

Appendix A1: Summary of evidence from surveillance

2018 surveillance of [Type 2 diabetes prevention: population and community-level interventions](#) (2011) NICE guideline PH35

Summary of evidence from surveillance

Studies identified in searches are summarised from the information presented in their abstracts.

Feedback from topic experts who advised us on the approach to this surveillance review, and from stakeholders if public consultation was conducted, was considered alongside the evidence to reach a final decision on the need to update each section of the guideline.

Summary of new evidence from 8-year (PH12)	Summary of new intelligence from 8-year surveillance (from topic experts or initial internal intelligence gathering)	Impact
<u>Recommendation 1 Integrating national strategy on non-communicable diseases</u>		
None	None	None
<u>Recommendation 2 Local joint strategic needs assessments</u>		
None	None	None

Summary of new evidence from 8-year (PH12)	Summary of new intelligence from 8-year surveillance (from topic experts or initial internal intelligence gathering)	Impact
<u>Recommendation 3 Developing a local strategy</u>		
<p>A modelling study (1) predicted estimated effects of the NHS Diabetes Prevention Programme using the School for Public Health Research Diabetes Prevention Model. The NHS Diabetes Prevention Programme was predicted to recoup intervention costs within 12 years, with net savings of £1.28 for each £1 invested over 20 years (with 97% probability of being cost-effective within 20 years). The programme was expected to be most cost-effective in people with obesity, those with HbA1c of 6.2–6.4% and in people aged 40–74 years. Gains in quality-adjusted life years were expected to be lower in people with low socioeconomic status and in ethnic minority groups.</p> <p>A retrospective cohort study (2) assessed employee financial incentives for participation in lifestyle interventions for people with non-diabetic hyperglycaemia (n=1,005) compared with a matched non-employee control group (n=1,005). The yearly reduction in HbA1c for employees compared with matched non-employees did not differ in 2008–10 when incentives were tied to program participation only, but was greater in 2010–12 when incentives were tied to program</p>	None.	<p>Current recommendations encourage targeting low socioeconomic status communities for interventions to reduce the risk of type 2 diabetes. A modelling study indicated that health gains from the NHS diabetes prevention programme would be lower in people with low socioeconomic status and in ethnic minority groups.</p> <p>These findings support the current recommendations on targeting interventions in this group, but suggest that further work in this area may be needed. However, we identified no evidence on interventions to improve outcomes in this population. Therefore, an update in this area is not warranted at this time.</p> <p>Although inequalities between communities may be persistent, the finding that financial incentives for achieving goals in a diabetes prevention programme may be effective provides another potential strategy. However, it is unclear whether this strategy would be generalisable to, or cost-effective in, an entire population.</p>

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<p>participation as well as achievement of goals. Analyses from both periods showed that employees lost more weight per year than matched non-employees. Employees who participated in disease management lost more weight than those who did not.</p>		<p>New evidence is unlikely to change guideline recommendations.</p>
<p><u>Recommendation 4 Interventions for communities at high risk of type 2 diabetes</u></p>		
None	None	None
<p><u>Recommendation 5 Conveying messages to the whole population</u></p>		
<p>An RCT (3) assessed a 16-session lifestyle intervention delivered via video-on-demand cable television with web-based lifestyle support tools compared with the cable television intervention alone in people with ‘diabetes risk factors’ (n=306). Most participants (87%) viewed at least 1 video, and 36 viewed 9 or more videos. After 5 months, both groups had mean weight loss of 3.3%. Weight loss was greater (4.9%) in people who watched at least 9 videos.</p>	None	<p>New evidence suggests that delivering lifestyle interventions via television programming may be feasible and has potential to be effective in people who have high adherence to watching the programmes. This finding provides some support for using national media (for example, television and online social media) as indicated in current recommendations. However, the new evidence did not add new insight into the content of such messages, such as ways to ensure the message is culturally appropriate for the audience.</p>

