

Cardiovascular disease prevention

Public health guideline

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Your responsibility

The recommendations in this guideline represent the view of NICE, arrived at after careful consideration of the evidence available. When exercising their judgement, professionals and practitioners are expected to take this guideline fully into account, alongside the individual needs, preferences and values of their patients or the people using their service. It is not mandatory to apply the recommendations, and the guideline does not override the responsibility to make decisions appropriate to the circumstances of the individual, in consultation with them and their families and carers or guardian.

All problems (adverse events) related to a medicine or medical device used for treatment or in a procedure should be reported to the Medicines and Healthcare products Regulatory Agency using the [Yellow Card Scheme](#).

Local commissioners and providers of healthcare have a responsibility to enable the guideline to be applied when individual professionals and people using services wish to use it. They should do so in the context of local and national priorities for funding and developing services, and in light of their duties to have due regard to the need to eliminate unlawful discrimination, to advance equality of opportunity and to reduce health inequalities. Nothing in this guideline should be interpreted in a way that would be inconsistent with complying with those duties.

Commissioners and providers have a responsibility to promote an environmentally sustainable health and care system and should [assess and reduce the environmental impact of implementing NICE recommendations](#) wherever possible.

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Overview

This guideline covers the main risk factors linked with cardiovascular disease: poor diet, physical inactivity, smoking and excessive alcohol consumption. It aims to reduce the high incidence of cardiovascular disease. This, in turn, will help prevent other major causes of death and illness, such as type 2 diabetes and many cancers.

Who is it for?

- National government
- NHS and local authorities
- Industry
- Commissioners, managers and practitioners working in the above and in the wider public, private, voluntary and community sectors
- Members of the public

Introduction

The Department of Health (DH) asked the National Institute for Health and Care Excellence (NICE) to produce public health guidance on the prevention of cardiovascular disease (CVD) at population level.

CVD includes coronary heart disease (CHD), stroke and peripheral arterial disease. These conditions are frequently brought about by the development of atheroma and thrombosis (blockages in the arteries). They are also linked to conditions such as heart failure, chronic kidney disease and dementia.

The guidance is for government, the NHS, local authorities, industry and all those whose actions influence the population's cardiovascular health. This includes commissioners, managers and practitioners working in local authorities and the wider public, private, voluntary and community sectors. It may also be of interest to members of the public.

The guidance complements, but does not replace, NICE's guidance on smoking cessation and prevention and tobacco control, physical activity, obesity, hypertension and maternal and child nutrition. It will also complement NICE guidance on alcohol misuse. The Programme Development Group (PDG) developed the recommendations on the basis of reviews of the evidence, economic modelling, expert advice, stakeholder comments and fieldwork.

Recommendations

People have the right to be involved in discussions and make informed decisions about their care, as described in [NICE's information on making decisions about your care](#).

[Making decisions using NICE guidelines](#) explains how we use words to show the strength (or certainty) of our recommendations, and has information about prescribing medicines (including off-label use), professional guidelines, standards and laws (including on consent and mental capacity), and safeguarding.

The evidence statements underpinning the recommendations are listed in [appendix C](#). See also the [evidence reviews, supporting evidence statements and economic modelling report](#).

Recommendations for policy: A national framework for action

- Changes in cardiovascular disease (CVD) risk factors can be brought about by intervening at the population and individual level. Government has addressed, and continues to address, the risk factors at both levels.
- Interventions focused on changing an individual's behaviour are important and are supported by a range of existing NICE guidance.
- Changes at the population-level could lead to further substantial benefits and this guidance breaks new ground for NICE, by focusing on action to bring about such changes. They may be achieved in a number of ways but national or regional policy and legislation are particularly powerful levers. For more on the importance of interventions aimed at the whole population, see [considerations 1.12 to 1.15](#). Also for reference, see:
 - Blas et al. (2008): Addressing social determinants of health inequities: what can the state and civil society do?
 - Kelly et al. (2009a) A conceptual framework for public health: NICE's emerging

approach.

- Marmot (2010) Fair society, healthy lives: strategic review of health inequalities in England post 2010.
 - Rose (2008) Rose's strategy of preventive medicine. Commentary by Khaw and Marmot.
- This guidance makes the case that CVD is a major public health problem.
 - Recommendations 1 to 12 are based on extensive and consistent evidence. This suggests that the policy goals identified provide the outline for a sound, evidence-based national framework for action which is likely to be the most effective and cost-effective way of reducing CVD at population level.
 - It would require a range of legislative, regulatory and voluntary changes including the further development of existing policies.
 - The framework would be established through policy, led by the Department of Health. It would involve government, government agencies, industry and key, non-governmental organisations working together.
 - The final decision on whether these policy options are adopted, and how they are prioritised, will be determined by government through normal political processes.
 - The recommendations for practice (recommendations 13 to 24) support and complement, and are supported by, these policy options.

Who should take action?

- As well as the Department of Health, the following should be involved:
 - Chief Medical Officer
 - National Clinical Director for Coronary Heart Disease
 - Government Chief Scientific Adviser
 - Department of Health Chief Scientist
 - Advertising Standards Authority
 - Department for Business, Innovation and Skills

- Department for Culture, Media and Sport
- Department for Education
- Department for Environment, Food and Rural Affairs
- Department for Transport
- Department of Communities and Local Government
- Food Standards Agency
- HM Treasury
- National Institute for Health Research
- Ofcom
- Other research organisations (for example, the Medical Research Council and the Economic and Social Research Council).
- Other key players include:
 - caterers
 - food and drink producers
 - food and drink retailers
 - marketing and media industries
 - national, non-governmental organisations including, for example, the British Heart Foundation, Cancer Research UK, Diabetes UK, National Heart Forum, the Stroke Association and other chronic disease charities
 - the farming sector.

Recommendation 1 Salt

- High levels of salt in the diet are linked with high blood pressure which, in turn, can lead to stroke and coronary heart disease. High levels of salt in processed food have a major impact on the total amount consumed by the population.
- Over recent years the food industry, working with the Food Standards Agency, has

made considerable progress in reducing salt in everyday foods. As a result, products with no added salt are now increasingly available. However, it is taking too long to reduce average salt intake among the population. Furthermore, average intake among children is above the level recommended by Public Health England, and some children consume as much salt as adults. Progress towards a low-salt diet needs to be accelerated as a matter of urgency.

Policy goal

- Reduce population-level consumption of salt. To achieve this, the evidence suggests that the following are among the measures that should be considered.

What action should be taken?

- Accelerate the reduction in salt intake among the population. Aim for a maximum intake of 6 g per day per adult by 2015 and 3 g by 2025.
- Ensure children's salt intake does not exceed age-appropriate guidelines (these guidelines should be based on up-to-date assessments of the available scientific evidence).
- Promote the benefits of a reduction in the population's salt intake to the European Union (EU). Introduce national legislation if necessary.
- Ensure national policy on salt in England is not weakened by less effective action in other parts of the EU.
- Ensure food producers and caterers continue to reduce the salt content of commonly consumed foods (including bread, meat products, cheese, soups and breakfast cereals). This can be achieved by progressively changing recipes, products and manufacturing and production methods.
- Establish the principle that children under 11 should consume substantially less salt than adults. (This is based on advice from the Scientific Advisory Committee on Nutrition.)
- Support the Food Standards Agency so that it can continue to promote, and take the lead on, the development of EU-wide salt targets for processed foods.
- Establish an independent system for monitoring national salt levels in commonly

consumed foods.

- Ensure low-salt products are sold more cheaply than their higher salt equivalents.
- Clearly label products which are naturally high in salt and cannot meaningfully be reformulated. Use the Food Standards Agency-approved traffic light system. The labels should also state that these products should only be consumed occasionally.
- Discourage the use of potassium and other substitutes to replace salt. The aim of avoiding potassium substitution is twofold: to help consumers' readjust their perception of 'saltiness' and to avoid additives which may have other effects on health.
- Promote best practice in relation to the reduction of salt consumption, as exemplified in these recommendations, to the wider EU.

Recommendation 2 Saturated fats

- Reducing general consumption of saturated fat is crucial to preventing CVD. Over recent years, much has been done (by the Food Standards Agency, consumers and industry) to reduce the population's intake. Consumption levels are gradually moving towards the goal set by the Food Standards Agency: to reduce population intake of saturated fat from 13.3% to below 11% of food energy.
- However, a further substantial reduction would greatly reduce CVD and deaths from CVD. Taking the example of Japan (where consumption of saturated fat is much lower than in the UK), halving the average intake (from 14% to 6 to 7% of total energy) might prevent approximately 30,000 CVD deaths annually. It would also prevent a corresponding number of new cases of CVD annually. (Note that low-fat products are not recommended for children under 2 years, but are fine thereafter.)

Policy goal

- Reduce population-level consumption of saturated fat. To achieve this, the evidence suggests that the following are among the measures that should be considered.

What action should be taken?

- Encourage manufacturers, caterers and producers to reduce substantially the amount

of saturated fat in all food products. If necessary, consider supportive legislation. Ensure no manufacturer, caterer or producer is at an unfair advantage as a result.

- Create the conditions whereby products containing lower levels of saturated fat are sold more cheaply than high saturated fat products. Consider legislation and fiscal levers if necessary.
- Create favourable conditions for industry and agriculture to produce dairy products for human consumption that are low in saturated fat.
- Continue to promote semi-skimmed milk for children aged over 2 years. This is in line with the American Heart Association's 2005 dietary recommendations for children and adolescents.

Recommendation 3 Trans fats

- Industrially-produced trans fatty acids (IPTFAs) constitute a significant health hazard. In recent years many manufacturers and caterers, with the encouragement of the Food Standards Agency and other organisations, have considerably reduced the amount of IPTFAs in their products. However, certain sections of the population may be consuming a substantially higher amount of IPTFAs than average (for instance, those who regularly eat fried fast-food). It is important to protect all social groups from the adverse effects of IPTFAs.
- In some countries and regions (for instance, Denmark, Austria and New York), IPTFAs have been successfully banned. A study for the European Parliament recently recommended that it, too, should consider an EU-wide ban. In the meantime, some large UK caterers, retailers and producers have removed IPTFAs from their products.

Policy goal

- Ensure all groups in the population are protected from the harmful effects of IPTFAs. To achieve this, the evidence suggests that the following are among the measures that should be considered.

What action should be taken?

- Eliminate the use of IPTFAs for human consumption.

- In line with other EU countries (specifically, Denmark and Austria), introduce legislation to ensure that IPTFA levels do not exceed 2% in the fats and oils used in food manufacturing and cooking.
- Direct the bodies responsible for national surveys to measure and report on consumption of IPTFAs by different population subgroups, rather than only by mean consumption across the population as a whole.
- Establish guidelines for local authorities to monitor independently IPTFA levels in the restaurant, fast-food and home food trades using existing statutory powers (in relation to trading standards or environmental health).
- Create and sustain local and national conditions which support a reduction in the amount of IPTFAs in foods, while ensuring levels of saturated fat are not increased. Encourage the use of vegetable oils high in polyunsaturated and monounsaturated fatty acids to replace oils containing IPTFAs. Saturated fats should not be used as an IPTFA substitute.
- Develop UK-validated guidelines and information for the food service sector and local government on removing IPTFAs from the food preparation process. This will support UK-wide implementation of any legislation produced on IPTFAs.

Recommendation 4 Marketing and promotions aimed at children and young people

- Eating and drinking patterns get established at an early age so measures to protect children from the dangers of a poor diet should be given serious consideration.
- Current advertising restrictions have reduced the number of advertisements for foods high in fat, salt or sugar during television programmes made for children and young people. However, advertisements, promotions, product placements and sponsorship shown between programmes for older audiences also have a powerful influence on children and young people. Marketing bans have been successfully introduced in several other countries; evidence shows that a 9pm watershed for such TV advertisements would reduce children and young people's exposure to this type of advertising by 82%. ([Office of Communications annex to consultation on television advertising of food and drink to children](#)).

Policy goal

Ensure children and young people under 16 are protected from all forms of marketing, advertising and promotions (including product placements) which encourage an unhealthy diet. To achieve this, the evidence suggests that the following are among the measures that should be considered.

What action should be taken?

- Develop a comprehensive, agreed set of principles for food and beverage marketing aimed at children and young people. This could be similar to the 'Sydney principles' ([Swinburn et al. 2008](#)). They should be based on a child's right to a healthy diet.
- Extend TV advertising scheduling restrictions on food and drink high in fat, salt or sugar (as determined by the Food Standards Agency's nutrient profile) up to 9pm.
- Develop equivalent standards, supported by legislation, to restrict the marketing, advertising and promotion of food and drink high in fat, salt or sugar via all non-broadcast media. This includes manufacturers' websites, use of the Internet generally, mobile phones and other new technologies.
- Ensure restrictions for non-broadcast media on advertising, marketing and promotion of food and drink high in fat, salt or sugar are underpinned by the Food Standards Agency nutrient profiling system.

Recommendation 5 Commercial interests

- If deaths and illnesses associated with CVD are to be reduced, it is important that food and drink manufacturers, retailers, caterers, producers and growers, along with associated organisations, deliver goods that underpin this goal. Many commercial organisations are already taking positive action.

Policy goal

Ensure dealings between government, government agencies and the commercial sector are conducted in a transparent manner that supports public health objectives and is in line with best practice. (This includes full disclosure of interests.) To achieve this, the following are among the measures that should be considered.

What action should be taken?

- Encourage best practice for all meetings, including lobbying, between the food and drink industry and government (and government agencies). This includes full disclosure of interests by all parties. It also involves a requirement that information provided by the food and drink, catering and agriculture industries is available for the general public and is auditable.

Recommendation 6 Product labelling

- Clear labelling which describes the content of food and drink products is important because it helps consumers to make informed choices. It may also be an important means of encouraging manufacturers and retailers to reformulate processed foods high in saturated fats, salt and added sugars. Evidence shows that simple traffic light labelling consistently works better than more complex schemes ([Kelly et al. 2009](#)).

Policy goals

- Ensure the Food Standards Agency's integrated front-of-pack labelling system is rapidly implemented.
- Ensure labelling regulations in England are not adversely influenced by EU regulation.

To achieve this, the evidence suggests that the following are among the measures that should be considered.

What action should be taken?

- Establish the Food Standards Agency's single, integrated, front-of-pack traffic light colour-coded system as the national standard for food and drink products sold in England. This includes the simple, traffic light, colour-coding visual icon and text which indicates whether food or drink contains a 'high', 'medium' or 'low' level of salt, fat or sugar. It also includes text to indicate the product's percentage contribution to the guideline daily amount (GDA) from each category.
- Consider using legislation to ensure universal implementation of the Food Standards Agency's front-of-pack traffic light labelling system.
- Develop and implement nutritional labelling for use on shelves or packaging for bread,

cakes, meat and dairy products displayed in a loose or unwrapped state or packed on the premises. The labelling should be consistent with the Food Standards Agency's traffic light labelling system.

- Ensure food and drink labelling is consistent in format and content. In particular, it should refer to salt (as opposed to sodium), the content per 100 g and use kcals as the measure of energy.
- Continue to support the Food Standards Agency in providing clear information about healthy eating.
- Ensure the UK continues to set the standard of best practice by pursuing exemption from potentially less effective EU food labelling regulations when appropriate.

Recommendation 7 Health impact assessment (see also recommendation 22)

- Policies in a wide variety of areas can have a positive or negative impact on CVD risk factors, and frequently the consequences are unintended. The Cabinet Office has indicated that, where relevant, government departments should assess the impact of policies on the health of the population. Well-developed tools and techniques exist for achieving this.

