

Of the 18 campaigns evaluated, significant increases in physical activity levels were reported in 7 campaigns. Of studies not reporting a significant effect, some did not report physical activity as an outcome, some reported increased activity but without statistical analysis, and some reported non-significant results.

Most of the campaigns showing significant effects on physical activity were to promote walking activities via television and radio adverts supplemented with print media such as posters, leaflets and adverts in newspapers or magazines. Some studies used newer technologies such as email or websites; however, many studies were conducted before widespread access to these technologies was available. The types of media used by campaigns showing significant effects on physical activity were generally similar to those used for studies that did not report significant effects. Although no formal synthesis of data from the 7 campaigns showing significant effects was performed, the authors noted that 4 of these campaigns were quasi-experimental in design and used a cohort sample, and 4 of the campaigns were 5 months or longer in duration.

Limitations of the evidence included that:

- Physical activity data were obtained by self-report and may therefore be at risk of bias.
- Across and within studies, consistency and strength of results varied. For example, within individual studies, positive effects were found for some outcomes but not others.

- Quality of the included studies was not appraised – for example, sub-analyses to look at effects among higher versus lower quality studies may have been useful.
- Publication bias was not assessed.
- Most studies were non-experimental (for example, several studies were cross-sectional in design and were performed post-campaign and may therefore be more prone to bias).

The evidence suggests that well-designed mass media campaigns to promote physical activity can bring about positive changes in physical activity behaviour, which is consistent with current recommendations for the use of media promotion in NICE PH35. However, further research to examine in more detail the characteristics of successful campaigns, and which takes into account study quality, is needed.

Additional information about the study by Leavy et al. (2011) is available from an independent critical appraisal report produced for the Centre for Reviews and Dissemination's Database of Abstracts of Reviews of Effects.

Key reference

Leavy JE, Bull FC, Rosenberg M et al. (2011) Physical activity mass media campaigns and their evaluation: a systematic review of the literature 2003–2010. Health Education Research 26: 1060–85

1.6 Conveying messages to the local population

No new key evidence for this section was selected for inclusion in this Evidence Update.

1.7 Promoting a healthy diet: national action

Food taxes and subsidies

For public health services involved in national action to promote a healthy diet, NICE PH35 recommends working with food retailers to develop pricing structures that favour healthier food and drink choices. However, no specific recommendations about the use of population-level taxes or subsidies are made.

Two studies examined the effects of modified food pricing (through taxes and subsidies) on dietary behaviour and health outcomes.

A systematic review by **Powell et al. (2013)** looked at the effect of food and beverage taxes and subsidies on consumption and body weight outcomes. US studies examining the price elasticity of demand for sugar-sweetened beverages, fast foods, and fruits and vegetables, as well as the direct associations of prices and taxes with body weight outcomes, were included. Intervention studies, pilot studies, studies looking at brands rather than generic food categories, and modelling studies that drew on price elasticity estimates to derive simulated impacts on weight, were excluded. A total of 41 studies were included: 20 studies (n=3,425,876) examined the effect of prices on body weight outcomes, and 21 studies (n>150,190; not all studies stated number of participants) looked at how price affected consumption. Participants comprised both adults and children. Consumption was measured by 'price elasticity' – the percentage change in quantity demanded (consumption or purchases) of a product resulting from a 1% change in the price of the product. Weight outcomes were examined by the extent to which price changes translated into changes in body weight, BMI, or obesity prevalence.

The mean price elasticities of demand estimated by the review were:

- Sugar-sweetened beverages: −1.21 (range −0.71 to −3.87). Namely, a tax raising the price by 20% would reduce overall consumption by 24%.
- Fast food: −0.52 (range −0.47 to −0.57). Namely, a tax raising the price by 20% would reduce consumption by about 10%.

- Fruits and vegetables: −0.49 (range −0.26 to −0.81) and −0.48 (range −0.26 to −0.72) respectively. Namely, subsidising fruits and vegetables by 20% would increase consumption by about 10%.

For the impact of food prices on weight, the authors stated that overall the evidence remained mixed, but some patterns were identified. Higher fast-food prices were associated with weight reduction, particularly among adolescents. Lower fruit and vegetable prices were generally associated with weight reduction among children and adults on low incomes.

Limitations of the evidence included that:

- All studies were from the USA which may reduce generalisability to the UK.
- Methods of pooling data from individual studies were not fully described, and publication bias was not assessed.
- Some studies grouped sugar-sweetened and non-sugar sweetened drinks in the same category which complicated the analysis.
- Most price elasticity estimates came from household-level or time-series data that did not differentiate by age group.