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		New evidence is unlikely to change guideline recommendations.
<u>Recommendation 6 Conveying messages to the local population</u>		
An observational study (4) assessed a diabetes prevention programme delivered by Young Men's Christian Association (YMCA) coaches rather than clinical staff. An invitation to participate (marketing approach) was mailed to 2,200 people who were eligible for Medicare in the USA and were at risk of non-diabetic hyperglycaemia. Overall, 351 people (16%) attended an information session and 228 (11.3%) enrolled in the programme and continued participating until at least week 9.	None	Current recommendations suggest ensuring that messages and information are disseminated locally to groups at higher risk of type 2 diabetes than the general population. New evidence suggesting that a marketing approach to inviting people to participate in lifestyle interventions may be an effective way of reaching people at risk of type 2 diabetes is thus consistent with current recommendations. However, the new evidence did not add new insight into the content of such messages. New evidence is unlikely to change guideline recommendations.
<u>Recommendation 7 Promoting a healthy diet: national action</u>		
A soft drinks industry levy is planned in the UK, beginning in April 2018. Non-alcoholic drinks with added sugars will be taxed at 18 pence per litre if the drink has 5 g of sugar or more per 100 ml and	Topic experts highlighted several of the studies included in this section.(7,8,10,12,13)	New evidence shows a consistent reduction in purchasing of sugar-sweetened beverages after the introduction of taxation. This supports the planned tax on sugar-sweetened beverages due to take effect from April 2018. Although the guideline currently has no recommendations on taxation of

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<p>24 pence per litre if the drink has 8 g of sugar or more per 100 ml.</p> <p>A modelling study (5) assessed the impact of the planned UK tax on sugar-sweetened beverages. Three possible industry responses were modelled: reformulation to reduce sugar concentration, an increase in product price, and a change in the market share of high-sugar, mid-sugar, and low-sugar drinks. For each response, a better-case and worse-case health scenario was defined.</p> <ul style="list-style-type: none"> • The best modelled scenario for health is reformulation of sugar-sweetened beverages, resulting in a reduction of 144,383 adults and children with obesity in the UK, 19,094 fewer incident cases of type 2 diabetes per year, and 269,375 fewer decayed, missing, or filled teeth annually. • An increase in the price of sugar-sweetened beverages in the better-case scenario would result in 81,594 fewer adults and children with obesity, 10,861 fewer incident cases of diabetes per year, and 149,378 fewer decayed, missing, or filled teeth annually. 		<p>high-sugar foods and drink, the planned government action in this area means that an update in this area is not necessary.</p> <p>New evidence is unlikely to change guideline recommendations.</p>

Summary of new evidence from 8-year (PH12)	Summary of new intelligence from 8-year surveillance (from topic experts or initial internal intelligence gathering)	Impact
<ul style="list-style-type: none"> Changes to market share to increase the proportion of low-sugar drinks sold in the better-case scenario would result in 91,042 fewer adults and children with diabetes, 1,528 (fewer incident cases of diabetes per year, and 172,718 fewer decayed, missing, or filled teeth annually. <p>The greatest benefit for obesity and oral health would be in people aged younger than 18 years, and people older than 65 years would have the largest absolute decreases in diabetes incidence.</p> <p>A systematic review and meta-analysis (6) assessed the association between consumption of sugar-sweetened beverages and type 2 diabetes in the USA and in the UK (17 cohorts, n=38,253). Higher consumption of sugar-sweetened beverages was associated with a greater incidence of type 2 diabetes, by 18% for each serving per day (13% after adjustment for adiposity). Higher consumption of artificially-sweetened beverages was associated with a greater incidence of type 2 diabetes, by 25% for each serving per day (8% after adjustment for adiposity). Higher consumption of fruit juices was associated with a greater incidence of type 2 diabetes, by 5% for each serving per day; however, this was not significant (7% after</p>		