Policy goals

- Ensure government policy is assessed for its impact on CVD.
- Ensure any such assessments are adequately incorporated into the policy making process.

To achieve this, the following are among the measures that should be considered.

What action should be taken?

- Assess (in line with the Cabinet Office requirement) all public policy and programmes for the potential impact (positive and negative) on CVD and other related chronic diseases. In addition, assess the potential impact on health inequalities. Assessments should be carried out using health and policy impact assessment and other similar, existing tools.

- Monitor the outcomes of policy and programmes after the assessment and use them to follow up and amend future plans.
- Make health impact assessment mandatory in specific scenarios. (Note that strategic environmental assessment, environmental impact assessment and regulatory impact assessment are already mandatory in certain contexts.)

Recommendation 8 Common agricultural policy

- The common agricultural policy (CAP) is the overarching framework used by EU member countries to form their own agricultural policies. The burden of diet-related disease has grown considerably since CAP was first implemented.
- CAP reform offers a significant opportunity to address the burden of CVD. However, there are still a number of significant 'distortions' in relation to certain food prices and production processes which potentially increase the burden of disease. Further reform should aim to remove these distortions to promote health and wellbeing and to provide a basis for UK government action to prevent CVD ([Lloyd-Williams et al. 2008](#) and [Lock et al. 2005](#)).
- The CAP has 2 main 'pillars': market measures (first pillar) and rural development policy (second pillar). Recent CAP reform has shifted money from the first to the second pillar which now focuses more on 'public goods'. However, health has not been formally recognised as a 'public good'.
- CAP reforms have begun to address this issue, but a clearer focus on CVD and its antecedents (that is, the production of foods high in fat, sugar or salt) is needed.

Policy goals

- Ensure promoting health and reducing disease is made an explicit part of the CAP's 'public goods' so that European money promotes the wellbeing of EU citizens. The scope of what are regarded as 'European public goods' in the EU is broader than the strict definition of a 'public good' used by some economists.
- Ensure CAP spending takes adequate account of its potential impact on CVD risk factors and is used in a way that optimises the public health outcomes.
- To achieve this, the following are among the measures that should be considered.

What action should be taken?

- Negotiate at EU and national level to ensure the CAP takes account of public health issues. Health benefits should be an explicit, legitimate outcome of CAP spending. This can be achieved through formal recognition of health as a 'public good'.
- Progressively phase out payments under 'pillar one' so that all payments fall under 'pillar two'. This will allow for better protection of health, climate and the environment. It will also improve and stimulate economic growth.
- Encourage the principle that future 'pillar two' funds should reward or encourage the production of highly nutritious foods such as fruit, vegetables, whole grains and leaner meats.
- Negotiate to ensure the European Commission's impact assessment procedure takes cardiovascular health and other health issues into account. (Impact assessment is part of the European Commission's strategic planning and programming cycle.)

Recommendation 9 Physically active travel (see also recommendation 21)

- Travel offers an important opportunity to help people become more physically active. However, inactive modes of transport have increasingly dominated in recent years. In England, schemes to encourage people to opt for more physically active forms of travel (such as walking and cycling) are 'patchy'.

Policy goal

- Ensure government funding supports physically active modes of travel.

To achieve this, the evidence suggests that the following are among the measures that should be considered.

What action should be taken?

- Ensure guidance for local transport plans supports physically active travel. This can be achieved by allocating a percentage of the integrated block allocation fund to schemes which support walking and cycling as modes of transport.

- Create an environment and incentives which promote physical activity, including physically active travel to and at work.
- Consider and address factors which discourage physical activity, including physically active travel to and at work. An example of the latter is subsidised parking.

Recommendation 10 Public sector catering guidelines (see also recommendations 19 and 20)

- Public sector organisations are important providers of food and drink to large sections of the population. It is estimated that they provide around one in three meals eaten outside the home. Hence, an effective way to reduce the risk of CVD would be to improve the nutritional quality of the food and drink they provide.

Policy goals

- Ensure publicly funded food and drink provision contributes to a healthy, balanced diet and the prevention of CVD.
- Ensure public sector catering practice offers a good example of what can be done to promote a healthy, balanced diet.
- To achieve this, the evidence suggests that the following are among the measures that should be considered.

What action should be taken?

- Ensure all publicly funded catering departments meet Food Standards Agency-approved dietary guidelines. This includes catering in schools, hospitals and public sector work canteens.
- Assess the effectiveness of the [government's healthier food mark pilot](#). If successful, develop a timetable to implement it on a permanent basis.

Recommendation 11 Take-aways and other food outlets (see also recommendations 23 and 24)

- Food from take-aways and other outlets (the 'informal eating out sector') comprises a

significant part of many people's diet. Local planning authorities have powers to control fast-food outlets.

Policy goal

Empower local authorities to influence planning permission for food retail outlets in relation to preventing and reducing CVD. To achieve this, the following are among the measures that should be considered.

What action should be taken?

- Encourage local planning authorities to restrict planning permission for take-aways and other food retail outlets in specific areas (for example, within walking distance of schools). Help them implement existing planning policy guidance in line with public health objectives. (See also recommendation 12.)
- Review and amend 'classes of use' orders for England to address disease prevention via the concentration of outlets in a given area. These orders are set out in the Town and Country Planning (Use Classes) Order 1987 and subsequent amendments.

Recommendation 12 Monitoring

- CVD is responsible for around 33% of the observed gap in life expectancy among people living in areas with the worst health and deprivation indicators compared with those living elsewhere in England. Independent monitoring, using a full range of available data, is vital when assessing the need for additional measures to address such health inequalities, including those related to CVD.

Policy goal

Ensure all appropriate data are available for monitoring and analysis to inform CVD prevention policy.

To achieve this, the evidence suggests that the following are among the measures that should be considered.

What action should be taken?

- Ensure data on CVD prevention is available for scrutiny by the public health community as a whole.
- Ensure new econometric data (including pooled consumer purchasing data) are rapidly made available by industry for monitoring and analysis by independent agencies.
- Use population surveys (including [Public Health England's National Diet and Nutrition Survey \[NDNS\]](#) and the [Low income diet and nutrition survey \[LIDNS\]](#)) and data from all relevant sources to monitor intake of nutrients for all population groups. (Sources include: the Food Standards Agency, Department of Health, Department for Environment, Food and Rural Affairs, Office for National Statistics, the Public Health Observatories, academic and other researchers.)
- Monitor the intake of salt, trans fatty acids, saturated fatty acids and mono and polyunsaturated fatty acids among different population groups and report the findings for those groups.
- Support the National diet and nutrition survey and the Low income diet and nutrition survey.
- Ensure the CVD module (including lipid profile measures) routinely appears in the [NHS Digital's Health surveys for England](#).
- Develop an international public health information system (resembling [GLOBALink](#)) for CVD prevention and use it to ensure widespread dissemination of these data.

Recommendations for practice

Recommendations 13 to 18 Regional CVD prevention programmes

- Recommendations 13 to 18 provide for a comprehensive regional and local CVD prevention programme. They should all be implemented, following the order set out below and in conjunction with recommendations 1 to 12, which they support. The aim is to plan, develop and maintain effective programmes.

The target population for recommendations 13 to 18 and the list of who should take action is outlined below. This is followed by the specific actions to be taken in relation

to each element of the programme.

Whose health will benefit?

- The population that falls within a local authority, primary care trust (PCT) area or across combined PCT and local authority areas or within a particular region of the country.

Who should take action?

Commissioners and providers of public health intervention programmes within:

- city region partnerships
- government regional offices
- local authorities
- local strategic partnerships
- non-governmental organisations, including charities and community groups
- PCTs
- strategic health authorities.

Recommendation 13 Regional CVD prevention programmes – good practice principles

What action should be taken?

- Ensure a CVD prevention programme comprises intense, multi-component interventions.
- Ensure it takes into account issues identified in recommendations 1 to 12.
- Ensure it includes initiatives aimed at the whole population (such as local policy and regulatory initiatives) which complement existing programmes aimed at individuals at high risk of CVD.

- Ensure it is sustainable for a minimum of 5 years.
- Ensure appropriate time and resources are allocated for all stages, including planning and evaluation.

Recommendation 14 Regional CVD prevention programmes – preparation

What action should be taken?

- Gain a good understanding of the prevalence and incidence of CVD in the community. Find out about any previous CVD prevention initiatives that have been run (including any positive or negative experiences).
- Consider how existing policies relating to food, tobacco control and physical activity, including those developed by the local authority, may impact on the prevalence of CVD locally.
- Gauge the community's level of knowledge of, and beliefs about, CVD risk factors. This includes beliefs that smoking is the only solace in life for people with little money, or that only people who have a lot of money eat salad.
- Gauge how confident people in the community are that they can change their behaviour to reduce the risks of CVD (see [NICE's guideline on behaviour change: general approaches](#)).
- Identify groups of the population who are disproportionately affected by CVD and develop strategies with them to address their needs.
- Take into account the community's exposure to risk factors (factors currently facing adults and those emerging for children and younger people).

Recommendation 15 Regional CVD prevention programmes – programme development

What action should be taken?

- Develop a population-based approach.

- Ensure a 'programme theory' is developed and used to underpin the programme (Pawson 2001). This should cover the reasons why particular actions are expected to have particular outcomes.
- Ensure the programme helps address local area agreement targets and acts as a local incentive to help meet the government's programme for world class commissioning in the NHS. Also ensure it tackles health inequalities.
- Link the programme with existing strategies for targeting people at particularly high risk of CVD and take account of ongoing, accredited screening activities by GPs and other healthcare professionals. This includes the NHS Health Checks programme.
- Work closely with regional and local authorities and other organisations to promote policies which are likely to encourage healthier eating, tobacco control and increased physical activity. Policies may cover spatial planning, transport, food retailing and procurement. Organisations that may get involved could include statutory, public sector and civil society groups (examples of the latter are charities, clubs, self-help and community groups).

When developing CVD programmes, take account of relevant recommendations in NICE's guidelines on tobacco, walking and cycling, physical activity: brief advice for adults in primary care, exercise referral schemes to promote physical activity, behaviour change: general approaches, physical activity and the environment, community engagement: improving health and wellbeing and reducing health inequalities, maternal and child nutrition, physical activity in the workplace, cardiovascular disease: identifying and supporting people most at risk of dying early, physical activity for children and young people and obesity prevention.

- Only develop, plan and implement a strategic, integrated media campaign as part of a wider package of interventions to address CVD risk factors. Media campaigns should be based on an acknowledged theoretical framework.

Recommendation 16 Regional CVD prevention programmes – resources

What action should be taken?

- Ensure the programme lasts a minimum of 5 years (while subject to annual evaluation reports) to maximise its potential impact.

- Produce a long-term plan, and gain political commitment, for funding to ensure the programme has adequate resources and is sustainable beyond the end of the research or evaluation period.
- Ensure the programme is adequately staffed. Avoid adding CVD prevention to the workload of existing staff without relieving them of other tasks.
- Ensure volunteers are an additional (rather than a core) resource and that their training and support is adequately resourced.
- Ensure steps are taken to retain staff.
- Where staff are recruited from the local community ensure, as far as possible, that they reflect the local culture and ethnic mix.
- Ensure there are effective links with other existing and relevant community initiatives.

Recommendation 17 Regional CVD prevention programmes – leadership

What action should be taken?

- Act as leader and governor of CVD prevention. Identify and articulate local community needs and aspirations and how these may impact on the community's risk of CVD. Reconcile these needs and aspirations or arbitrate on them to help prevent CVD (see the [Department for Communities and Local Government's 2008 statutory guidance on creating strong, safe and prosperous communities](#)).
- Identify senior figures within PCTs and local authorities as champions for CVD prevention.
- Identify people to lead the CVD programme, including members of the local community. Identify in advance, and provide for, the training and other needs of these potential leaders.
- Develop systems within local strategic partnerships and other subregional or regional partnerships for agreeing shared priorities with other organisations involved in CVD prevention. Ensure senior staff are involved, as appropriate.

Recommendation 18 Regional CVD prevention programmes –

evaluation

What action should be taken?

- Establish baseline measures before the CVD programme begins. These should include lifestyle and other factors that influence cardiovascular risk, as well as figures on CVD prevalence and mortality. The establishment of such measures should be budgeted for as part of the programme.
- Ensure evaluation is built in (in line with [NICE's guideline on behaviour change: general approaches](#)). It should include the policies and activities of partner organisations which are likely to influence CVD prevalence.
- Ensure appropriate methods (using multiple approaches and measures) are used to evaluate the programme's processes, outcomes and measures or indicators. Evaluation should include determining how acceptable the programme is to the local community or the groups targeted.
- Ensure the results of evaluation are freely available and shared with partner organisations. Use the findings to inform future activities.

Recommendation 19 Children and young people

Whose health will benefit?

- Children and young people aged under 16 years.

Who should take action?

- Parents and carers of children and young people under the age of 16.
- Local authorities (providers of cultural and leisure services).
- Schools (governors and teachers).
- Catering staff.
- Nursery nurses and workers in pre-school day care settings such as nurseries.
- Managers of children's centres.

What action should they take?

- Help children and young people to have a healthy diet and lifestyle. This includes helping them to develop positive, life-long habits in relation to food. This can be achieved by ensuring the messages conveyed about food, the food and drink available, and where it is consumed, is conducive to a healthy diet. (For more details, see [NICE's guidelines on maternal and child nutrition and physical activity for children and young people](#)).
- When public money is used to procure food and drink in venues outside the direct control of the public sector, ensure those venues provide a range of affordable healthier options (including from vending machines). Ideally, the healthier options should be cheaper than the less healthy alternatives. For instance, carbonated or sweetened drinks should not be the only options and fruit and water should be available at an affordable price. (Examples of when public money is used in this way include school visits to museums, sports centres, cinemas and fun parks.)
- Encourage venues frequented by children and young people and supported by public money to resist sponsorship or product placement from companies associated with foods high in fat, sugar or salt. (This includes fun parks and museums.)
- Organisations in the public sector should avoid sponsorship from companies associated with foods high in fat, sugar or salt.

Recommendation 20 Public sector food provision

Whose health will benefit?

- Anyone who eats food provided by public sector organisations.

Who should take action?

- Education authorities.
- Government departments and agencies.
- Local authorities.
- NHS organisations.

- Prison services.
- The armed forces.
- The emergency services.

What action should they take?

- Ensure all food procured by, and provided for, people working in the public sector and all food provided for people who use public services:
 - is low in salt and saturated fats
 - is nutritionally balanced and varied, in line with recommendations made in the [NHS eatwell guide](#)
- does not contain industrially produced trans fatty acids (IPTFAs).

Recommendation 21 Physical activity

Whose health will benefit?

- Everyone.

Who should take action?

- Local authorities.
- PCTs.

What action should they take?

- Ensure the physical environment encourages people to be physically active (see [NICE's guideline on physical activity and the environment](#)). Implement changes where necessary. This includes prioritising the needs of pedestrians and cyclists over motorists when developing or redeveloping highways. It also includes developing and implementing public sector workplace travel plans that incorporate physical activity (see [NICE's guideline on physical activity in the workplace](#)). Encourage and support employers in other sectors to do the same.

- Ensure the need for children and young people to be physically active is addressed (see [NICE's guideline on physical activity for children and young people](#)). This includes providing adequate play spaces and opportunities for formal and informal physical activity.
- Audit bye-laws and amend those that prohibit physical activity in public spaces (such as those that prohibit ball games).
- Consider offering free swimming to parents and carers who accompany children aged under 5 years to swimming facilities.
- Apportion part of the local transport plan (LTP) block allocation to promote walking, cycling and other forms of travel that involve physical activity. The proportion allocated should be in line with growth targets for the use of these modes of transport.
- Ensure cycle tracks created under the Cycle Tracks Act 1984 are part of the definitive map (the legal record of public rights of way).
- Align all 'planning gain' agreements with the promotion of heart health to ensure there is funding to support physically active travel. (For example, Section 106 agreements are sometimes used to bring development in line with the government's sustainable development objectives).