A systematic review by **Lehnert et al. (2012)** assessed the long-term cost effectiveness of interventions to prevent obesity. Long-term (≥40 years) cost-utility analyses evaluating interventions aimed at increasing physical activity or promoting healthy diets were included. Studies of therapeutic interventions in obese people (bariatric surgery and drug treatment), and studies from non-member states of the Organisation for Economic Co-operation and Development, were excluded. A total of 18 studies employing 9 different decision-analytic models were included. Models fell into 3 broad categories: Markov cohort simulations, multi-state life table-based Markov models, and microsimulations. The main mechanism in all models by which interventions were assumed to offset costs was by lowering the incidence of obesity-related diseases, which may then have influenced mortality or survival.

The 18 studies between them examined 48 obesity prevention interventions (7 interventions were replicated in both the UK and Mexico). Interventions were based in Australia (17 interventions), the UK (8 interventions), the USA (8 interventions), Mexico (7 interventions), the Netherlands (6 interventions), New Zealand and Switzerland (1 intervention each). Interventions were grouped into 3 categories:

- Behavioural (21 interventions) – modification of behaviours related to diet, physical activity or obesity.
- Community (12 interventions) – community-wide lifestyle and physical activity programmes, and school and workplace interventions.
- Environmental (8 interventions) – fiscal measures (such as taxes and subsidies), advertising regulation, food labelling, and mass media campaigns.

Half of the studies evaluated cost-effectiveness from a societal perspective, the other half from a healthcare sector perspective. All costs were inflated to 2010 US dollars using country-specific gross domestic product inflators, and converted to purchasing power parities (to account for different price levels between countries). Interventions were considered cost-effective if the incremental cost-effectiveness ratio (ICER; namely, the cost per QALY gained or disability-adjusted life year averted) was less than US$50,000.

Of the 41 interventions, 7 were cost-saving, 10 were not cost-effective, and the remainder were deemed cost effective at the US$50,000 level. Of the 3 categories of interventions (behavioural, community, environmental), environmental interventions were found to be the most cost-effective. No environmental intervention's ICER was above US$16,000, 5 of the interventions were cost saving, and for most interventions the probability that the intervention was cost-effective or cost-saving was 100%.

Specific examples of environmental measures included:

- Fiscal measures (taxing less healthy foods and subsidising healthier foods): cost-saving in Australia, the UK and Mexico.
- Mandatory food labelling schemes: cost-saving in Australia and Mexico, and cost-effective in the UK.
- Regulating advertisements of certain foods to children during prime TV watching hours: cost-saving in Australia, and cost-effective in the UK and Mexico.
- Mass media campaigns: cost-saving in Australia, and cost-effective in Mexico and the UK.

Limitations of the evidence included that:

- Studies were not formally assessed for quality (nor were the assumptions or evidence used to populate the economic models), grey literature was not included, and publication bias was not examined.
- Effectiveness of environmental interventions was largely based on lower quality evidence (namely, observational and modelling studies). There was also some uncertainty around assumptions about intervention reach in the target population. It was, however, noted that sensitivity analyses of environmental interventions indicated a high probability of cost-effectiveness.
- Most studies considered costs only for obesity-related disease, whereas by prolonging survival, other costs may arise such as those associated with older age.
- Comparing results between studies was made more difficult by heterogeneity of the models used and outcomes assessed.

Evidence suggests that raising the price of foods and drinks such as sugar-sweetened beverages and fast food at a population level (for example, through taxation) appears to reduce their overall consumption, whereas nationally subsidising healthier foods such as fruits and vegetables appears to increase consumption of these foods. Fiscal and regulatory measures also appear to be cost effective in the long term for preventing obesity. NICE PH35 does not currently recommend population-level taxes or subsidies for specific foods. Evidence now suggests that health benefits could be obtained by fiscal measures, which may have a potential impact on guidance. The details of any impact are outside the scope of the Evidence Update. Decisions on how the new evidence may impact guidance will not be possible until the guidance is reviewed by NICE following its published processes and methods.

Key references

Lehnert T, Sonntag D, Konnopka A et al. (2012) The long-term cost-effectiveness of obesity prevention interventions: systematic literature review. Obesity Reviews 13: 537–53

Powell LM, Chriqui JF, Khan T et al. (2013) Assessing the potential effectiveness of food and beverage taxes and subsidies for improving public health: a systematic review of prices, demand and body weight outcomes. Obesity Reviews 14: 110–28 [NIH Public Access author manuscript – full text]

1.8 Promoting a healthy diet: local action

Subsidies to promote healthier food purchases

For public health services involved in local action to promote a healthy diet, NICE PH35 recommends:

- Making people aware of their eligibility for welfare benefits and wider schemes that will supplement the family's food budget and improve their eating patterns. This includes free school meals, free school fruit and Healthy Start food vouchers.