Summary of new evidence from 8-year (PH12)	Summary of new intelligence from 8-year surveillance (from topic experts or initial internal intelligence gathering)	Impact
<p>adjustment for adiposity, which was significant). Fruit juice also showed no significant association with diabetes in studies with objective measures of diabetes. Under specified assumptions for population attributable fraction, of 20.9 million events of type 2 diabetes predicted to occur over 10 years in the USA (absolute event rate 11.0%), 1.8 million would be attributable to consumption of sugar sweetened beverages (population attributable fraction 8.7%); and of 2.6 million events in the UK (absolute event rate 5.8%), 79,000 would be attributable to consumption of sugar sweetened beverages (population attributable fraction 3.6%).</p> <p>In January 2014, the Mexican government implemented an 8% tax on non-essential foods with energy density of 275 kcal or more per 100 g and a peso-per-litre tax on sugar-sweetened beverages. Several studies assessing the effectiveness of this approach were identified.</p> <p>An observational study (7) assessed data on household packaged food purchases from The Nielsen Company's Mexico Consumer Panel for 6,248 households that participated in at least 2 months during 2012–14. A longitudinal, fixed-effects model adjusting for pre-existing trends to test whether the post-tax observations were</p>		

Summary of new evidence from 8-year (PH12)	Summary of new intelligence from 8-year surveillance (from topic experts or initial internal intelligence gathering)	Impact
<p>significantly different from expected, based on pre-tax trend. The analysis controlled for household characteristics and contextual factors like minimum salary and unemployment rate. The mean volume of purchases of taxed foods in 2014 reduced by 25 g per person per month, which was a 5.1% change beyond what would have been expected based on pre-tax (2012–13) trends, with no corresponding change in purchases of untaxed foods. Low income households purchased on average 10.2% less of the taxed foods than expected; medium income households purchased 5.8% less of the taxed foods than expected, whereas high income households' purchases did not change.</p> <p>A further study of data from 6,253 households from Mexican cities found similar results for sugar-sweetened beverage consumption. Purchases of sugar-sweetened beverages reduced by an average of 6%, at an increasing rate over time, to 12% in December 2014. Reductions occurred in all socioeconomic groups, but were highest in people with low income (average 9%, maximum of 17% in December 2014). Untaxed beverage sales increased by 4%. Additional analysis (8) assessing consumption of sugar-sweetened beverages in Mexico in 2015, showed a sustained and growing</p>		

Summary of new evidence from 8-year (PH12)	Summary of new intelligence from 8-year surveillance (from topic experts or initial internal intelligence gathering)	Impact
<p>reduction in purchases of sugar sweetened beverages of 9.7%.</p> <p>A Markov modelling study (9) assessed the long-term effects of the Mexican sugar-sweetened beverage tax. After 10 years, weight reduction of 0.15 kg/m² per person was expected, which would translate into a 2.54% reduction in obesity prevalence. People in the lowest level of socioeconomic status and those 20–35 years of age showed the largest reductions in BMI and prevalence of overweight and obesity. Simulations showed that by 2030, the current tax of 1-peso-per-litre would prevent 86,000 to 134,000 cases of diabetes. Overall, a tax of 2-pesos-per-litre was expected to produce twice as much of a reduction, assuming the tax effect on consumption remains stable over time. Sensitivity analyses showed similar results with various parameter assumptions and alternative modelling approaches.</p> <p>An observational study (10) assessed the effects of a tax on sugar-sweetened beverages of \$0.01 per fluid ounce implemented in Berkeley, (California, the USA) in March 2015. Beverage consumption frequency was assessed in low-income households before (n=990) and after implementation of the tax (n=1,689), and was compared with low-income</p>		

Summary of new evidence from 8-year (PH12)	Summary of new intelligence from 8-year surveillance (from topic experts or initial internal intelligence gathering)	Impact
<p>neighbourhoods in two comparator cities. Consumption of sugar-sweetened beverages reduced by 21% in Berkeley after implementing the tax, whereas consumption rose by 4% in comparator cities, which was a significant difference. Water consumption increased in all cities, but was significantly greater in Berkeley.</p> <p>A cohort study (11) assessed the effect of replacing sugar-sweetened beverages with artificially sweetened beverages or water, using data from the US Women's Health Initiative obtained in 1993 to 1998 (n=64,850). Over an average follow-up of 8.4 years, 4,675 postmenopausal women developed diabetes. Sugar-sweetened beverages and artificially sweetened beverages were both associated with an increased risk of diabetes. However, in subgroup analysis, artificially sweetened beverages were associated with diabetes only in people with obesity. Modelling the substitution of sugar-sweetened beverages with an equal amount of artificially sweetened beverages did not significantly reduce the risk of developing diabetes. Substituting 1 serving of artificially sweetened beverages with water was associated with a significant reduction in risk of diabetes of 5%; whereas substituting 1 serving of sugar-sweetened</p>		