Recommendation 22 Health impact assessments of regional and local plans and policies

Whose health will benefit?

- Everyone.

Who should take action?

- Local policy makers.
- PCTs.
- Regional and local government.

What action should they take?

- Use a variety of methods to assess the potential impact (positive and negative) that all local and regional policies and plans may have on rates of CVD and related chronic diseases. Take account of any potential impact on health inequalities.
- Identify those policies and plans that are likely to have a significant impact on CVD rates. This can be achieved by using screening questions that cover the social, economic and environmental determinants of CVD.
- Monitor the outcomes following an assessment and use this to follow up and amend plans.
- Identify where expertise is required to carry out assessments and where this is available locally.
- Identify the training and support needs of staff involved in carrying out assessments and provide the necessary resources.

Recommendation 23 Take-aways and other food outlets

Whose health will benefit?

- Everyone but particularly those who frequently use these food outlets.

Who should take action?

- Environmental health officers.
- Local government planning departments.
- Public health nutritionists.
- Trading standards officers.

What action should they take?

- Use bye-laws to regulate the opening hours of take-aways and other food outlets, particularly those near schools that specialise in foods high in fat, salt or sugar.

- Use existing powers to set limits for the number of take-aways and other food outlets in a given area. Directives should specify the distance from schools and the maximum number that can be located in certain areas.
- Help owners and managers of take-aways and other food outlets to improve the nutritional quality of the food they provide. This could include monitoring the type of food for sale and advice on content and preparation techniques.

Recommendation 24 Nutrition training

Whose health will benefit?

- People eating snacks and meals provided by public sector services.

Who should take action?

- Caterers.
- Chartered Institute of Environmental Health (CIEH).
- Local authorities.
- Providers of hygiene training.
- The food and farming network (Feast).

What action should they take?

- Ensure the links between nutrition and health are an integral part of training for catering managers. In particular, they should be made aware of the adverse effect that frying practices and the use of salt, industrial trans fats and saturated fats can have on health.
- Ensure they are aware of the healthy alternatives to frying and to using salt and sugar excessively, based on the [NHS eatwell guide](#).
- The PDG considers that all the recommended measures are cost effective.
- See the [recommendations for research](#) and [gaps in the evidence](#).

Public health need and practice

Cardiovascular disease (CVD) is generally due to reduced blood flow to the heart, brain or body caused by atheroma or thrombosis. It is increasingly common after the age of 60, but rare below the age of 30. Plaques (plates) of fatty atheroma build up in different arteries during adult life. These can eventually cause narrowing of the arteries, or trigger a local thrombosis (blood clot) which completely blocks the blood flow.

The main types of CVD are: coronary heart disease (CHD), stroke and peripheral arterial disease (PAD) (British Heart Foundation 2009a).

Globally, CVD is the leading cause of death (World Health Organization 2007). It is also associated with a large burden of preventable illnesses.

CVD in England and the UK

In England in 2007, CVD led to nearly 159,000 deaths (accounting for nearly 34% of all deaths in England). This includes 74,185 deaths from coronary heart disease (CHD) and 43,539 from stroke (British Heart Foundation 2009b).

Most premature deaths from CVD, that is, among people aged less than 75 are preventable. In 2006, CVD accounted for around 30% of premature deaths among men and 21% among women, accounting for just over 40,000 premature deaths in that year. The purpose of preventing premature death from CVD is to enable high quality life for as long as possible.

An estimated 2.8 million men and 2.8 million women in the UK are living with CVD. The British Heart Foundation estimates that around 111,000 people have a stroke for the first time every year. Its 2009 report notes that national stroke audit data is more conservative, putting the estimated 'first time' strokes a year at approximately 72,000 (33,000 among men and 39,000 among women).

In addition, the British Heart Foundation estimates 96,000 new cases of angina in the UK each year (52,000 among men and about 43,000 among women) and around 113,000 heart attacks per year (67,000 among men and 46,000 among women). New cases of heart failure total around 68,000 a year (about 38,000 among men and 30,000 among women).

women).

Overall, CVD costs the UK approximately £30 billion annually (Luengo-Fernandez et al. 2006).

Despite recent improvements, death rates in the UK from CVD are relatively high compared with other developed countries (only Ireland and Finland have higher rates). There is also considerable variation within the UK itself, geographically, ethnically and socially. For instance, premature death rates from CVD are up to six times higher among lower socioeconomic groups than among more affluent groups (O'Flaherty et al. 2009). In addition, death rates from CVD are approximately 50% higher than average among South Asian groups (Allender et al. 2007).

The reduction in CVD-related risks among younger men (and perhaps women) over previous years seems to have stalled in England from around 2003. This is also the case in a number of other countries including Scotland (O'Flaherty et al. 2009), Australia (Wilson and Siskind 1995) and the United States (Ford and Capewell 2007).

The higher incidence of CVD is a major reason why people living in areas with the worst health and deprivation indicators have a lower life expectancy compared with those living elsewhere in England. For males, it accounts for 35% of this gap in life expectancy (of that, approximately 25% is due to CHD and 10% due to other forms of CVD). Among females, it accounts for 30% of the gap (DH 2008a).

Risk factors for CVD

Lifetime risk of CVD is strongly influenced by diet and physical activity levels since childhood (National Heart Forum 2003). The risk among adults is determined by a variety of 'upstream' factors (such as food production and availability, access to a safe environment that encourages physical activity and access to education). It is also influenced by 'downstream' behavioural issues (such as diet and smoking).

In more than 90% of cases, the risk of a first heart attack is related to nine potentially modifiable risk factors (Yusuf et al. 2004):

- smoking/tobacco use
- poor diet

- high blood cholesterol
- high blood pressure
- insufficient physical activity
- overweight or obesity
- diabetes
- psychosocial stress (linked to people's ability to influence the potentially stressful environments in which they live)
- excess alcohol consumption.

Other factors, such as maternal nutrition and air pollution may also be linked to the disease (Allender et al. 2007).

How these risk factors cause many other illnesses

Addressing diet, physical inactivity, smoking and excessive alcohol consumption to reduce CVD will also help reduce a wide range of other chronic conditions. This includes many of the other main causes of death and illness in England such as type 2 diabetes and many common cancers (see also 3.73).

Type 2 diabetes, which affects over two million people in the UK, is associated with being overweight and sedentary. (It also accounts for an estimated 5% of UK healthcare expenditure.) Between 8% and 42% of certain cancers (endometrial, breast, and colon) are attributable to excess body fat.

The report 'Food matters' (Cabinet Office 2008) estimates that a total of around 70,000 lives would be saved each year in the UK if people's diet matched the nutritional guidelines on fruit and vegetable consumption and saturated fat, added sugar and salt intake.

Tackling the risk factors

Reducing the risks, for example, by quitting tobacco or improving the diet (so reducing cholesterol or blood pressure levels) can rapidly reduce the likelihood of developing CVD. Actions which impact on the whole population most effectively reduce these risk factors (Kelly et al. 2009a).

Some population-based prevention programmes have been accompanied by a substantial reduction in the rate of CVD deaths. However, the degree to which these are attributable to the programme is contested. This is due to a number of reasons including:

- It is difficult to design studies which evaluate entire cities, regions or countries or are of sufficient duration.
- Control sites can become 'contaminated' (that is, if the intervention affects people living in the control area).
- There may be unreasonable expectations about the speed of change.
- Behaviour change is often erratic or slow.
- Failure to address 'upstream' influences such as policy or manufacturing and commercial practices.

The crucial importance of using policy to modify population-wide CVD risk factors has been recognised on an international, European and national level. For example, the World Health Organization's (WHO) first global treaty on health, the 'Framework convention on tobacco control' (2003) undertook to enact key tobacco control measures, such as tobacco tax increases, smokefree public places and tobacco advertising controls. Parties to the treaty included the UK.

In 2004, WHO member states also agreed to a non-binding global strategy on diet, physical activity and health. In addition, since 1993 the European Union (EU) has legislated on issues such as advertising and the labelling of consumer products like food and tobacco.

In 2009, the Cardio and Vascular Coalition published 'Destination 2020', the voluntary sector's plan for cardiac and vascular health in England (Cardio and Vascular Coalition 2009).

Government policy

Government policy in many areas influences CVD. The 'Choosing health' white paper (DH 2004) set priorities for action on nutrition, physical activity, obesity and tobacco control. It was supported by delivery plans on food, physical activity and tobacco control, including the provision of NHS Stop Smoking Services.

Since that time, a wide variety of policy documents have been published including:

- Active travel strategy (Department for Transport 2010)
- A smokefree future: a comprehensive tobacco control strategy for England (DH 2010)
- Be active be healthy. A plan for getting the nation moving (DH 2009a)
- Commissioning framework for health and well-being (DH 2007a)
- Delivering choosing health: making healthier choices easier (DH 2005a)
- Food 2030 (Department for Environment, Food and Rural Affairs 2010)
- Health challenge England – next steps for choosing health (DH 2006a)
- Health inequalities: progress and next steps (DH 2008b)
- Healthy weight, healthy lives: a cross-government strategy for England (DH 2008c)
- National stroke strategy (DH 2007b)
- NHS 2010 – 2015: from good to great. Preventative, people-centred, productive (DH 2009b)
- Our health, our care, our say (DH 2006b)
- Putting prevention first – vascular checks: risk assessment and management (DH 2008d)
- Tackling health inequalities – a programme for action (DH 2003)
- Tackling health inequalities: what works (DH 2005b)
- Tackling health inequalities: 2007 status report on the programme for action (DH 2008a)
- The NHS in England: the operating framework for 2006/7 (DH 2006c)
- The NHS in England: the operating framework for 2008/9 (DH 2007c)
- Wanless report: securing good health for the whole population (Wanless 2004).

Considerations

The Programme Development Group (PDG) took account of a number of factors and issues when developing the recommendations.

Introduction

- 1.1 Evidence was presented on how to prevent or reduce the combination of modifiable risk factors that can cause cardiovascular disease (CVD). The PDG also considered evidence and expert testimony on separate key risk factors. The reviews, together with the expert testimonies, are listed in [appendix A](#). Relevant existing NICE guidance was also summarised.
- 1.2 The key CVD risk factors that can be modified are: smoking, a poor diet, obesity, lack of physical activity and high alcohol consumption (Emberson et al. 2004; Yusuf et al. 2004). CVD risk factors tend to 'cluster together'. Thus people who smoke are more likely to have a poor diet and exercise less. This 'clustering' also tends to have a disproportionate effect on people who are disadvantaged, further accentuating health inequalities.
- 1.3 The PDG noted that approximately 100,000 people die from smoking-related diseases in the UK every year. Tobacco accounts for approximately 29% of deaths from cancer, 13% of cardiovascular deaths and 30% of deaths from respiratory disease (Action on Smoking and Health 2008). It also acknowledged that smoking accounts for over half the disproportionate burden of illnesses experienced by disadvantaged groups. The PDG strongly endorsed the national tobacco control measures set out in 'Beyond smoking kills' (Action on Smoking and Health 2008).
- 1.4 Approaches to helping people quit smoking, or to stop using other forms of tobacco, are covered by [NICE's guideline on tobacco](#). As a result, tobacco issues are not covered in this guidance.
- 1.5 The PDG noted that nicotine replacement therapy (NRT) can help to reduce CVD among people who are addicted to nicotine. It fully endorses the Tobacco

Advisory Group's recommendations on the regulation and marketing of NRT (Royal College of Physicians 2007). (The report advocates making NRT more acceptable and accessible to people who smoke and who find it impossible to quit.)

- 1.6 Taking a population-based approach, the PDG focused on the major contributors to CVD risk found in the typical UK diet. These include: a high intake of saturated and industrially-produced trans fatty acids and salt. It acknowledged and supports the work of the Food Standards Agency and other organisations (such as the Advertising Standards Authority) in helping to reduce general consumption of these products. However, it believes further action is essential to achieve greater reductions in premature death and disease and to reduce health inequalities.
- 1.7 A consistent message on lifestyle risk factors related to CVD is important.
- 1.8 The recommendations made in this guidance are not intended to replace existing advice to the public on diet. Rather, they will support the next stage of policy development to tackle the substantial burden of ill health from CVD and other chronic diseases (see also the [section on public health need and practice](#)). This includes the development of effective local and regional, population-level programmes to prevent CVD, diabetes, obesity, kidney disease and some common cancers.
- 1.9 In response to stakeholder feedback, the PDG considered the evidence on interventions targeting specific CVD risk factors. For example, in relation to salt, saturated fats and trans fatty acids.
- 1.10 Policies to promote physical activity were considered. However, physical activity, smoking and obesity have all been covered by other NICE guidance. In addition, as policies to increase the consumption of fresh fruit and vegetables are already agreed and widely implemented, the PDG did not consider them in detail.

Population versus individual approach

- 1.11 CVD risk factors can be reduced in a number of ways. Two different (and

frequently, complementary) approaches are often described as 'individual-' and 'population-based'. The former involves interventions which tend to give people direct encouragement to change their behaviour. It may involve providing information about the health risks of their current behaviour, advice (such as to be more active) or prescribing a treatment. Alternatively, it may involve altering the way the NHS and other organisations deliver prevention or healthcare services. Population-based interventions, on the other hand, aim to change the risks from the social, economic, material and environmental factors that affect an entire population. This can be achieved through regulation, legislation, subsidy and taxation or rearranging the physical layout of communities. The PDG focused on population-based approaches.

- 1.12 The NHS Health Check programme, which was being rolled out as this guidance was published, is aimed at all those aged 40 to 74. It will ensure everyone in this age range is assessed to determine their risk of heart disease, stroke, kidney disease and diabetes. It will also help them to reduce or manage that risk by providing individually tailored advice. This guidance complements the NHS Health Check programme by focusing on the CVD risk factors for an entire population. It will benefit the NHS, local authorities and industry, as well as individuals, by substantially reducing the number of people who need statin or anti-hypertensive medication. It will also enable services to focus more on those who still need treatment.
- 1.13 The PDG recognised that smoking cessation and other services that focus on helping individuals to change their behaviour have an important role to play in preventing CVD. Many of these services or approaches have been the focus of earlier NICE guidance.
- 1.14 Previously in the UK, interventions focused on individuals have tended to dominate CVD prevention activities and it is important to identify and treat those who are at higher risk. However, a much larger overall benefit could be achieved by making changes (albeit small ones) among any given population as a whole. As indicated by the Rose hypothesis, a small reduction in risk among a large number of people may prevent many more cases, rather than treating a small number at higher risk. A whole-population approach explicitly focuses on changing everyone's exposure to risk (Rose 2008).

- 1.15 There is growing evidence in support of the Rose hypothesis (see point above). For instance, data were recently pooled from six general population cohort studies involving 109,954 European participants. These data were analysed to compare different CVD strategies. The analysis found that a 10%, population-wide reduction in blood cholesterol, blood pressure and smoking prevalence would save approximately 9120 lives per million population over 10 years. In contrast, treating 40% of high-risk individuals with a 'polypill' (containing a statin, three half-dose anti-hypertensives and aspirin) would save about 3720 lives per million, even assuming complete, long-term adherence (Cooney et al. 2009).
- 1.16 It should be noted that, as indicated above, population- and individual-based approaches are both important and can be complementary. They do not have to be considered as alternatives for CVD prevention.