- Working with local food retailers, caterers and workplaces to encourage local provision of affordable fruit and vegetables and other food and drinks that can contribute to a healthy, balanced diet.
- Encouraging local retailers to use incentives (such as promotional offers) to promote healthier food and drink options. The aim should be to make the healthier choice the easiest and relatively cheaper choice.

See NICE PH35 for the full recommendation on local action for promoting a healthy diet.

A systematic review by **An (2013)** investigated the effect of subsidies to promote buying and consuming healthier foods. RCTs, cohort studies or pre–post studies of real-world interventions among people aged 12 years and older, were included. Eligible trials examined price discounts or vouchers for healthier foods and their effect on food purchases or consumption. A total of 24 articles reporting on 20 separate studies were identified, 14 of which were from the USA, and 9 of which were RCTs. Of the interventions assessed by the 20 studies, 14 were price discounts and 6 were vouchers for a variety of healthier foods and drinks across different outlets such as supermarkets, cafeterias and vending machines. Population subgroups varied and included students, transit workers and low-income women. Heterogeneity between studies prevented meta-analysis.

In all except 1 study, subsidies for healthier foods significantly increased purchase and consumption of the subsidised products. Most studies used a fixed subsidy level, but in the 2 studies analysing variable subsidies, a dose–response effect was observed:

- A 48-week RCT found that price reductions of 10%, 25% and 50% for low-fat snacks in a vending machine increased sales by 9%, 39% and 93% respectively.
- A 132-week RCT found that discounts of 10% and 25% on healthier foods in a supermarket increased daily fruit and vegetable intake by 0.38 and 0.64 servings respectively.

Limitations of the evidence included that:

- Most studies were from the USA (only 1 was from the UK), had small or convenience samples (opposed to samples representing the population), and were in specific settings – all of which may limit generalisability.
- Most interventions lasted only a few weeks (less than 18 weeks in 10 studies), and there was no follow up in the majority of studies, so sustained effects of incentives are uncertain.
- Studies did not examine cost-effectiveness, impact on the food industry, or effect on dietary quality or energy intake.
- The review looked only at subsidies through price discounts and vouchers (which varied considerably between studies). Other methods such as taxes, food stamps, or rewards were not examined.

The evidence suggests that local subsidies (such as price discounts and vouchers) for healthier foods such as fruits and vegetables can increase purchase and consumption of these products. This is consistent with current recommendations in NICE PH35 to work with local food retailers, caterers and workplaces to encourage provision of affordable fruit and vegetables, and to use incentives (such as promotional offers) to promote healthier choices.

Key reference

An R (2013) Effectiveness of subsidies in promoting healthy food purchases and consumption: a review of field experiments. Public Health Nutrition 16: 1215–28

Workplace health-promotion programmes

For public health services involved in local action to promote a healthy diet, NICE PH35 recommends:

- Working with local workplaces to encourage local provision of affordable fruit and vegetables and other food and drinks that can contribute to a healthy, balanced diet.
- Ensuring local authorities and NHS organisations develop internal policies to help prevent employees from being overweight or obese and encouraging local employers to develop similar policies.

See NICE PH35 for the full recommendation on local action for promoting a healthy diet.

A systematic review and meta-analysis by **Rongen et al. (2013)** investigated the effectiveness of workplace health promotion programmes. RCTs examining a primary preventive workplace programme aimed at physical activity, healthy diet, weight loss, or smoking cessation, were eligible. A total of 18 studies (11 of which were from northern Europe) were included that focused on improving physical activity, weight status, or a combination of lifestyle factors. Outcomes examined across the studies (some studies assessed multiple outcomes) were: sickness absence (12 studies), self-perceived health (8 studies), work productivity (4 studies), and work ability (2 studies). The number of employees commencing interventions ranged in size from 40 to 924 (with numbers initially targeted ranging from 62 to 12,895). Generic effect sizes (ES) were estimated based on data from individual studies, and were then meta-analysed. An ES of 0.2 was considered a small effect, 0.5 a medium effect, and 0.8 or higher a large effect.

The overall effect of a workplace health promotion programme was small (ES=0.24, 95% CI 0.14 to 0.34 [18 studies]), and similar effect sizes were seen when analyses were stratified by individual outcomes (sickness absence, self-perceived health, work productivity, and work ability).