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<p>beverages with water was associated with a reduction in risk of diabetes of 10%.</p> <p>An observational study (12) assessed the effects of the Berkeley sugar-sweetened beverages tax. Prices of sugar sweetened beverages at 26 stores, sales data from supermarkets and a telephone survey (n=957) were analysed. Supermarket data was from 3 stores in Berkeley and 6 non-Berkeley control stores. Changes in price of sugar-sweetened beverages (pass through) after imposition of the tax varied in degree and timing by store type and beverage type. Prices increased in chain supermarkets and chain gas stations, increased partially in pharmacies, and reduced in independent corner stores and independent gas stations. Sales-unweighted mean price change from scanner data showed increased prices for sodas and energy drinks, but a lower change in other categories. After a year, sugar-sweetened beverage sales reduced by 9.6% in Berkeley, but increased by 6.9% in non-Berkeley stores. Overall beverage sales increased: sales of untaxed beverages increased by a significantly greater extent in Berkeley 3.5% compared with non-Berkeley stores (0.5%). In Berkeley, sales of water increased by 15.6%; untaxed fruit, vegetable, and tea drinks by 4.37%; and plain milk by 0.63%.</p>		

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<p>Scanner data mean store revenue or consumer spending (dollars per transaction) reduced to a lesser extent in Berkeley than in comparison stores. Sugar-sweetened beverage sales and usual dietary intake were low in Berkeley compared with national levels both at baseline and after the tax. Reductions in self-reported mean daily sugar-sweetened beverage intake and mean per capita caloric intake from baseline to after taxation were not statistically significant.</p>		
<p><u>Recommendation 8 Promoting a healthy diet: local action</u></p>		
<p>A cohort study (14) assessed diet diversity and cost in a UK population (n=23,238; EPIC-Norfolk cohort). Participants completed a baseline questionnaire in 1993–1997 and were followed-up for a median of 10 years. Overall, 892 new cases of type 2 diabetes were recorded. Greater total diet diversity was associated with a significant reduction in incidence of type 2 diabetes, when comparing diets consisting of all 5 food groups (dairy, fruit, vegetables, meat or alternatives, and grains) compared with diets of 3 or fewer food groups. This analysis adjusted for confounders including obesity and socioeconomic status. In analyses of diversity within each food group, greater diversity in dairy</p>	<p>None</p>	<p>The findings that higher diet diversity is associated with reduced incidence of type 2 diabetes, and that such a diet is more expensive than less healthy diets are consistent with current recommendations on awareness of benefit eligibility and encouraging local provision of affordable fruit and vegetables.</p> <p>New evidence is unlikely to change guideline recommendations.</p>

Summary of new evidence from 8-year (PH12)	Summary of new intelligence from 8-year surveillance (from topic experts or initial internal intelligence gathering)	Impact
<p>products, fruits, and vegetables were each associated with lower incident diabetes. The cost of consuming a diet covering all 5 food groups was 18% higher than a diet of three or fewer groups.</p> <p>An observational study (15) assessed family consumer behaviours and their effects on adolescent non-diabetic hyperglycaemia and diabetes. Data from the US NHANES study were used (n=2,520 adolescents). Adolescents with healthier household food availability had negative odds of developing type 2 diabetes. Higher supermarket spending was also associated with lower odds of diabetes. These effects were stronger in female adolescents.</p> <p>A cohort study (16) assessed the effects of incremental dietary changes on incidence of diabetes in two cohorts of the Nurses' Health Study, and in the Health Professionals follow-up study (n=124,067). Participants did not have diabetes at baseline and were followed-up for more than 20 years. Diet quality, measured by the Alternate Healthy Eating Index (AHEI) score, was calculated every 4 years. Diabetes was diagnosed in 9,361 people. A reduction in diet quality of more than 10% was associated with a significantly higher risk of diabetes, whereas an increase in diet quality</p>		