Population-based approaches: health inequalities

- 1.17 Both population- and individual-based approaches can influence health inequalities. However, population-based approaches may be more likely to reduce health inequalities. That is because there are many reasons why people who are disadvantaged might find it more difficult to change their behaviour than those who are affluent (Swann et al. 2009). As a result, some activities aimed at individuals may inadvertently increase health inequalities.
- 1.18 'Upstream', population-level interventions include: fiscal measures (such as taxation), national or regional policy and legislation (such as legislation on smokefree public places or the way food is produced); and environmental changes. They are not reliant on an individual's knowledge or ability to choose healthier options. Social and economic action can also change people's risk of CVD (in such cases, the health outcomes are side effects, albeit desirable).
- 1.19 The recommendations in this guidance do not, in the main, rely on individual choice. Rather, they aim to improve social environments and thus ensure the healthy choice is the easy choice. The emphasis is on changing policies, systems, regulations, the physical environment and other 'upstream' factors. This approach is likely to reduce, rather than increase, health inequalities and is congruent with NICE's guidance on behaviour change.

Population-level approaches: cost effectiveness

- 1.20 The financial modelling for this guidance shows that considerable cost savings could be made. Using a number of conservative assumptions, it found that halving CVD events across England and Wales (a population of 50 million) would result in discounted savings in healthcare costs of approximately £14 billion per year. Reducing mean population cholesterol or blood pressure levels by 5% would result in discounted annual savings of approximately £0.7 billion and £0.9 billion respectively. Reducing population cardiovascular risk by even 1% would generate discounted savings of approximately £260 million per year.
- 1.21 A 3 g reduction in mean daily salt intake by adults (to achieve a target of 6 g daily) would lead to around 14,000 to 20,000 fewer deaths from CVD annually (Strazzullo et al. 2009). Using conservative assumptions, this means approximately £350 million in healthcare costs would be saved. In addition, approximately 130,000 quality-adjusted life years (QALYs) would be gained. A mean reduction of 6 g per day would double the benefits: an annual saving of £700 million in healthcare costs and a gain of around 260,000 QALYs. A 3 g reduction in daily salt intake (a reasonably conservative estimate of what could be achieved) would reduce systolic blood pressure by approximately 2 mmHg. This would equate to a 2% decrease in the risk reduction model. Similarly, a reduction of IPTFA intake to approximately 0.7% of total fat energy might save approximately 571,000 life years, and some £2 billion.

Epidemiology

- 1.22 The PDG noted that CVD death rates are no longer falling among young and middle aged people in the UK (for instance, they are no longer falling among those aged 35 to 54 in the most socially disadvantaged groups in Scotland), the USA and Australia. This reflects a combination of adverse risk factors including smoking, a poor diet and disadvantage (O'Flaherty et al. 2009).
- 1.23 The prevalence of obesity and overweight continues to rise (National Heart Forum 2010). This, in turn, will lead to a rise in type 2 diabetes which can increase the risk of CVD. The risk of CHD is particularly high among women with diabetes (Barrett-Connor et al. 1991).

- 1.24 Epidemiological studies indicate that approximately 45 to 75% of the recent fall in CVD deaths in Westernised industrialised countries was the result of a reduction in the major risk factors. This includes a reduction in smoking prevalence and salt and saturated fat consumption.
- 1.25 The decline in CVD deaths noted above began long before effective treatments were introduced. In Finland and Iceland, coronary heart disease mortality rates declined by 63% between 1982 and 1997. Seventy five per cent of this was attributed to a reduction in smoking, blood pressure and cholesterol levels (Aspelund et al. 2009; Laatikainen et al. 2005). Sweden also observed a large reduction in CVD-related mortality. This was attributed to dietary reductions in cholesterol and blood pressure. In contrast, blood pressure and cholesterol levels in the UK have, thus far, only fallen a modest amount (Unal et al. 2005).
- 1.26 The fall in blood pressure and cholesterol levels seen in many Western populations are mainly attributable to lifestyle changes and changes in the wider determinants of health, rather than to medication. Changes to the wider determinants of health have often been as a consequence of public health policy. Preventive services are unlikely to tackle these wider determinants unless supported by national policies and systems (Capewell and O'Flaherty 2008).
- 1.27 Data from 'natural experiments' in a whole population (where there were no randomised controlled trials to assess the results) provide compelling evidence of the links between CVD and diet. Rapid and large falls in CVD deaths have been observed in diverse populations including those living in Poland, Mauritius, Finland, Iceland and Norway. In Poland, a 26% decrease in coronary deaths followed a substantial reduction in the consumption of animal fats and increased consumption of vegetable oils and fruit after the break-up of the Soviet Union (Zatonski and Willett 2005). In Mauritius, CVD deaths fell following the introduction of legislation to make it mandatory to use polyunsaturated oils as a substitute for highly saturated cooking oils (Dowse et al. 1995). A substantial fall in CVD deaths also followed a reduction in saturated fat intake in Finland, Iceland, Norway and elsewhere (Zatonski and Willet 2005, Laatikainen et al. 2005.) Conversely, rapid rises in CVD mortality have been seen in China and elsewhere, principally due to the adoption of a Western diet rich in saturated fats (Critchley et al. 2004).

- 1.28 The PDG discussed the nature and quality of evidence relevant to CVD prevention in whole populations. As indicated in consideration 3.71, this evidence is not drawn from randomised trials alone. The PDG felt it important to consider natural experiments and observational studies as well. The studies had to include a known cause–effect mechanism and an association which was both strong and consistent.

Primordial prevention

- 1.29 The PDG noted the importance of taking action to prevent the elevation of CVD risk factors among children, by ensuring they have a healthy, balanced diet and are physically active. This supports the principle of 'primordial prevention'. In this context, this means ensuring the low cholesterol and blood pressure levels seen in normal childhood are maintained throughout life (Labarthe 1999). This is crucial to prevent risk factor 'tracking' whereby, for instance, children with obesity, elevated blood pressure or raised cholesterol are very likely to become adults with above-average risk-factor levels. There is also a strong association between early abuse and neglect and subsequent depression, drug abuse and ischemic heart disease. In addition, some evidence suggests that childhood maltreatment, including both abuse and neglect, influences depression and heart disease in ways that are gender-dependent.
- 1.30 Maternal and fetal nutrition may have an important influence on whether or not people develop CVD later in life. Some evidence suggests that breastfeeding may protect against the development of risk factors for CVD. For example, it is associated with small reductions in blood pressure (Martin et al. 2005) and serum cholesterol. It is also associated with a reduced risk of being overweight (Harder et al. 2005) or having type 2 diabetes. However, the evidence on breastfeeding per se as a means of preventing CVD is weak (Owen et al. 2006; 2008).
- 1.31 The PDG recognised the many benefits of breastfeeding (including the benefits of continuing to breastfeed beyond the recommended first 6 months after birth). However, it concluded that there was insufficient evidence to make a recommendation related to CVD prevention. Note: NICE's guideline on maternal and child nutrition is referred to in the recommendations.

Single risk factors

- 1.32 The Strategy Unit report 'Food matters' (2008) concluded that some 70,000 premature UK deaths could be avoided with a healthier diet. More recently, the Food Standards Agency suggested that poor dietary health in the UK could contribute to up to 150,000 CVD deaths, and a further 155,000 cancer deaths, per year (Food Standards Agency 2009).
- 1.33 Much of the observational evidence that links diet to CVD is based on individual nutrients. However, the PDG recognised that their impact should also be considered in the context of the whole diet. It recognised that a 'healthier' diet is likely to comprise a favourable balance of food and nutrients and a reduction in the intake of harmful elements. In a typical Western diet, the latter include substantial amounts of salt, saturated fat and trans fats (Hu 2008).
- 1.34 A 'healthier' diet based on fruit, legumes, pulses, other vegetables, wholegrain foods, fish and poultry is consistently associated with lower levels of CVD risk factors (Fung et al. 2001; Lopez-Garcia et al. 2004) and lower CVD mortality (Heidemann et al. 2008; Osler et al. 2001). Vegetarian and 'Mediterranean' diets are also consistently associated with lower CVD mortality (Hu 2008; Mann et al. 2009). Interventions promoting these types of 'healthier' diet have been shown to be highly effective in reducing blood pressure, cholesterol and subsequently CVD (Appel et al. 1997; de Lorgeril et al. 1999).
- 1.35 The PDG emphasised its support for a healthy diet, as advocated in the 'eatwell' plate (Food Standards Agency 2007).
- 1.36 The PDG discussed whether it would be feasible for food labels to present calorie content in terms of the hours of physical activity required to use them up. There was no evidence to support this approach. However, there is evidence that presenting the total calorific content on food labels might help reduce intake (Ludwig and Brownell 2009).
- 1.37 Salt intake is a major determinant of CVD in the UK, mainly due to its effect on blood pressure. On average, 70% to 90% of people's intake comes from salt added during the manufacturing process; only 10% to 30% comes from adding it during cooking or at the table. Reducing the population's salt intake will,

therefore, involve encouraging the food industry to reduce the salt used in processed foods, as well as encouraging people to reduce the salt they add themselves. The PDG believes the former will best be achieved by using a combination of voluntary and regulatory action.

- 1.38 The UK population's per capita daily salt intake has fallen by 0.9 g in the last 5 years (a reduction of around 2% per year). This means people are consuming an average 8.6 g of salt per day. The reduction has mainly come about as a result of public awareness campaigns and a voluntary code of practice for industry, led by the Food Standards Agency. The voluntary agreement came into force in 2004 and was followed by progressive targets (in 2006 and 2009). The campaigns, which cost just £15 million, led to approximately 6000 fewer CVD deaths per year, saving the UK economy approximately £1.5 billion per annum. The PDG noted the new targets for 2010 and 2012.
- 1.39 Recent evidence shows that it is feasible to reduce the salt content of foods even further and that this would lead to substantial health benefits (Appel and Anderson 2010). For example, a 10% reduction in the salt content of items like bread and soup is not detected by consumers and does not, therefore, affect consumer choice. This would reduce both strokes and cardiovascular events. A reduction in mean salt intake of 3 g per day for adults (to achieve a target of 6 g daily) would lead to around 14,000 to 20,000 fewer deaths from CVD annually (Strazzullo et al. 2009). Using conservative assumptions, this means approximately 130,000 quality-adjusted life years (QALYs) would be gained and around £350 million would be saved in healthcare costs. A reduction of 6 g per day would lead to twice the gain: some 260,000 QALYs and an annual saving of £700 million in healthcare costs.
- 1.40 Many children in the UK may be consuming as much salt as adults (He et al. 2008). Indeed, single helpings of soup or 'meal deals' may contain as much as 3 g of salt. Currently, it is recommended that: children aged from 1 to 3 years should consume no more than 2 g salt a day (0.8 g sodium); from 4 to 6 years they should consume no more than 3 g salt a day (1.2 g sodium); and from 7 to 10 years a maximum of 5 g salt a day (2 g sodium) (Scientific Advisory Committee on Nutrition 2003).
- 1.41 The PDG discussed the benefits of substituting mono-unsaturated or

polyunsaturated fats for saturated fats (Hu 2008) and of reducing total fat consumption. Evidence suggests that reducing saturated fat intake from 14% to 7% of energy intake (to reach the levels seen in Japan) might prevent around 30,000 CVD deaths annually. Changes in CVD deaths are also addressed in consideration 3.27.

- 1.42 The PDG discussed whether to recommend 'low' rather than 'full-fat' products as there is a risk that if saturated fat is removed to create a 'low-fat' product, it could still be used in another product, with no overall reduction in the population's fat consumption. In addition, the Group felt that there was a risk that some fat content would be replaced with high levels of sugar, so losing some of the benefit of reducing calorie intake.
- 1.43 The PDG discussed the potential problems that might arise if low-fat milk was made cheaper than full-fat milk. In general, most of the population should aim for a low-fat diet. However, full-fat products are the 'healthier' choice for some groups. Children aged under 2, for instance, may need the additional calories and fat-soluble vitamins found in full-fat milk and the PDG noted that full-fat milk is recommended for this group when cow's milk is being used. The Group was concerned that increasing the relative price of full-fat milk (to make lower-fat milk a more attractive option) could place an added financial burden on disadvantaged groups. However, it also believed that this added burden could be addressed by the tax and benefits system.
- 1.44 The PDG agreed with the 2009 World Health Organization (WHO) review of industrially-produced trans fatty acids (IPTFAs), also known as partially hydrogenated vegetable oils (PHVOs). In line with the WHO review, the PDG concluded that IPTFAs are unnecessary and 'toxic' and should be eliminated from foodstuffs. The WHO review states that because IPTFAs are produced by partial hydrogenation they are not normally present naturally in foods and have no known health benefits. The review defined them as 'industrial additives'. It recommended that food services, restaurants, and food and cooking fat manufacturers should avoid their use (Uauy et al. 2009). A recent study commissioned by the European Parliament advocated that an EU-wide ban on IPTFAs should be considered. The PDG noted that IPTFAs have been successfully banned in Denmark and New York City.

- 1.45 The WHO review of industrially-produced trans fatty acids noted that people who use partially hydrogenated vegetable oils (PHVOs) for cooking would have mean trans fatty acids intakes considerably higher than the national average. The same would be true for those who eat a high proportion of industrially processed or 'fast food'. The review noted that '...replacing TFAs [trans fatty acids] with vegetable oils high in polyunsaturated fatty acids (PUFA) and monounsaturated fatty acids (MUFA) is the preferred option for health benefits... Eliminating use of TFA-containing PHVO [partially hydrogenated vegetable oils] should be considered as hazard removal, in line with risk management models used to address many other food safety issues.' The PDG concurred.
- 1.46 Assuming a linear dose response, if less than 1% of food energy came from IPTFAs, between 4500 and nearly 7000 lives might be saved in England.
- 1.47 The PDG commended the substantial efforts made by much of the UK-based food industry and the Food Standards Agency to remove IPTFAs from the UK food chain. It also noted the review of trans fats by the Scientific Advisory Committee on Nutrition (SACN). New concerns have now emerged, particularly in relation to imported products and fried food prepared in some settings. People from disadvantaged groups are likely consume more of these products which, in turn, could be an important contributory factor to health inequalities.
- 1.48 Some products (this includes fried food from take-away venues) may contain substantial levels of IPTFAs. The PDG noted that some people may be consuming this sort of meal on a frequent basis. Hence, it considered that IPTFA consumption across different population groups is relevant, and that simply looking at average intake will not suffice.
- 1.49 The Group discussed the links between sedentary behaviour and CVD, and the need to encourage people to be more physically active. However, evidence on how to address sedentary behaviour is not well developed and remains an area for further study.
- 1.50 The PDG noted the importance of ensuring physical activity is enjoyable and can be incorporated into daily life. Effective interventions to encourage physical activity are possible both nationally and locally. For example, NICE has made recommendations on how to help people to be physically active in [guidelines on](#)

walking and cycling, physical activity: brief advice for adults in primary care, exercise referral schemes to promote physical activity, physical activity and the environment, physical activity in the workplace and physical activity for children and young people.