The effectiveness of a workplace programme was larger for:

- Populations aged under 40 years versus those over 40 (ES=0.48, 95% CI 0.23 to 0.73 [5 studies] versus ES=0.13, 95% CI 0.08 to 0.18 [12 studies]).
- Interventions with at least weekly contact versus less frequent contact (ES=0.36, 95% CI 0.18 to 0.53 [9 studies] versus ES=0.11, 95% CI 0.05 to 0.17 [10 studies]).
- Studies with low participation versus high participation rates (ES=0.38, 95% CI 0.20 to 0.55 [9 studies] versus ES=0.10, 95% CI 0.04 to 0.17 [8 studies]).

The authors suggested that the increased effectiveness seen in studies with low rates of participation may be as a result of selection bias, whereby only those with the highest motivation to improve their health entered the study.

Limitations of the evidence included that:

- Several studies had low participation rates (4 were at less than 10%), and high loss to follow up (4 were at greater than 35%) – although this may reflect the reality of workplace health interventions.
- Studies rated by the authors as poor or fair quality found an almost 3-fold higher effect of workplace programmes than studies of good or excellent quality, which may suggest publication bias (although in a funnel plot, only 3 of the 28 effect sizes fell outside funnel plot boundaries).

The evidence suggests that workplace health promotion programmes appear to have some effect on sickness absence, self-perceived health, work productivity, and work ability – particularly among people aged under 40 years, and when the intervention is at least weekly. These data are consistent with recommendations in NICE PH35 that workplace interventions

and policies should promote a healthy diet and physical activity. However, the authors noted that the variation in results among studies of lower and higher quality suggests that confirmation in high quality studies is needed.

Additional information about the study by Rongen et al. (2013) is also available from an independent critical appraisal report produced for the Centre for Reviews and Dissemination's Database of Abstracts of Reviews of Effects.

Key reference

Rongen A, Robroek SJ, van Lenthe FJ et al. (2013) Workplace health promotion: a meta-analysis of effectiveness. Preventive Medicine 44: 406–15

1.9 Promoting physical activity: national action

No new key evidence for this section was selected for inclusion in this Evidence Update.

1.10 Promoting physical activity: local action

Community interventions to increase physical activity

For public health services involved in local action to promote physical activity, NICE PH35 recommends several interventions at the community level, including:

- Ensuring local planning departments facilitate physical activity.
- Encouraging people to include physical activities in their everyday life.
- Assessing the type of physical activity opportunities needed locally.
- Providing information on local, affordable, practical and culturally acceptable opportunities to be more active.
- Encouraging local employers to develop policies to encourage employees to be more physically active.

See NICE PH35 for the full recommendation on local action to promote physical activity.

A Cochrane review by **Baker et al. (2011)** evaluated interventions to increase levels of physical activity at the community level using multiple strategies. Studies aimed at the whole community (such as a village, town, or city), with a minimum 6-month follow up, were included. Studies had to examine at least 2 of the following 6 broad strategies: social marketing via mass media; other communication strategies (such as posters or flyers); individual counselling by health professionals; work with voluntary, government, and non-government organisations; work within specific settings (such as schools or workplaces); or environmental change strategies. Eligible study designs were: cluster RCTs, RCTs, quasi-experimental designs with a control population comparator, interrupted time-series, and prospective controlled cohort studies. Whole-state or country interventions were excluded. The primary outcome was physical activity in the study population, which could be measured in a variety of ways such as percentage of people active or inactive, or frequency of physical activity.

A total of 25 studies were identified, of which 19 were in high-income countries (9 in North America, 8 in Europe, 2 in Australia), and 6 in low-income countries. Of the studies in high-income countries, 11 were in communities reported to be deprived, disadvantaged, or of low socio-economic status. The size of the communities ranged from 2 villages in Finland with a population of less than 1000, to a large region of Iran with almost 2 million inhabitants. The interventions varied by the number and intensity of the strategies. Most studies examined 3 or 4 of the 6 broad strategies noted as inclusion criteria, with some including all 6, but some only looking at 2. The most commonly assessed strategy was partnership with local government or non-governmental organisations (22 studies), and the least common was environmental change (10 studies). Heterogeneity of studies prevented meta-analysis.

The authors reported a noticeable inconsistency in the findings among the included studies. Because of the heterogeneity between interventions, intensity of actions delivered, outcomes assessed and comparison communities, and the overall poor quality of evidence, the authors stated it could not be determined whether community interventions were effective in increasing physical activity.