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of more than 10% was associated with a significantly lower risk of diabetes. Changes in bodyweight explained about a third of the association between diet quality and diabetes risk.		
<u>Recommendation 9 Promoting physical activity: national action</u>		
None	None	None
<u>Recommendation 10 Promoting physical activity: local action</u>		
A Cochrane review (17) of 8 studies (4 RCTs, 3 controlled before-and-after studies and 1 cluster RCT; n=1,125) assessed the effects of workplace interventions to reduce sitting at desks. The studies evaluated physical workplace changes (3 studies), policy changes (1 study) and information and counselling (4 studies). No studies investigated the effect of treadmill desks, stepping devices, periodic breaks or standing or walking meetings. The authors classed all of the studies at high risk of bias and the quality of the evidence as very low to low. Sit-stand desks with or without additional counselling reduced sitting time at work per workday at 1 week follow-up and at 3 months compared with no intervention (very low quality evidence). Total sitting time during the whole day	None	Evidence on the use of standing desks in workplaces shows little benefit for employees' wellbeing. However, the current evidence base is fairly small and rated as very low to low quality by the authors of a Cochrane review. Therefore, current recommendations to encourage local employers to develop policies to encourage employees to be more physically active, should not be updated at this time. New evidence is unlikely to change guideline recommendations.

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<p>decreased with sit-stand desks compared with no intervention, as did the duration of sitting episodes lasting 30 minutes or more. Sit-stand desks did not have a considerable effect on work performance and had an inconsistent effect on musculoskeletal symptoms and sick leave. Walking strategies had no significant effect on sitting at work (low quality evidence). Guideline-based counselling by occupational physicians reduced sitting time at work (low quality evidence) but there was no considerable effect on reduction in total sitting time during the whole day. Mindfulness training induced a non-significant reduction in workplace sitting time at 6 and 12 months (low quality evidence). Computer prompting showed inconsistent effects on sitting time at work. Computer prompting software also led to a non-significant increase in energy expenditure at work (low quality evidence) at 13 weeks.</p>		
<p><u>Recommendation 11 Training those involved in promoting healthy lifestyles</u></p>		
None	None	None
<p>Research recommendation 1</p>		

Summary of new evidence from 8-year (PH12)	Summary of new intelligence from 8-year surveillance (from topic experts or initial internal intelligence gathering)	Impact
How effective and cost effective are interventions which use either a 'total population' or 'high-risk population' approach to preventing type 2 diabetes among people from black and minority ethnic or lower socioeconomic groups?		
None	None	None
Research recommendation 2		
What are the most effective and cost effective ways of developing, implementing and assessing tailored and culturally appropriate community-level interventions to prevent type 2 diabetes among people at high risk? This includes people from a range of black and minority ethnic groups and those from lower socioeconomic communities.		
None	None	None
Research recommendation 3		
Which participatory approaches are most effective and cost effective among populations at higher risk of type 2 diabetes? This should consider the awareness, knowledge, understanding and skills of the providers of interventions for people at high risk of developing type 2 diabetes?		
None	None	None
Research recommendation 4		
How do socioeconomic, environmental, biological and psychosocial factors determine diet and physical activity behaviours and how do they contribute to differences in the risk of developing type 2 diabetes?		
None	None	None

Summary of new evidence from 8-year (PH12)	Summary of new intelligence from 8-year surveillance (from topic experts or initial internal intelligence gathering)	Impact
<p>Research recommendation 5</p> <p>How do financial factors (including incentives, pricing and taxation of food and incentives, and pricing for physical activity opportunities) affect food and physical activity choices?</p>		
<p>Several studies on taxation of high sugar food and drinks were identified.</p> <p>See recommendation 7 above.</p>	<p>Topic experts highlighted several studies on taxation of high sugar food and drinks.</p>	<p>None</p>

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