Achieving change: national level

- 1.51 Public, private, voluntary and community sector organisations all have a role to play in preventing CVD at national level. For example, measures to encourage commercial markets to be health promoting could be highly cost saving (Abelson 2003; Catford 2009; Trust for America's Health 2008; Wanless 2004). Such measures might include: improving the content of products (re-formulation); controls on the marketing of energy-dense, nutrient-poor foods, foods high in fat, salt or sugar and processed foods; and package labelling.
- 1.52 Those preparing, producing and selling food have a particularly important role in improving the diet of the nation. Although such organisations must consider their commercial interests, the PDG considers it also reasonable to expect them to work with others to help prevent CVD. It takes this view in light of the diseases and deaths caused by CVD (and the consequent costs to the exchequer and society). The PDG recognised that many responsible commercial organisations are already taking positive action. Many organisations, for instance, have taken praiseworthy action to reduce the salt or saturated fat content of food, or to remove industrially-produced trans fats from their processes (Brownell and Warner 2009).
- 1.53 The PDG believes that more could be done to assist those sectors which have, for a variety of reasons, been unable or unwilling to take positive action. Such action would not only benefit the population, but would also help provide a 'level playing field', where all businesses work to the same standard. Brownell and Warner (2009) state: 'there is an opportunity if the industry chooses to seize it – an opportunity to talk about the moral high ground and to occupy it'.
- 1.54 Advertising and other marketing activities have an important influence on consumption patterns. They encourage people to change brands and they also encourage overall increases in consumption of related brands.

- 1.55 The PDG noted the work of the Advertising Standards Authority and others to develop the existing overarching regulatory system that controls food advertising aimed at children. Furthermore, the Group noted and praised the important work involved in developing the current UK advertising regulations. The Ofcom/Food Standards Agency restrictions on TV advertisements for foods high in salt, fat or sugar aimed at children are a good example of these regulations being put into practice. However, the PDG felt that children are particularly vulnerable and need further protection from commercial pressures. The 'Sydney principles' (developed by the International Obesity Taskforce Working Group in Sydney, Australia [Swinburn et al. 2007]) provide for the type of protection that it believes is still needed in the UK. The principles state that any action to reduce marketing to children should: support their rights; afford them substantial protection; be statutory in nature; take a wide definition of commercial promotion; guarantee commercial-free childhood settings; include cross-border media; and be evaluated, monitored and enforced. In other words, the PDG considers that a comprehensive model which includes marketing, advertising, promotion and product placement would provide the necessary protection.
- 1.56 Advertising restrictions are gaining support. In 2007, WHO called for recommendations to restrict food marketing to children. Examples of jurisdictions that have successfully introduced such restrictions now include Norway, Sweden, Belgium, Greece, Romania and Quebec.
- 1.57 National policy has an important role in changing the risk factors faced by a population (both direct, indirect and unintentional). However, the PDG recognised that developing and implementing such policy is a highly complex process: it is not linear and rarely moves simply from design to implementation. In addition, the Group acknowledged that evidence alone is rarely sufficient to bring about policy change.
- 1.58 The way research evidence influences the policy process and gets translated into action can be explained by a model such as Kingdon's (1995) 'policy windows'. This suggests that 'windows' open (and close) by the coupling (or de-coupling) of three 'streams': problems, policies and politics. It can be applied nationally and locally (Exworthy et al. 2002). Other policy models also provide a potentially valuable insight into this complex, non-linear process. Whichever model is applied, however, all parties concerned need to acknowledge that the problem is

important. In addition, it has to be possible to devise policies to remedy it, and there has to be a political willingness to act. Examples from other countries of where policy has been successfully used to reduce CVD are particularly valuable in showing what could be achieved in the UK.

- 1.59 This guidance has made the case unequivocally that CVD is a major and, most significantly, a preventable problem. It has also identified policy options which would be effective at the population level.
- 1.60 Nationally, the campaigning activities of charities such as the British Heart Foundation, the National Heart Forum and others focused on chronic diseases are particularly influential.
- 1.61 Voluntary action may be effective. However, if the pace of change is insufficient mandatory measures may be needed. The success of legislation banning tobacco advertising and smoking in public places followed unsuccessful voluntary agreements with industry. This also demonstrates the effectiveness of national government action to improve the public's health.

Achieving change: the regional, community and private sectors

- 1.62 Regional government offices and strategic health authorities could make an important contribution to CVD prevention. For example, they could negotiate to maximise the number of local area agreements (LAAs) that include 'stretch' targets related to CVD. They could also ensure all PCT 'world class commissioning' strategies for healthcare adequately address CVD prevention at a population and individual level. This involves having long-term strategies for sustainable change that avoid an over-dependence on medical solutions. There is also scope for effective action by public sector bodies at a sub-regional level. This was the case in Merseyside where, prior to the national ban on smoking in public places, a private members bill supporting local smoking restrictions had been developed in case national legislation was delayed.
- 1.63 Local authorities and PCTs, working with the private and 'the third sector' in local

strategic partnerships (LSPs), have demonstrated their commitment to CVD prevention. (The third sector includes voluntary and community groups, social enterprises, charities, cooperatives and mutual organisations.) For example, many have established health and wellbeing partnerships. In addition, 5 of the 15 most popular improvement targets in LSP local area agreements relate directly or indirectly to CVD prevention. Fifty-one LSPs have also selected national indicator (NI) 121 (mortality rate from all circulatory diseases for those aged under 75) as an indicator for the current round of local area agreements, which runs to 2011.

- 1.64 Only 5 (6.7%) of the 74 green flags awarded to the 152 LSPs in England as part of their first comprehensive area assessment related to public health (green flags represent exceptional performance or outstanding improvement); 19 (30.6%) of the 62 red flags awarded related to public health. Of these, 15 (24.2%) related directly or indirectly to CVD prevention. (Red flags indicate the need to improve outcomes.) The first comprehensive area assessment reports were published in December 2009.
- 1.65 Local advocacy by 'third sector' groups and organisations, including the voluntary sector, is an important part of CVD prevention activities. For example, it could have an impact on planning applications for fast-food outlets.
- 1.66 Addressing the needs of disadvantaged groups involves working beyond geographical boundaries with different communities. The leaders of some communities may be able to deliver CVD prevention programmes effectively. However, it should not be assumed that all community leaders will be able or willing to participate, or that it would be appropriate.

Evidence

- 1.67 Many studies considered in the reviews of effectiveness for this guidance were carried out some years ago (that is, studies reporting on regional, population-level programmes). The majority were published before 2000, with a substantial number published before 1990. This reflects, in part, the decision to include studies such as the North Karelia and HeartBeat Wales CVD population programmes which took place in the 1970s and 1980s. The age of the studies means a number of factors have to be taken into account when considering

effectiveness. In particular:

- The risk factor levels for CVD are likely to have changed. For instance, intake of salt and saturated fat and the prevalence of smoking may have fallen, while a sedentary lifestyle and rates of obesity may have increased.
- The political and cultural environments which potentially influence the effectiveness of interventions may have changed substantially.

1.68 A number of issues have to be taken into account when considering evidence of the effectiveness of population-level interventions:

- Changes may have come about inadvertently, for instance, as a result of a change in agriculture practice following economic developments. Any evaluation of such changes is likely to have been carried out after the event, using proxy data.
- It is often difficult to find a suitable control population where conditions are relatively similar to those in the intervention group. Where a control group is used, there is often contamination between the two groups which can lead to an underestimation of any beneficial effects.
- It is ethically wrong, and practically impossible, to randomly allocate country-wide populations to controlled trials. The best evidence available has to be gleaned from other research designs, in particular, natural experiments, epidemiological models and cost effectiveness and cost-benefit analyses.

1.69 The potential effect of any intervention may change according to the initial level of risk. For instance, it may be easier to reduce salt consumption among a population with a high intake than among a population where intakes of salt are lower. However, epidemiological modelling suggests that substantial reductions in CVD rates can be achieved by reducing the major risk factors as much as possible. This is the case even in countries where CVD mortality rates are already relatively low, such as Italy (Palmieri et al. 2009).

1.70 The economic modelling used for this guidance was based on conservative assumptions. Nevertheless, it suggested that the recommended population-based approaches are likely to be consistently cost saving (see [considerations 1.33 and 1.45](#) and [appendix C](#)).

Interpreting the evidence

- 1.71 The PDG recognised that empirical data alone, even from the best conducted investigation, seldom provides a sufficient or complete basis for making recommendations. Rather, it requires interpretation and analysis. Therefore, the PDG developed its recommendations using the best available empirical data and inductive and deductive reasoning, using prior knowledge and understanding and existing models and theories. The development of policy to reduce mortality and morbidity from CVD flow from these inductive and deductive interpretations.
- 1.72 The PDG acknowledged that the traditional hierarchy of evidence does not resolve all the problems associated with empirical data. For example, while it explicates the degree of bias attributable to poor internal validity, it does not answer it completely. Nor does it deal with external validity, that is, the degree to which findings are transferable to other experimental settings or to practice. The PDG therefore, took a broad approach to the evidence available to it.

Other issues

- 1.73 Many of the risk factors that the PDG considered are also associated with other health-related conditions including some common cancers, chronic respiratory disease, obesity, diabetes, kidney disease and mental wellbeing. The strategies discussed in this guidance are likely to help prevent some of these other health conditions. (Certainly, they are not likely to increase the risk of any common chronic diseases.) However, it was not possible to consider each of these other health conditions in detail.
- 1.74 Daily consumption of products containing plant sterols and stanols may reduce blood cholesterol by about 10%, and so may reduce CVD mortality substantially. However, it was not clear how a recommendation on their use might impact on inequalities in health. The PDG believes this issue deserves further attention.
- 1.75 Agricultural and transport policy and practice (and associated issues) has a powerful impact on people's diet and physical activity levels. It also has an impact on climate change and sustainable development (which, in turn, can affect health). An analysis of transport patterns in London and how they could be

changed indicates the extent of this synergy (Woodcock et al. 2009). One scenario described a 'sustainable transport future' featuring more physically active travel and low-emission vehicles to cut CO₂ emissions by three-fifths. The report points out that physically active travel could bring substantial benefits: the incidence of heart disease and stroke could fall by 10% to 20%, with reductions in breast cancer (12% to 13%), dementia (8%) and depression (5%). Reductions in air pollution would bring additional health benefits.

- 1.76 Agriculture and food production account for 10% to 12% of greenhouse gas emissions (Friel et al. 2009). Livestock farming is responsible for four-fifths of these emissions (including methane). A 30% fall in adult consumption of saturated fat from animal sources (and an associated fall in livestock-related greenhouse gas emissions) would reduce heart disease by around 15% in the UK. If additional, positive effects are taken into account (such as a reduction in the prevalence of obesity and diet-related cancers) the health gains might be even more substantial.
- 1.77 Monitoring is crucial. The PDG commended the regular Food Standards Agency/ Department of Health-sponsored surveys. These include the National diet and nutrition survey (NDNS) and the Low income diet and nutrition survey (LIDNS).

Recommendations for research

The Programme Development Group (PDG) recommends that the following research questions should be addressed. It notes that 'effectiveness' in this context relates not only to the size of the effect, but also to cost effectiveness rapidity and duration of effect. It also takes into account any harmful or negative side effects.

1 Marketing bans in other countries

What has been the impact of marketing bans on foods high in fat, sugar or salt in Norway, Sweden, Romania and Quebec? What lessons can the UK learn?

2 Inequalities and their contribution

How do inequalities contribute to:

- the consumption of trans fats, poly-unsaturated and mono-unsaturated fats, fresh fruit and vegetables and stanols?
- variations in physical activity levels among different population groups?

3 Widening health inequalities

CVD prevention aimed at individuals tends to widen health inequalities. Is there any effective way to ameliorate this? Conversely, is there any further empirical evidence that population-wide policy interventions or CVD preventive strategies narrow the inequalities gap?

4 Food taxes and subsidies

What impact would food taxes and subsidies, particularly in relation to salt, saturated fats and fruit and vegetable consumption, have on CVD risk and health inequalities?

5 Natural experiments

Could 'natural' experiments aid understanding of the impact that 'upstream' factors such as the social, economic and physical environment have on the incidence and rates of cardiovascular disease (CVD)? How could CVD modelling be developed in the UK, particularly to examine health inequalities?

6 Regular daily intake of 2.5 g of stanols or sterols

What effect would a regular daily intake of 2.5 g of stanols or sterols have on the incidence of cardiac and stroke events? How can we best evaluate stanols in terms of their acceptability, affordability, effectiveness, cost-effectiveness and impact on health inequalities?

More detail on the gaps in the evidence identified during development of this guidance is provided in [appendix D](#).

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Appendix A: Membership of the Programme Development Group (PDG), the NICE project team and external contractors

Programme Development Group

PDG membership is multidisciplinary, comprising public health practitioners, clinicians (both specialists and generalists), local authority officers, teachers, social care professionals, representatives of the public, patients, carers, academics and technical experts as follows.

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Evidence reviews

Review 1: Prevention of cardiovascular disease at population level (Question 1; phase 1) was carried out by the West Midlands Health Technology Assessment Collaboration (WMHTAC), University of Birmingham. The principal authors were: Mary Pennant, Wendy Greenheld, Anne Fry-Smith, Sue Bayliss, Clare Davenport and Chris Hyde.

Review 2: Prevention of cardiovascular disease at population level (Question 1; phase 2) was carried out by WMHTAC, University of Birmingham. The principal authors were: Mary Pennant, Wendy Greenheld, Anne Fry-Smith, Sue Bayliss, Clare Davenport and Chris Hyde.

Review 3: Prevention of cardiovascular disease at population level (Question 1; phase 3) was carried out by WMHTAC, University of Birmingham. The principal authors were: Mary Pennant, Wendy Greenheld, Anne Fry-Smith, Sue Bayliss, Clare Davenport and Chris Hyde.

Review 4: Barriers to, and facilitators for, the effectiveness of multiple risk factor programmes aimed at reducing cardiovascular disease within a given population: a systematic review of qualitative research was carried out by the Peninsula Technology Assessment Group at the Peninsula Medical School, Universities of Exeter and Plymouth.

The principal authors were: Ruth Garside, Mark Pearson, Kate Ashton, Tiffany Moxham and Rob Anderson.

Primary research

Review 5: Population and community programmes addressing multiple risk factors to prevent cardiovascular disease: A qualitative study into how and why some programmes are more successful than others was carried out by the Peninsula Technology Assessment Group at the Peninsula Medical School, Universities of Exeter and Plymouth. The principal authors were: Ruth Garside, Mark Pearson, Tiffany Moxham, and Rob Anderson.

Economic analysis

Review 6: Prevention of cardiovascular disease at population level (Question 1; cost-effectiveness) was carried out by WMHTAC, University of Birmingham. The principal authors were: Lazaros Andronis, Pelham Barton, Sue Bayliss and Chris Hyde.

Modelling report: Prevention of cardiovascular disease at population level: modelling strategies for primary prevention of cardiovascular disease was carried out by WMHTAC, University of Birmingham. The principal authors were: Pelham Barton and Lazaros Andronis.

Fieldwork

Fieldwork on prevention of cardiovascular disease at population level was carried out by Greenstreet Berman.

Expert testimony

Report 1: The effectiveness of physical activity promotion interventions was carried out by Charlie Foster and Nick Cavill, British Heart Foundation Health Promotion Research Group.

Report 2: Health policy analysis was carried out by Mark Exworthy, School of Management, Royal Holloway University of London.

Report 3: Expert testimony on salt and cardiovascular disease was carried out by Francesco Cappuccio, Clinical Sciences Research Institute, University of Warwick Medical

School.

Report 4: The relationship between commercial interests and risk of cardiovascular disease was carried out by Jane Landon, National Heart Forum.

Report 5: Regional development of a population-based collaborative CVD prevention strategy: the experience of NHS West Midlands was carried out by Kiran Patel, University of Birmingham and West Midlands Strategic Health Authority.

Report 6: NICE guidance on the prevention of CVD at population level: evidence from the Co-operative Group was carried out by Cathryn Higgs, the Co-operative Group.