The major limitation of the evidence was risk of bias – 16 of the included studies were at high risk of bias (as a result of, for example, no randomisation of control and comparator groups, and the use of non-validated or self-reported outcome measures), and no study had a low risk of bias.

Inconsistent findings among studies of limited quality suggest that the effect of multi-component community interventions on increasing population levels of physical activity is uncertain. This evidence is therefore unlikely to have any impact on NICE PH35. The authors stated there is a clear need for well-designed intervention studies focusing on quality and frequency of measurement of physical activity, and allocation to intervention and control communities.

Key reference

Baker PR, Francis DP, Soares J et al. (2011) Community wide interventions for increasing physical activity. Cochrane Database of Systematic Reviews issue 4: CD008366

Increasing physical activity among women with socioeconomic disadvantage

For public health services involved in local action to promote physical activity, NICE PH35 recommends:

- Assessing the type of physical activity opportunities needed locally and at what times and where.
- Mapping physical activity opportunities against local needs and addressing any gaps in provision.
- Ensuring commissioned leisure services are affordable and acceptable to those at high risk of developing type 2 diabetes.

See NICE PH35 for the full recommendation on local action to promote physical activity.

A systematic review and meta-analysis by **Cleland et al. (2012)** assessed interventions to increase physical activity among women with socioeconomic disadvantage. Inclusion criteria were: randomised and non-randomised controlled trials; healthy participants (at least 80% women) aged 18–64 years (or mean age <65 years) with socioeconomic disadvantage; any physical activity intervention in any setting with any control group; and a physical activity outcome measure, or one closely related (such as cardiorespiratory fitness). Studies aimed at pregnant women, athletes or sports students were excluded.

A total of 19 studies were included (n=6,339), 10 of which were from the USA and 4 were from Europe. Intervention duration ranged from 6 weeks to 6 years (median=5 months). Most interventions comprised some form of education and many also included an exercise component. Thirteen studies employed at least 1 theoretical framework, most commonly social cognitive theory (6 studies) and the transtheoretical model of behaviour change (4 studies). Behaviour change techniques employed across the studies included: information about behaviour-health links (12 studies), barrier identification (11 studies), and planning for social support or social change (10 studies). Physical activity was measured mainly via self-report (16 studies). No studies reported adverse events or cost-effectiveness. An overall meta-analysis was inappropriate because of heterogeneity across all the studies. Therefore, standard mean differences (SMD) were calculated using meta-regression of pre-specified subgroup analyses.

In studies with any group component (either group intervention alone, or group intervention combined with individual delivery), a significant effect on physical activity was seen (SMD=0.36, 95% CI 0.17 to 0.54, p=0.0002; 11 studies, n=2506). The inclusion of a group component in the intervention had both a statistically and clinically significantly greater effect than studies using other modes of delivery, such as individual interventions alone (SMD=−0.02, 95% CI −0.35 to 0.31, p=0.9; 5 studies, n=758) or community interventions alone (SMD=−0.02, 95% CI −0.10 to 0.05, p=0.58; 3 studies, n=3075). The authors noted that the greater effect of group interventions was equivalent to achieving an extra 70 minutes per week of physical activity.

Limitations of the evidence included that:

- Physical activity was self-reported in most studies with the potential to introduce bias.
- Many studies were from the USA, which may affect generalisability to the UK.
- Risk of bias was high in 14 of the 19 studies.
- A funnel plot suggested the potential for publication bias. However sensitivity analyses to take this bias (and several other limitations described above) into account did not meaningfully alter results.

Limited evidence suggests that interventions to promote physical activity that include a group delivery component could increase physical activity among women with socioeconomic disadvantage. Although NICE PH35 does not specifically recommend group delivery in this population, limitations of the evidence mean that it is unlikely to affect current guidance.

Additional information about the study by Cleland et al. (2012) is available from an independent critical appraisal report produced for the Centre for Reviews and Dissemination's Database of Abstracts of Reviews of Effects.

Key reference

Cleland V, Granados A, Crawford D et al. (2012) Effectiveness of interventions to promote physical activity among socioeconomically disadvantaged women: a systematic review and meta-analysis. Obesity Reviews 14: 197–212

Workplace health-promotion programmes

For public health services involved in local action to promote physical activity, NICE PH35 recommends:

- Encouraging local employers to develop policies to encourage employees to be more physically active, for example, by: using healthier modes of transport to and from work; using the stairs rather than the lift; being active in lunch breaks and at other times.

See NICE PH35 for the full recommendation on local action for promoting physical activity.