Report 7: Population and community programmes addressing multiple risk factors to prevent cardiovascular disease (CVD): addendum to qualitative study produced by Peninsula Technology Assessment Group for NICE: CVD programme – Heart of Mersey (HoM) was carried out by Robin Ireland, Heart of Mersey.

Report 8: Expert testimony paper on the independent evaluation of 'have a heart Paisley' phase one (Scotland's national CHD prevention demonstration project) was carried out by Avril Blamey, Avril Blamey and Associates.

Report 9: Expert testimony on the public health harm caused by industrially produced trans fatty acids and actions to reduce and eliminate them from the food system in the UK was carried out by Paul Lincoln, National Heart Forum.

Report 10: Prevention of cardiovascular disease at a population level: evidence on interventions to address dietary fats was carried out by Modi Mwatsama, Heart of Mersey.

Report 11: CVD risk factors: paradigms and pathways was carried out by Simon Capewell, University of Liverpool.

Report 12: CVD prevention in populations: lessons from other countries was carried out by Simon Capewell, University of Liverpool.

Report 13: Will CVD prevention widen health inequalities? was carried out by Simon Capewell, University of Liverpool.

Report 14: Food manufacturer's perspective was carried out by Frances Swallow and

Nicola Currie, Greencore.

Appendix B: Summary of the methods used to develop this guidance

Introduction

The reviews, expert reports and economic analysis include full details of the methods used to select the evidence (including search strategies), assess its quality and summarise it.

The minutes of the PDG meetings provide further detail about the Group's interpretation of the evidence and development of the recommendations.

All supporting documents are listed in [appendix E](#).

Key questions

The key questions were established as part of the scope. They formed the starting point for the reviews of evidence and were used by the PDG to help develop the recommendations.

The overarching questions were:

- Which multiple risk-factor interventions are effective and cost effective in preventing the onset of cardiovascular disease (CVD) within a given population (primary prevention)?
- How does effectiveness and cost effectiveness vary between different population groups?

The subsidiary question was:

What barriers and facilitators influence the effectiveness of multiple risk-factor programmes aimed at reducing CVD (or the risk factors associated with CVD) among a given population (including subgroups experiencing health inequalities, where the data allows)?

These questions were made more specific for each review (see reviews for further details).

Single risk factors were considered using expert testimony. See [appendix C](#).

Reviewing the evidence

Three reviews of effectiveness (reviews 1,2 and 3), one qualitative review (review 4), one primary study of barriers and facilitators (review 5) and one review of cost effectiveness (review 6) were conducted.

Identifying the evidence

The following databases were searched for randomised controlled trials (RCTs); controlled before-and-after trials; cohort studies; case-control studies; before-and-after studies; and interrupted time series (from 1970 onwards):

- ASSIA (Applied Social Science Index and Abstracts)
- CINAHL (Cumulative Index of Nursing and Allied Health Literature)
- Cochrane Database of Systematic Reviews (CDSR)
- Cochrane Library (Wiley)
- Database of Abstracts of Reviews of Effects (DARE)
- DH-Data
- EMBASE
- Health Management Information Service (HELMIS)
- Health Technology Assessment (HTA)
- HMIC (Health Management Information Consortium)
- King's Fund Database
- MEDLINE
- MEDLINE In Process

- PsycINFO

The following websites were also searched:

- Centre for the Evaluation of Public Health Interventions, London School of Hygiene & Tropical Medicine
- Cochrane Public Health Group
- Health evidence
- The Campbell Collaboration
- The Evidence for Policy and Practice Information and Coordinating Centre

Further details of the databases, search terms and strategies used are included in the review reports.

Selection criteria

Studies were included in the effectiveness reviews if they:

- Involved a population at least the size of one covered by a UK primary care trust.
- Were based in an Organisation for Economic Co-operation and Development (OECD) country, another developed country or within a World Health Organization region.
- Included primary prevention strategies to tackle at least two of the key risk factors for CVD.

Studies were excluded if they were:

- Confined to populations clinically diagnosed as being at high risk of CVD or diagnosed with CVD.
- Published before 1970.
- Not published in English.

Quality appraisal

Included papers were assessed for methodological rigour and quality using the NICE

methodology checklist, as set out in the NICE technical manual 'Methods for the development of NICE public health guidance'. Each study was graded (++, +, -) to reflect the risk of potential bias arising from its design and execution.

Study quality

++ All or most of the checklist criteria have been fulfilled. Where they have not been fulfilled, the conclusions are very unlikely to alter.

+ Some of the checklist criteria have been fulfilled. Those criteria that have not been fulfilled or not adequately described are unlikely to alter the conclusions.

- Few or no checklist criteria have been fulfilled. The conclusions of the study are likely or very likely to alter.

Economic analysis

The economic analysis consisted of a review of economic evaluations (review 6) and a cost effectiveness analysis.

Review of economic evaluations

The same protocol was used to conduct the literature reviews for all phases of the review. In a minor departure from the protocol, the list of included study designs was extended to include cost-consequences.

The following databases were searched from 1970 to August 2008:

- ECONLIT
- EMBASE
- MEDLINE
- NHS EED database (Cochrane Library, Wiley).

The search was limited to articles published from 1970 onwards and in the English language.

In addition to the general bibliographic database searches, specific searches were conducted for each programme found during the general searches to ensure all published evaluations, particularly economic evaluations, were identified.

Study quality was assessed using an evidence form based on the 'Methods for the development of NICE public health guidance' (second edition 2009) and adapted to reflect the parameters of this review. It was supplemented with questions from the Drummond checklist (Drummond MF [1996] Guidelines for authors and peer reviewers of economic submissions to the BMJ. London: BMJ).

The selection criteria were the same as for the effectiveness reviews (see pages 53 to 54). The following study types were included: cost–benefit, cost–effectiveness and cost–utility analyses.

Modelling

An economic model was constructed to incorporate data from the reviews of effectiveness and cost effectiveness. The results are reported in [Prevention of cardiovascular disease at population level: modelling strategies for primary prevention of cardiovascular disease](#).

Fieldwork

Fieldwork was carried out to evaluate how relevant and useful NICE's recommendations are for practitioners and how feasible it would be to put them into practice. It was conducted with practitioners and commissioners who are involved in activities relevant to cardiovascular disease. They included those working in the food industry (such as food retailers, food producers and trade associations), local planning departments, local authority catering representatives and representatives from the NHS and PCTs.

The fieldwork comprised:

- Eight half-day workshops.
- Nine case studies (interviews involving practitioners, commissioners and professionals). Each reviewed recommendations made in the following specific areas:
 - health impact assessments
 - CVD prevention programmes (two case studies)

- take-away planning
 - training caterers
 - public sector food provision
 - physically active travel
 - the dairy industry
 - reformulation of food.
- Telephone interviews covering the following topics: mass media, government departments, and key food industry producers.

The studies were commissioned to ensure there was ample geographical coverage. The main issues arising from these studies are set out in [appendix C under fieldwork findings](#). See the [full fieldwork report on prevention of cardiovascular disease at population level](#).

How the PDG formulated the recommendations

At its meetings between September 2008 and July 2009, the PDG considered the evidence of effectiveness, expert reports and cost effectiveness to determine:

- whether there was sufficient evidence (in terms of strength and applicability) to form a judgement
- where relevant, whether (on balance) the evidence demonstrates that the intervention or programme/activity can be effective or is inconclusive
- where relevant, the typical size of effect (where there is one)
- Whether the evidence is applicable to the target groups and context covered by the guidance.

The PDG developed draft recommendations through informal consensus, based on the following criteria:

- Strength (type, quality quantity and consistency) of the evidence.
- The applicability of the evidence to the populations/settings referred to in the scope.

- Effect size and potential impact on the target population's health.
- Impact on inequalities in health between different groups of the population.
- Equality and diversity legislation.
- Ethical issues and social value judgements.
- Cost effectiveness (for the NHS and other public sector organisations).
- Balance of harms and benefits.
- Ease of implementation and any anticipated changes in practice.

Where possible, recommendations were linked to evidence statements (see [appendix C](#)). Where a recommendation was inferred from the evidence, this was indicated by the reference 'IDE' (inference derived from the evidence).

The draft guidance, including the recommendations, was released for consultation in October 2009. At its meeting in December 2009, the PDG amended the guidance in light of comments from stakeholders and experts and the fieldwork. The guidance was signed off by the NICE Guidance Executive in May 2010.

Appendix C: The evidence

This appendix lists the evidence statements from four reviews, a cost-effectiveness review and a primary research study provided by external contractors (see [appendix A](#)) and links them to the relevant recommendations. (See [appendix B](#) for the key to quality assessments.)

The evidence statements are presented here without references, these can be found in the full reviews (see [appendix E](#)).

The appendix also sets out a brief summary of findings from the economic analysis.

The 4 reviews (reviews 1 to 4), the primary research study (review 5) and the cost-effectiveness review (review 6) are:

- Evidence reviews:
 - Review 1: Prevention of cardiovascular disease at population level (Question 1; phase 1)
 - Review 2: Prevention of cardiovascular disease at population level (Question 1; phase 2)
 - Review 3: Prevention of cardiovascular disease at population level (Question 1; phase 3)
 - Review 4: Barriers to, and facilitators for, multiple risk factor programmes aimed at reducing cardiovascular disease within a given population: a systematic review of qualitative research
- Primary research:
 - Review 5: Population and community programmes addressing multiple risk factors to prevent cardiovascular disease: A qualitative study into how and why some programmes are more successful than others
- Cost-effectiveness review:
 - Review 6: Prevention of cardiovascular disease at population level (Question 1;

cost-effectiveness)

Evidence statement R3.E1a indicates that the linked statement is numbered E1a in review 3. **Evidence statement R5.12** indicates that the linked statement is numbered 12 in the primary research study (review 5). **Evidence statement ER1** indicates that the linked statement is from expert report 1 (see additional evidence). **Evidence statement CE1** indicates that the linked statement is numbered 1 in the cost-effectiveness review (review 6). '

The [reviews](#), [economic analysis](#) and [additional evidence](#) are available. Where a recommendation is not directly taken from the evidence statements, but is inferred from the evidence, this is indicated by **IDE** (inference derived from the evidence).

Where the PDG has considered other evidence, it is linked to the appropriate recommendation below. It is also listed in the additional evidence section of this appendix. This includes evidence used to develop other NICE guidelines and guidance.

Recommendation 1: evidence statement R3.E1m; additional evidence ER3

Recommendation 2: evidence statements R3.E1b; R3E1h; R3.E1i; R3.E1j; R3.E1k; additional evidence ER10

Recommendation 3: additional evidence ER9; ER10

Recommendation 4: additional evidence ER4; ER6; CG43 (1)

Recommendation 5: additional evidence ER4

Recommendation 6: additional evidence ER3; ER4; ER6; CG43 (2)

Recommendation 7: additional evidence ER1; ER10; ER13

Recommendation 8: additional evidence ER10; ER13

Recommendation 9: additional evidence ER1; CG43 (3)

Recommendation 10: additional evidence CG43 (4)

Recommendation 11: evidence statements R4.18a; R4.18b

Recommendation 12: IDE

Recommendation 13: evidence statements R3.E2a–f, R4.2a–c, R4.17a–d, R4.18a–c, R4.19a, R4.20a, R4.21a–c, R4.22a, R4.23a–b, R4.24a–d, R4.25a–d, R4.26a–d, R5.2

Recommendation 14: evidence statements R3.E1a–o, R3.E2a–f, R3.E3a–c, R4.14a–b, R5.5, R5.7, R5.10, CE 1–9; additional evidence ER 7, ER 8, ER 13

Recommendation 15: evidence statements R4.3a, R4.3b, R4.10a–d, R4.11a, R4.11b, R4.12a, R4.13a–d, R4.15a, R4.15b, R5.2, R5.4, R5.6, R5.7

Recommendation 16: evidence statements R4.1b, R4.7c, R4.10d, R5.2, R5.3

Recommendation 17: evidence statements R4.16a–c, R5.12

Recommendation 18: evidence statements R3.E1n, R3.E3c, R4.4a, R4.9f, R4.18a, R4.18c; additional evidence ER 1

Recommendation 19: evidence statements R3.E5c, R4.18a–c; additional evidence ER 4

Recommendation 20: evidence statements R3.E1a–m, R3.E3c, R4.4a, R4.9e, R4.18a, R4.18b, R4.25e; additional evidence ER 3, ER 9, ER 10

Recommendation 21: evidence statements R4.1b, R4.3a, R4.3b, R4.7a–c, R4.8a–d, R4.16a–c, R4.17a–d, R5.3, R5.7, R5.8, R5.9, R5.11, R5.12; additional evidence ER 5, ER 7, ER 8

Recommendation 22: evidence statements R4.3a, R4.18a, R4.18c, R5.10; additional evidence ER 1, ER 5, ER 7, ER 8, ER 12, IDE

Recommendation 23: evidence statements R3.E3a, R3.E3c, R4.18a, R4.18b; additional evidence ER 3, ER 4, ER 9, ER 10

Recommendation 24: evidence statements R4.9e; additional evidence ER 3, ER 9, ER 10

In addition, the approach taken in recommendations 1 to 12 is supported by the following evidence statements: R4.3a, R4.3b, R4.4a, R4.18a, R4.18b, R4.18c, R5.9 and additional evidence ER10, ER11, ER12, ER13.

Evidence statements

Please note that the wording of some evidence statements has been altered slightly from those in the evidence reviews to make them more consistent with each other and NICE's standard house style.

Evidence statement R3.E1a

CVD mortality and morbidity: Limited evidence from 3 out of 38 programme evaluations using different summary effect measures demonstrate a mixed effect of multiple risk factor interventions (MRFI) on CVD mortality (the majority of programmes were beneficial) with two controlled before-and-after (CBA) studies demonstrating a net decrease in CVD mortality and one randomised controlled trial (RCT) demonstrating no net change. Limited evidence from 4 out of 38 programme evaluations, using different summary effect measures, demonstrate a mixed effect of MRFI on CVD morbidity (the majority disbeneficial) with one CBA study and one RCT demonstrating a net increase in morbidity and one RCT demonstrating no net change in morbidity. The effect of one programme on morbidity and mortality is unclear.

Evidence statement R3.E1b

Blood cholesterol: A large body of evidence from 15 CBA studies and 5 RCTs demonstrates a mixed direction of effect (majority of programmes beneficial) of MRFI programmes on blood cholesterol. Fourteen studies (nine CBA and five RCTs) demonstrate a beneficial net effect. Four CBA studies demonstrate no net effect or inconclusive net effects and two CBA studies demonstrate a disbeneficial net effect. The most optimistic result was from a CBA study, reporting a 0.7mmol/l net reduction in blood cholesterol. The least optimistic result was from a CBA study, reporting a +0.5mmol/l net increase in blood cholesterol.

Evidence statement R3.E1c

Diastolic and systolic blood pressure: A large body of evidence demonstrates a mixed direction of effect (majority of programmes beneficial) in favour of MRFI programmes on diastolic and systolic blood pressure. Fourteen CBA studies and five RCTs demonstrate a mixed direction of effect (majority of programmes beneficial) on diastolic blood pressure. Twelve studies (seven CBA studies and five RCTs) demonstrate a beneficial net effect. Five CBA studies demonstrate no net effect or inconclusive net effects and two CBA studies demonstrate a disbeneficial net effect. The most optimistic result was from a CBA

study, reporting a 5.5mmHg net reduction in diastolic blood pressure. The least optimistic result was from a CBA study, reporting a 6mmHg net increase in diastolic blood pressure. Fourteen CBA studies and five RCTs demonstrate a mixed effect (majority of programmes beneficial) on systolic blood pressure. Ten studies (five CBA studies and five RCTs) demonstrate a beneficial net effect. Five CBA studies demonstrate no net effect or inconclusive net effects and four CBA studies demonstrate a disbeneficial net effect. The most optimistic result was from a CBA study, reporting an 11.8 mmHg net reduction in systolic blood pressure. The least optimistic result was from a CBA study, reporting a 5mmHg net increase in systolic blood pressure.