The systematic review and meta-analysis by **Rongen et al. (2013)** investigated the effectiveness of workplace health promotion programmes, which included interventions promoting physical activity (see 'Workplace health-promotion programmes' in Section 1.8 'Promoting a healthy diet: local action' for detailed commentary). The evidence is consistent with recommendations in NICE PH35 to encourage local employers to develop policies to encourage employees to be more physically active.

1.11 Training those involved in promoting healthy lifestyles

Cost-effectiveness of training lay health workers in deprived communities

NICE PH35 recommends training programmes for those responsible for, or involved in, promoting a healthy lifestyle, which should cover: diversity; identifying communities at increased risk; strategies for changing behaviour; providing advice on healthy eating, physical activity and weight management; and challenging stigma and myths around type 2 diabetes.

Those responsible for, or involved in, promoting healthy lifestyle choices should be given time and support to develop and maintain the skills described above.

See NICE PH35 for the full recommendation on training those involved in promoting healthy lifestyles.

An RCT and economic evaluation in the UK by **Barton et al. (2011)** assessed the cost-effectiveness of training lay health workers (LHWs) to improve lifestyles related to heart health in deprived communities. Participants aged 18 years or over with at least 1 risk factor for cardiovascular disease (hypertension, raised cholesterol, diabetes, BMI>30, or smoker) were eligible. People with established cardiovascular disease, a prescribed diet that was inconsistent with trial protocol, minimal control over their own diet, or life expectancy of less than 2 years were excluded. Participants were randomised to receive support from trained LHWs (n=72) or to a control group (n=38). LHWs were recruited from the same community as the participants. They were trained by the research team to provide information, advice and support aimed at changing beliefs and behaviour around diet and cardiovascular disease risk, and to help set goals. LHW support was available for 3 months, comprising 6 meetings at 2-week intervals. Both the LHW and control groups received health promotion literature and completed a food diary at baseline and at 6 months.

For the economic evaluation, changes in quality-adjusted life years (QALYs) and costs at 2008/09 financial year levels were estimated over 6 months. Health-related quality of life data were obtained via the EQ-5D questionnaire. Costs comprised overall LHW, NHS and social services costs. A cost-effectiveness acceptability curve was then used to determine probability of cost-effectiveness of the intervention for different payment thresholds.

The mean cost of training LHWs per participant was £151 (range £17–766). At 6 months, overall NHS and social services costs had increased by £77 in the LHW group (because of the added cost of the LHW intervention) and reduced by £21 in the control group. The overall incremental cost of LHWs was therefore £98. Mean EQ-5D score at 6 months had increased by 0.113 for those assigned to LHWs (giving a mean QALY gain of 0.028) and by 0.086 in the control group (mean QALY gain 0.022). The incremental cost-effectiveness ratio for LHWs was £14,480, which was below a cost-effectiveness threshold of £20,000–30,000 per QALY. The probability of the cost-effectiveness of LHWs was 39.5% at £20,000 per QALY, and 40.1% at £30,000 per QALY.

Limitations of the evidence included that:

- QALY gains were based on the EQ-5D which is a self-reported questionnaire.
- The authors did not comment on the clinical or statistical significance of the RCT results.
- Patient recruitment costs were excluded (although the authors felt that at-risk individuals would likely be detected through everyday practice).
- Cost-effectiveness was estimated over a 6-month period only.

The evidence suggests that providing trained lay health workers appears to be cost-effective for improving lifestyles related to heart health among people in deprived communities at risk of cardiovascular disease. These data are consistent with recommendations in NICE PH35 to provide training programmes for those responsible for, or involved in, promoting a healthy lifestyle.

Additional information about the study by Barton et al. (2011) is available from an independent critical appraisal report produced for the Centre for Reviews and Dissemination's NHS Economic Evaluation Database.

Key reference

Barton GR, Goodall M, Bower P et al. (2011) Increasing heart-health lifestyles in deprived communities: economic evaluation of lay health trainers. Journal of Evaluation in Clinical Practice 18: 835–40

2 New evidence uncertainties

During the development of the Evidence Update, the following evidence uncertainties were identified for the UK Database of Uncertainties about the Effects of Treatments (UK DUETs).

Interventions for communities at high risk of type 2 diabetes

- Dietary interventions for weight loss and cardiovascular risk reduction in people of African ancestry

Promoting a healthy diet: national action

- Food subsidies for modifying dietary behaviour
- Price changes of sugar-sweetened beverages and weight outcomes

Promoting physical activity: local action

- Community wide interventions for increasing physical activity

Further evidence uncertainties for preventing type 2 diabetes can be found in the UK DUETs database and in the NICE research recommendations database.

UK DUETs was established to publish uncertainties about the effects of treatments that cannot currently be answered by referring to reliable up-to-date systematic reviews of existing research evidence.

Appendix A: Methodology

Scope

The scope of this Evidence Update is taken from the scope of the reference guidance:

- Preventing type 2 diabetes: population and community-level interventions. NICE public health guidance 35 (2011)

Searches

Very few studies were found during the searches for the original guidance. It was also decided that replicating all of these searches was not a viable option for the Evidence Update. Therefore, only the search for the review of review-level evidence conducted for the original guidance was replicated, with some additional terms.

Searches were conducted of the following databases, covering the dates 7 July 2010 (the end of the search period of NICE public health guidance 35) to 14 February 2014 (ASSIA searched to 17 February):

- ASSIA (Applied Social Sciences Index and Abstracts)
- CDSR (Cochrane Database of Systematic Reviews)
- DARE (Database of Abstracts of Reviews of Effects)
- DoPHER (Database of Promoting Health Effectiveness reviews)
- EMBASE (Excerpta Medica database)
- HMIC (Health Management Information Consortium) database
- HTA (Health Technology Assessment) database
- MEDLINE (Medical Literature Analysis and Retrieval System Online)
- MEDLINE In-Process
- PsycINFO
- Social Policy and Practice

In addition, a call for evidence was made to the Evidence Update Advisory Group, and citation searches for studies originally included in the reviews on which NICE PH35 was based were undertaken (from 1 November 2009 to 24 March 2014 to cover the period from the end of the searches for the original review questions).

This list of evidence was then assessed and prioritised by the Chair for discussion by the rest of the Evidence Update Advisory Group.

Table 1 provides details of the MEDLINE search strategy used, which was adapted to search the other databases listed above.

Figure 1 provides details of the evidence selection process. The list of evidence excluded after review by the Chair of the EUAG, and the full search strategies, are available on request from contactus@evidence.nhs.uk

See the NICE Evidence Services website for more information about how NICE Evidence Updates are developed.

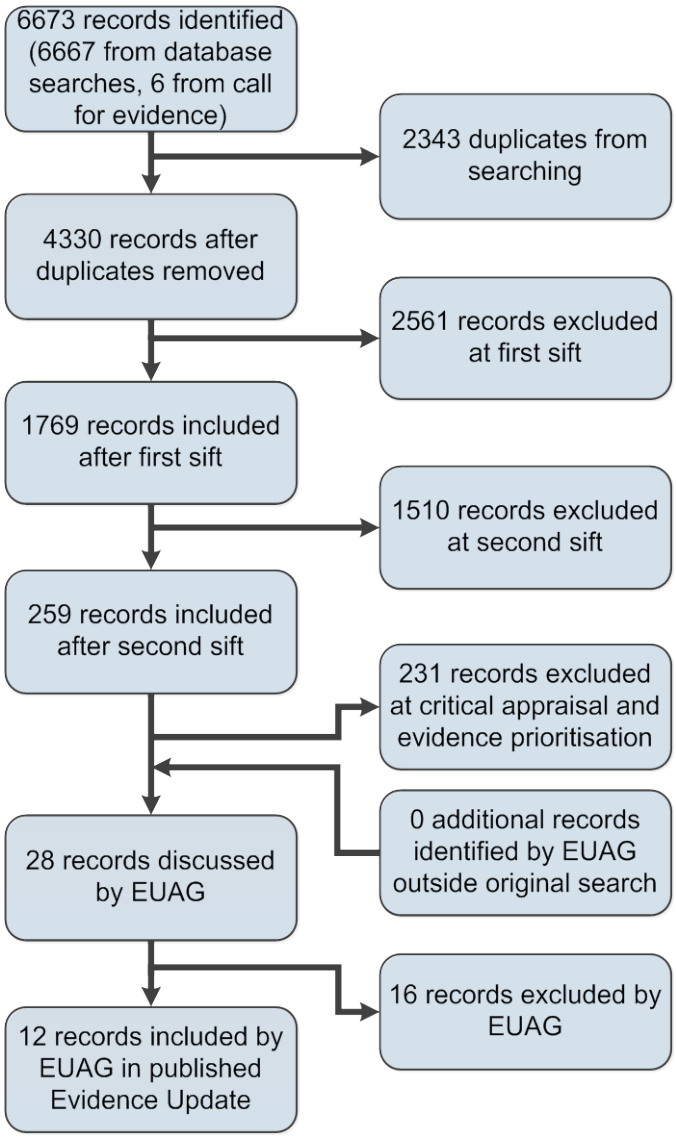
Table 1 MEDLINE search strategy (adapted for individual databases)