Evidence statement R3.E1d

Smoking: A large body of evidence from twenty CBA studies and four RCTs demonstrate a mixed effect of MRFI on smoking prevalence (the majority of programmes beneficial). Twelve studies (nine CBA studies and three RCTs) demonstrate a beneficial net effect. Seven studies (six CBA studies and one RCT) demonstrate no net effect or inconclusive net effects and five CBA studies demonstrate a disbeneficial net effect. The most optimistic result was from a CBA study, reporting an 18.6% net reduction in smoking prevalence. The least optimistic result was from a CBA study, reporting a 12.8% net increase in smoking prevalence.

Evidence statement R3.E1e

BMI: A large body of evidence from fourteen CBA studies and three RCTs demonstrate a mixed effect of MRFI programmes on body mass index (BMI) (the majority of programmes beneficial). Ten studies (seven CBA studies and three RCTs) demonstrate a beneficial net effect. Four CBA studies demonstrate no net effect or inconclusive net effects and three CBA studies demonstrate a disbeneficial net effect. The most optimistic result was from a CBA study, reporting a 1.3kg/m² net reduction in BMI. The least optimistic result was from a CBA study, reporting a 0.7kg/m² net increase in BMI.

Evidence statement R3.E1f

Blood glucose: Limited evidence from 3 out of 38 programme evaluations, using different summary effect measures, demonstrate a mixed effect of MRFI on blood glucose. One RCT and one CBA study report mixed results: net decreases in men and net increases in women, whilst one CBA study demonstrates no net effect.

Evidence statement R3.E1g

Triglyceride levels, high-density lipoprotein/low-density lipoprotein (HDL/LDL) ratio or lipid levels: No evidence has been identified on the effects of MRFI programmes on triglyceride levels, HDL/LDL ratio or lipid levels.

Evidence statement R3.E1h

Dietary change – low versus high fat spreads: Five CBA studies and one RCT (+) demonstrate a mixed effect of MRFI programmes on consumption of low versus high fat spreads (the majority of programmes beneficial). Four studies (three CBA studies and one RCT) demonstrate a beneficial net effect. One CBA study demonstrates an inconclusive net effect and one CBA study demonstrates an unfavourable net effect. The most optimistic result was from a CBA study, reporting a 24% net reduction in the number of people with high consumption of fat spread on bread. The least optimistic result was from a CBA study, reporting a 3.3% net decrease in the use of unsaturated spreading fats.

Evidence statement R3.E1i

Dietary change – vegetable versus animal fats for cooking: Four CBA studies demonstrate a mixed effect of MRFI programmes on the use of vegetable versus animal fat for cooking (the majority of programmes beneficial). Three CBA studies demonstrate a beneficial net effect and one CBA study demonstrates an inconclusive net effect. The most optimistic result was from a CBA study, reporting a 6% net increase in the use of unsaturated fats for cooking. The least optimistic result was from a CBA study, reporting a 2% net decrease in the use of vegetable fats for cooking.

Evidence statement R3.E1j

Dietary change – low versus high fat milk: Five CBA studies and one RCT (+) demonstrate a mixed effect of MRFI programmes on the consumption of low- versus high-fat milk (the majority of programmes beneficial). Three CBA studies and one RCT demonstrate a beneficial net effect and two CBA studies demonstrate an inconclusive net effect. The most optimistic result was from a CBA study, reporting a 9% net increase in the use of low fat milk in men. The least optimistic result was from a CBA study, reporting a 1% net decrease in the use of low fat milk in women.

Evidence statement R3.E1k

Dietary change – consumption high fat foods: Six CBA studies demonstrate a mixed effect of MRFI programmes on the percentage of high-fat foods in the diet (the majority of programmes beneficial). Three CBA studies demonstrate a beneficial net effect, two CBA studies demonstrate no net effect or inconclusive net effects and one CBA study demonstrates a disbeneficial net effect. The most optimistic result was from a CBA study, reporting a 24% net decrease in saturated fat intake. The least optimistic result was from a CBA study, reporting a 3.4% net increase in high-fat/junk food consumption.

Evidence statement R3.E1l

Dietary change – consumption of fruit and vegetables and wholemeal bread: Limited evidence is available on the effects of MRFI programmes on the consumption of fruit and vegetables and wholemeal bread (the majority of programmes beneficial). Three CBA studies demonstrate a mixed effect of MRFI programmes on the consumption of fruit and vegetables. Two CBA studies demonstrate a beneficial net effect and one CBA study demonstrates an inconclusive net effect. The most optimistic result is from a CBA study, reporting a 9% net increase in the number of people consuming five portions of fruit and vegetables per day. The least optimistic result is from a CBA study, reporting a 0.2% net decrease in fruit consumption. Two CBA studies demonstrate a mixed effect on the consumption of wholemeal bread. One CBA study demonstrates a beneficial net effect and one CBA study demonstrates an inconclusive effect. The most optimistic result is from a CBA study, reporting a 3% increase in children. The least optimistic result is from the same CBA study, reporting a 0.3% net decrease in adults.

Evidence statement R3.E1m

Dietary change – salt intake: Two CBA studies (one [+] and one [-]) provide mixed results for the effects of MRFI programmes on salt intake. One CBA study demonstrates a beneficial net treatment effect and one CBA demonstrates an inconclusive net treatment effect.

Evidence statement R3.E1n

Physical activity: Evidence from 11 CBA studies and one RCT (+) provide a mixed pattern for the effect of MRFI programmes on physical activity (the majority of studies are disbeneficial). Three CBA studies and two RCTs demonstrate a favourable net effect.

Three CBA studies demonstrate inconclusive net effects and four CBA studies demonstrate a disbeneficial net effect. The most optimistic result is from a CBA study, reporting an 11.5% net increase in the number of people doing strenuous physical activity more than three times per week. The least optimistic result is from a CBA study, reporting a 6% net decrease in the number of people who were physically active.

Evidence statement R3.E1o

Attitudes, knowledge and intentions relating to CVD risk factors: Limited evidence is available on the effects of MRFI programmes on CVD risk factor attitudes, knowledge and intention to change. One CBA study and one uncontrolled before-and-after study suggest beneficial changes in CVD knowledge following MRFI programmes. One of these studies showed a net increase in the number of individuals intending to lose weight. No evidence has been identified on the effects of MRFI programmes on CVD risk factor attitudes.

Evidence statement R3.E2a

General: Evidence for variation in effectiveness in subgroups of the population is limited and inconsistently reported across included programmes. There is no clear pattern with respect to gender, age, ethnicity or measures of deprivation which may be the result of the limited information available, confounding and selective reporting.

Evidence statement R3.E2b

Ethnicity: Three programmes report the results of subgroup analysis of effectiveness according to ethnicity. One uncontrolled before-and-after study reports lower effectiveness in ethnic minorities in acquisition of CVD knowledge. One CBA study reports lower effectiveness in ethnic minority groups for reducing smoking prevalence, reducing BMI and increasing fruit and vegetable intake and one CBA study reports no difference in effectiveness according to ethnic group.

Evidence statement R3.E2c

Age: Six programmes report results of subgroup analysis according to age. Two uncontrolled before-and-after studies report a reduction in effectiveness in acquisition of CVD knowledge in younger participants and one uncontrolled before-and-after study reports a reduction in effectiveness in reducing salt intake in younger participants. One CBA study reports a reduction in effectiveness in promoting CVD awareness in older

participants. Two CBA studies report no differences in effectiveness according to age.

Evidence statement R3.E2d

Gender: Seven programmes report results of subgroup analysis according to gender. Four programmes report a reduction in effectiveness in women compared to men. One RCT reports a reduction in effectiveness in increasing physical activity in women compared to men. One uncontrolled before-and- after study and two CBA studies report a reduction in effectiveness in reducing smoking prevalence in women compared to men. One CBA study reports a reduction in effectiveness in reducing cholesterol in women compared to men. One CBA study reports a reduction in effectiveness in drinking low-fat compared to high-fat milk in women compared to men. Two programmes report a reduction in effectiveness in men compared to women. Two CBA studies report a reduction in effectiveness in promoting CVD awareness and acquisition of CVD knowledge in men compared to women and one CBA study reports a reduction in effectiveness in reducing CVD morbidity and mortality in men compared to women. One CBA study reports no differences in effectiveness according to gender.

Evidence statement R3.E2e

Social class: Two programmes report results of subgroup analysis according to social class. One CBA study reports a reduction in effectiveness in reducing smoking in lower social classes compared to higher social classes. One CBA study reports no differences in effectiveness according to social class.

Evidence statement R3.E2f

Level of education: One programme reports results of subgroup analysis according to level of education. One CBA study reports a reduction in effectiveness in CVD awareness in those relatively more educated.

Evidence statement R3.E3a

Nature of the interventions: Thirty one programmes were concerned with the effectiveness of population programmes using education and mass media, and seven with screening programmes directed at large populations in the community or primary care. However, 16 of the education and mass-media programmes contained screening components. Counselling was a key process in many programmes, undertaken individually

in 24 programmes and amongst groups in 16 programmes. The 38 programmes varied in many other ways. Programme length ranged from one to over 20 years. The size of the population addressed ranged from approximately 2,500 to over 1 million. Fourteen of the programmes implemented changes to the environment. Health departments (n=23) [where n is the number of programmes in which the organisations indicated were involved], local health committees (n=12), voluntary organisations (n=11) and community volunteers (n=9) had roles in programme delivery. Programmes were delivered in a variety of settings including workplaces (n=12) and schools (n=18).

Evidence statement E.3b

Education and mass-media based programmes compared to screening based: As indicated this was the most marked contrast between the programmes. However, comparing the effectiveness of the 2 groups is complicated:

- Many of the education and mass-media based programmes contain elements of screening.
- There are many CVD screening programmes, particularly focused on moderate or high-risk populations which are not included in this review.
- The comparison between the 2 groups is likely to be confounded by other factors, a very important one of which is that CBA studies are used to evaluate most of the education and mass-media based programmes, and RCTs all the screening based programmes.

With these provisos (and reference to pages 127 to 131 in report 3), the pattern of results for the risk factors of cholesterol, blood pressure (BP), smoking and body mass index (BMI) in the 2 different groups of programmes are summarised in the tables below. In each case the programme result (beneficial, inconclusive, disbeneficial or no data) is based on direction of effect:

Net change in mean total cholesterol in mmol/litre

| Programme type (n=38) | Beneficial | Inconclusive | Disbeneficial | No data |
|----------------------------|------------|--------------|---------------|---------|
| Educational and mass media | 9 | 4 | 2 | 16 |
| Screening | 5 | 0 | 0 | 2 |

Net change in systolic BP in mmHg

| Programme type (n=38) | Beneficial | Inconclusive | Disbeneficial | No data |
|----------------------------|------------|--------------|---------------|---------|
| Educational and mass media | 6 | 4 | 4 | 17 |
| Screening | 5 | 0 | 0 | 2 |

Net change in diastolic BP in mmHg

| Programme type (n=38) | Beneficial | Inconclusive | Disbeneficial | No data |
|----------------------------|------------|--------------|---------------|---------|
| Educational and mass media | 7 | 5 | 2 | 17 |
| Screening | 5 | 0 | 0 | 2 |

Net change in BMI in kg/m²

| Programme type (n=38) | Beneficial | Inconclusive | Disbeneficial | No data |
|----------------------------|------------|--------------|---------------|---------|
| Educational and mass media | 8 | 3 | 3 | 17 |
| Screening | 3 | 0 | 0 | 4 |

Net change in smoking prevalence in %

| Programme type (n=38) | Beneficial | Inconclusive | Disbeneficial | No data |
|----------------------------|------------|--------------|---------------|---------|
| Educational and mass media | 9 | 6 | 5 | 11 |
| Screening | 3 | 1 | 0 | 3 |

Although the results are similar, there does appear to be a more consistent pattern of benefit in the programmes focusing on screening. As well as the provisos mentioned above, the following also need to be borne in mind when taking this observation at face value:

- Whether this difference could be accounted for by chance alone.
- Whether the difference would persist if the size of the effects could be taken into account.
- Vote counting as a method of summarising the results in a systematic review is recognised to be the weakest approach.

Evidence statement R3.E3c

Possible variations in effectiveness by other aspects of the nature of the intervention:

Over the three reports, many other plausible reasons for the noted variation in effectiveness have been identified. These include:

- duration of programme
- intensity of programme
- use of an underlying theoretical model to inform the design of the programme
- pre-programme investigation of particular risk factors operating in a population
- community involvement in planning and/or design of programme
- adaptability of the programme as new challenges emerge
- level of integration of the separate components of the programme
- inclusion of environmental changes as part of the programme.

Whether any of these factors account for differences in effectiveness which could not arise by chance alone has not been fully explored, and their potential importance can neither be confirmed nor refuted. Unfortunately, the extent to which the differences could ever be satisfactorily explored using the results from these evaluations is debatable given noted limitations in the reporting of the precise differences in nature of the programmes and the amount of statistical information available.

Evidence statement R3.E5c

Age: Fifteen programmes report participation in programme interventions and/or programme evaluation surveys according to age. One uncontrolled before-and-after study and 13 CBA studies report lower participation in evaluation surveys or programme interventions by those of younger age whilst one CBA study reports no difference in participation according to age.

Evidence statement R4.1b

These suggest that factors influencing success include: time limitations for projects, leadership, (including difficulties engaging community members at strategic levels), and cooperation between partner organisations.

Evidence statement R4.2a

Four study reports show conflicting evidence about the degree and methods of community engagement important for success.

Evidence statement R4.2b

For programmes that were successful, one study reports that positive community expectations about the potential of the programme to effect wider change facilitated community engagement. It is suggested that insufficient community engagement did not significantly impact on another programme's success.

Evidence statement R4.2c

For programmes that were unsuccessful, 1 study reports that previous negative experiences of community programmes discouraged community engagement. Conversely, another study reports engagement in the programme increased willingness for future involvement.

Evidence statement R4.3a

There is evidence from five study reports that community programmes to address heart health can be affected by the broader political context.

Evidence statement R4.3b

This can effect diverse organisational elements such as: the availability of project funding, the development of partnerships between organisations and a sense of shared purpose at different administrative levels. Individual responses may also be affected through legislation incentives to healthier behaviours.

Evidence statement R4.4a

There is evidence from four study reports that high pricing can impact on people's ability and willingness to adopt healthy eating behaviours and to participate in organised physical activity.

Evidence statement R4.7a

Six study reports discuss factors relating to organisational and strategic issues.

Evidence statement R4.7b

There is evidence from four studies that short time frames limit the ability to plan and develop the programme, engage the community, develop partnerships and communication, meet targets and leave a positive legacy.

Evidence statement R4.7c

Leadership was identified as a key organisational benefit of programmes by three studies. It is required to develop partnerships and collaborations within communities, and is important at all levels, from volunteers to with senior administrators. One study failed to see the desired shift in leadership to the community itself.

Evidence statement R4.8a

Evidence from 6 study reports is related to the organisational culture and partnerships of those involved in CVD programme services.

Evidence statement R4.8b

Three studies note differences in culture between partner organisations including frames of reference, terminology and programme expectations although this didn't always lead to conflict.