1	(pre-diabetes or pre diabetes or prediabetes).ti,ab. or Prediabetic State/pc
2	(pre adj1 diabetic adj1 state$).ti,ab.
3	(history adj3 (gestational adj diabetes)).ti,ab. or Diabetes, gestational/
4	(((Metabolic or Reaven$1 or Dysmetabolic) and syndrome) or insulin resistance syndrome).ti,ab. or Metabolic Syndrome X/pc
5	(((((weight adj2 gain) or weight) adj2 increase$) or weight) adj2 excess$).ti,ab.
6	(obes$ or overweight or over weight).ti,ab. or *Obesity/pc or *Overweight/pc
7	(healthy eating or unhealthy eating or diet).ti,ab. or food habits/eh or diet/
8	(physical$ adj1 (activ$ or inactiv$)).ti,ab.
9	((sedentary or active) adj (lifestyle or life-style or (life adj1 style$))).ti,ab.
10	1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 or 9
11	((ethnic$ or multi-ethnic$ or multi ethnic$ or multi-rac$ or multi rac$ or multi-cultural or cultural$ diversit$ or minority or colo?r) and (ethnic$ or social group$ or population$ or neighbourhood$1 or neighborhood$1 or communit$ or rac$ or religious$ or people or population$ or families)).ti,ab.
12	((Arab$ or Asian or Asian American$1 or African or African American or Caribbean or Afro Caribbean or Caucasian or Hispanic or Latino or Indian or Mexican$ or Pakistani or Bangladeshi or Chinese or traveller or Gypsi$ or romany or romani or roma or traveller$ or Black$ or (Black$ and (African or Caribbean)) or BME) and (ethnic$ or social group$ or population$ or neighbourhood$1 or neighborhood$1 or communit$ or rac$ or religious$ or people or population$ or families)).ti,ab.
13	(black adj1 minority ethnic).ti,ab.
14	Minority Groups/ or Vulnerable Populations/ or exp Ethnic Groups/ or exp Continental Population Groups/ or cultural diversity/
15	((low-income or low income or low pay or low-socioeconomic status or low paid or poor or deprived or disadvantaged or underserved or under represented or under-represented or under-privilege$ or underprivilege$) and (ethnic$ or social group$ or population$ or neighbourhood$1 or neighborhood$1 or communit$ or rac$ or religious$ or people or population$ or families)).ti,ab.
16	(poverty or deprivation or financial hardship$).ti,ab. or poverty/ or poverty areas/
17	(health adj2 inequalit$).ti,ab. or *Health Status Disparities/
18	11 or 12 or 13 or 14 or 15 or 16 or 17
19	(promot$ or prevent$ or reduc$ or educat$ or improv$ or upstream$ or ((population or communit$) and intervention$1)).ti,ab.
20	health promotion/ or intervention studies/
21	(uptake or take up or increas* or impact* or effect* or improve* or enhance* or encourag* or support* or optimiz* or optimis* or adher* or access* or motivat* or accept* or satisfaction or compliance or comply or complie* or refus* or availabl* or provision or provid* or offer or incentive* or start or attend* or campaign* or interven* or program* or activit* or project* or counsel* or advice or advise or advising or engage* or curriculum or curricula or initiative*).ti,ab.
22	((decreas$ or reduc$ or discourag$) adj2 (sedentary or deskbound)).ti,ab.
23	19 or 20 or 21 or 22
24	(Literature review or narrative review or qualitative review or quantitative review or systematic review or systematic narrative or evidence review or meta-analysis or meta-analyses or meta analysis or evidence synthesis or evidence review or evaluation studies).ti,ab,pt.

25	(health technology adj6 assessment$).ti,ab,pt.
26	((review adj2 literature) or (review adj2 reviews)).ti,ab,pt.
27	Review.ti,ab.
28	24 or 25 or 26 or 27

29	10 and 18 and 23 and 28
30	limit 29 to english language
31	limit 30 to ed=20100707-20140214
32	limit 31 to yr="2010-Current"

Figure 1 Flow chart of the evidence selection process



EUAG – Evidence Update Advisory Group

Appendix B: The Evidence Update Advisory Group and Evidence Update project team

Evidence Update Advisory Group

The Evidence Update Advisory Group is a group of topic experts who reviewed the prioritised evidence from the literature search and advised on the development of the Evidence Update.

Professor Nick Wareham – Chair

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