Evidence statement R4.8c

Four studies suggest that CVD programmes are enhanced where partner organisations have aligned values, priorities, focus and goals between organisations.

Evidence statement R4.8d

Partnerships may have positive effects through interagency learning, increasing the visibility of smaller organisations and enhanced funding opportunities.

Evidence statement R4.9e

Two studies note that to sustain the provision of healthier food options, communities need to take them up and so they need to be made attractive and clear.

Evidence statement R4.9f

One study found that community projects were largely unwilling address smoking, preferring to promote physical activity.

Evidence statement R4.10a

Five studies reported on staffing successful programmes.

Evidence statement R4.10b

Three studies report difficulties in recruitment and retention.

Evidence statement R4.10c

Positive staff contributions were defined in three studies where successful networking allowed staff to use their time effectively because they were not duplicating activities; where they were assisted by structures that focus on heart health issues and where flexibility allowed them to spend significant periods of time with participants.

Evidence statement R4.10d

Positive staff characteristics included knowledge and interest in heart health and being upbeat and friendly. A range of specialist staff should be involved.

Evidence statement R4.11a

Six study reports make specific comments about funding and resource requirements.

Evidence statement R4 11.b

Five study reports note the need for those with existing roles and responsibilities to be

given resources to take on additional CVD programme work, or for dedicated positions to be created. Limited time for school-based staff may be a particular problem.

Evidence statement R4.12a

Two studies identify effective communication between organisations, staff and the community, to be important, but use different mechanisms to achieve this: lay health advisers or having a full-time project coordinator.

Evidence statement R4.13a

Four study reports discuss recruiting and retaining programme volunteers.

Evidence statement R4.13b

Volunteers need adequate resourcing and leadership, and may be motivated by witnessing positive changes in the community.

Evidence statement R4.13c

One study suggests that volunteers find health promotion less satisfying than traditional patient service roles.

Evidence statement R4.13d

Two study reports about the same programme note that lay health advisers, recruited from the target community, were key.

Evidence statement R4.14a

Two study reports mention the role of GPs in community CVD projects.

Evidence statement R4.14b

GP uptake was slow and it is suggested that GPs may be less comfortable in health promotion roles than their traditional role of secondary prevention.

Evidence statement R4.15a

Evidence relating to staff training were identified by six study reports.

Evidence statement R4.15b

While skills training is needed, involvement in the programme itself increases skills and knowledge through sharing information and implementing theoretical knowledge.

Evidence statement R4.16a

Five study reports relate to the evaluation of CVD prevention programmes.

Evidence statement R4.16b

Two study reports found that process evaluation and action research raised self-awareness among staff and promoted programme improvement. While a third reports that time limited projects limit the possibility of such learning.

Evidence statement R4.16c

Data management was a challenge in long-term projects and those with multiple strands across a number of organisations.

Evidence statement R4.17a

There is evidence from 8 study reports about community engagement in CVD prevention programmes.

Evidence statement R4.17b

Two study reports suggest that successful community engagement requires multiple approaches across populations.

Evidence statement R4.17c

Two study reports suggest that successful programmes need to be sensitive to

communities' habits and cultural patterns, while a further three describe the important of matching programme staff to the social and/or ethnic characteristics of the target communities.

Evidence statement R4.17d

Challenges to community engagement include engaging community representatives at strategic levels; building confidence in community leaders; difficulties breaking into existing networks; competing with other community events; reaching young people; reluctance due to the legacy of negative experiences with previous initiatives; lack of enthusiasm in the community.

Evidence statement R4.18a

Seven studies report that the local physical environment had important effects on the ability of community CVD risk-reduction projects to be successful.

Evidence statement R4.18b

Five studies reported that access to healthy food options was limited, while unhealthy food was more visible, both in the community and in school-based programmes.

Evidence statement R4.18c

Local barriers to physical activity including no sidewalks, unmetalled roads or loose dogs; lack of school provision to secure bikes or store kit which discourages extra-curricular exercise; and local availability of gyms or other facilities.

Evidence statement R4.19a

Community and familial norms: There is evidence from one study report among British Asians that stress from a variety of sources was a noted problem among both men and women and this might lead to inability to access essential services or to communicate with professionals.

Evidence statement R4.20a

Attitudes to food and cooking: There is evidence from three study reports that specific foods and eating patterns may be regarded as important expressions of cultural identity. Cultural norms about food types and their preparation may not be the healthiest from a CVD prevention perspective.

Evidence statement R4.21a

There is evidence from three study reports about cultural attitudes to weight and exercise.

Evidence statement R4.21b

These suggest that, among some groups, understandings of greater weight as a sign of wealth and health may persist which may challenge successful adoption of CVD prevention activities.

Evidence statement R4.21c

Further, specific connotations of language used to describe weight and physical activities may exist, so shared understandings between clinical and community meanings should not be assumed.

Evidence statement R4.22a

Fatalism and health: There is evidence from three study reports, among three different ethnic groups, of fatalistic attitudes where one's state of health is the will of God.

Evidence statement R4.23a

There is evidence from 6 study reports to suggest that a benefit of community CVD programmes is in providing leadership that encourages local attitudes to change for the better.

Evidence statement R4.23b

As well as making personal changes, such 'social health' encouraged changes within the

family, within the local community and within the wider social and political community. Despite this, one study suggests that men remain less likely to use health services.

Evidence statement R4.24a

Nine studies discuss community perceptions of CVD risk factors.

Evidence statement R4.24b

Six studies report high levels of understanding about CVD risk among the target population while 2 suggest limited understanding and 2 suggest challenges in turning knowledge into action.

Evidence statement R4.24c

One study suggests that different types of knowledge are at play (theoretical, practical, experiential and intuitive), and where there is a discrepancy between theoretical and experiential knowledge, the latter influences what participants do. These links might be challenged by cues to action (health belief model), most significantly breakdown of self-image and social networks.

Evidence statement R4.24d

One study develops a typology of 6 'ideal types' of functional and dysfunctional attitude among programme participants who see it as a blessing, an opportunity, a confirmation, a watchman, a disappointment or an insult. The latter 2 are negative or 'dysfunctional' in terms of positive health choices and more men have these attitudes.

Evidence statement R4.25a

Nine study reports discuss people's motivations for, or resistance to, adopting risk reduction behaviours.

Evidence statement R4.25b

Two studies report that health concerns, sometimes serious, were motivating factors to participate and 2 that feedback of physiological test results was motivating.

Evidence statement R4.25c

Women may be targeted to take heart health practices home, however, 2 studies report on difficulties initiating or maintaining family interest and that resistance from family members was a barrier to adopting healthier behaviour. It is difficult to maintain behaviour changes amidst the usual business of family commitments.

Evidence statement R4.25d

One study suggests that there is a need for ongoing support in order for behavioural changes to be made and maintained.

Evidence statement R4.25e

One study found that secondary school pupils enjoyed the freedom to make food choices not available at primary school, pupils' food choices, and those of the wider population, may reflect issues other than health.

Evidence statement R4.26a

Six studies report on participant perceptions of programmes in which they were involved.

Evidence statement R4.26b

In 2 studies participants reported improving heart health through weight loss, increased exercise, as well as increased awareness and use of services and programme activities. One study also suggests that networks providing community support was a benefit.

Evidence statement R4.26c

One study found that practical demonstrations were much more successful than information provision alone.

Evidence statement R4.26d

Two studies suggest that the participants may doubt the credibility of health messages, with so many sources of, sometimes contradictory, information available. Matching the

characteristics of the community may be important.

Evidence statement R5.2

Community engagement: Positive community engagement requires trusting, respectful relationships to be built which motivate and support change. Community engagement should be an ongoing and dynamic partnership which responds to community needs.

As CVD may not be seen as an immediate concern within targeted communities, staff may first need to listen and respond to the existing concerns of the community. This may be done through participating in existing networks and forums, or creating forums that have more open agendas, at least to start with.

Sufficient time is needed to ensure that this is done appropriately and also to ensure that changes become adopted by the community so that they are empowered to continue, even if the project itself comes to an end.

Information and education is likely to be more effective if it relates to the experiences of the community, and if those that deliver it are seen as part of that community. Appropriately skilled staff are needed for effective community engagement.

Greater levels of participation, that involve community members as partners or devolve power to them, may have additional benefits, ensuring that programmes are truly responsive to community needs, involving local people in the complexities of planning and delivering such programmes and so facilitating understanding within the community.

Done well, community engagement may create a positive feedback loop which motivates change, improving health which produces greater motivation. However, care needs to be taken to ensure that those adopting behaviour change are not just those already motivated to change, thereby increasing, rather than lessening, health inequalities.

Evidence statement R5.3

Staffing – leadership: Strong, inspirational leadership may be important to initiate, coordinate and drive complex programmes and motivate and encourage cooperation among multiple staff across a number of agencies with a range of responsibilities.

To fulfil this, staff are needed whose role is dedicated to the programme and those with

multiple roles need to have appropriate time freed up.

Leaders may be needed for the project overall, but also for specific elements of the project, for example, to encourage primary care participation or ensure local political or funding support. Leaders from within the community are also needed to champion the project and facilitate engagement.

Expectations of leadership roles should be matched by appropriate control and responsibility, and given the necessary training and support.

Evidence statement R5.4

Staffing – staff engagement: To ensure that staff are engaged with the aims of a CVD prevention programme, they require appropriate training and resources, a good understanding of how their role fits into the programme overall and a clear understanding of the extent of their roles and responsibilities.

Evidence statement R5.5

Staffing – GPs: The role of primary care was complicated and sometimes contradictory. Some GPs may be more comfortable with a secondary, rather than primary, prevention role, which may explain why some participants found it difficult to engage them in CVD prevention programmes. Conversely, other participants viewed primary care as crucial partners in CVD prevention. Advocacy among other local organisations may be a key role.

Where primary care is involved in CVD prevention programmes, they need to receive appropriate resources to free-up staff time.

Engaging primary care and keeping them appropriately informed may require tailored approaches.

Evidence statement R5.6

Staffing – volunteers: Volunteers from within the community may be particularly effective at informing, motivating and engaging their peers in the community and enhance community empowerment.

Volunteer workers need to be properly trained and supported to ensure that they continue

to be involved and don't get burnt out.

The issues of paying those involved should be considered carefully.

Evidence statement R5.7

Staffing – multi-agency, multi-disciplinary teams: Public health work to reduce CVD is likely to require the involvement of multiple agencies and disciplines.

Coordination and cooperation is required to build trust and a sense of shared purpose through aligning the goals and activities of different agencies involved, and assigning clear roles and responsibilities to participating organisations and staff within them. Joint appointments may facilitate this. Ongoing feedback and communication is vital.

Sufficient time is needed to successfully negotiate and accommodate different expectations and bureaucracies.

Evidence statement R5.8

Legacy: CVD reduction programmes may enhance their longer-term impact through ensuring that programme activities are embedded within organisations and the community.

Appropriate training and support for key staff, and community members, from project inception may help to ensure activities become 'institutionalised'. Ongoing sources of funding should also be identified.

Programme impacts should be regularly assessed and results fed back to staff and organisations so that successful activities are recognised and adopted. This will require the identification of appropriate resources.

Early and ongoing community engagement may ensure ongoing changes in healthy behaviours, empowering the community to maintain positive changes. Short-term projects often fail to leave lasting benefits to a community as their short-term goal setting may preclude the necessary engagement required.

Evidence statement R5.9

Short time frames: Short time frames for CVD prevention programmes may threaten success at a number of levels: implementation, staff engagement and training, community engagement, evaluation and legacy. It is difficult for such programmes to meet community needs, staff needs or to permit changes to become embedded in the community. This may lead communities and local agencies to lose faith in such interventions, further hampering the ability of future work to be successful in those areas.

Evidence statement R5.10

Structural barriers: At a macro-level, changes in the broader political environment can have dramatic effects on the adoption and continuation of prevention activities.

Support for CVD prevention programmes may be affected by changing political priorities around prevention and treatment of illness.

Evidence statement R5.11

Piloting and monitoring: Cyclical approaches to monitoring and evaluation, such as piloting, process evaluation and action research, allow project to be responsive to local needs, adapting or removing inappropriate projects and allowing successful projects to be rolled out.

Information from this process fed back to staff in a timely way can help develop a sense of ownership and cooperation and motivate good practice.

Organisations and individuals should also learn from the experiences of previous projects.

Evidence statement R5.12

Challenges of evaluation: Commissioners and funders may need to allow flexibility in programme evaluation designs to allow them to adapt to local needs, rather than requiring fixed plans prior to funding. In addition, programmes and evaluations should allow sufficient time for outcomes to be achieved.

Multiple methods may be needed to evaluate important aspects of CVD prevention programmes, such as community empowerment, that are not all easily captured through

numerical outcome data.

Programmes that measure only population-level changes may not capture large impacts for some individuals, and this may be important, especially where health inequalities are addressed.

Evidence statement CE1

Three studies gave results in cost per life-year gained for population-based programmes compared to no intervention. The results ranged from cost-saving to £240,000 per life-year gained.

Evidence statement CE2

Two studies gave results in cost per QALY or DALY (disability-adjusted life years) for population-based programmes compared to no intervention. Results ranged from £10 per QALY to £96 per DALY.

Evidence statement CE3

Two studies gave results in cost per case prevented for population-based programmes compared to no intervention. Results ranged from cost saving to £22,000 per case prevented.

Evidence statement CE4

Five studies reported results in cost per life-year gained for some form of screening strategy compared to no intervention. Results ranged from cost saving to £140,000 per life-year gained.

Evidence statement CE5

Two studies gave results in cost per case prevented for screening compared to no intervention. Results ranged from £10,000 to £730,000 per case prevented.

Evidence statement CE6

Two studies gave results per 1% reduction in coronary risk for screening compared to no intervention. Results ranged from £2.25 to £5.30 per 1% reduction for 1 person.

Evidence statement CE7

One study gave a result of £0.80 per pound weight lost for a screening programme compared to no intervention.

Evidence statement CE8

One study gave results ranging from £12,000 to £120,000 per life-year gained and £100,000 to £230,000 per QALY for screening compared to a population-based approach.

Evidence statement CE9

One study gave results from cost saving to £39,000 per life-year gained for some form of exercise training.

Additional evidence

- Expert reports:
 - ER 1: The effectiveness of physical activity promotion interventions
 - ER 3: Expert testimony on salt and cardiovascular disease
 - ER 4: The relationship between commercial interests and risk of cardiovascular disease
 - ER 5: Regional development of a population-based collaborative CVD prevention strategy: the experience of NHS West Midlands
 - ER 6: NICE guidance on the prevention of CVD at population level: evidence from the Co-operative Group
 - ER 7: Population and community programmes addressing multiple risk factors to prevent cardiovascular disease (CVD): addendum to qualitative study produced by

Peninsula Technology Assessment Group for NICE: CVD programme – Heart of Mersey (HoM)

- ER 8: Expert testimony paper on the independent evaluation of 'have a heart Paisley' phase one (Scotland's national CHD prevention demonstration project)
- ER 9: Expert testimony on the public health harm caused by industrially produced trans fatty acids and actions to reduce and eliminate them from the food system in the UK
- ER 10: Prevention of cardiovascular disease at a population level: evidence on interventions to address dietary fats
- ER 11: CVD risk factors: paradigms and pathways
- ER 12: CVD prevention in populations: lessons from other countries
- ER 13: Will CVD prevention widen health inequalities?
- NICE's guideline on obesity prevention:
 - (1) Section 7.4.1.3 Evidence of corroboration
 - (2) Evidence statement 5, Section 12 Prevention evidence summary: broader community interventions (Community 2)
 - (3) Evidence statement 6, Section 12 Prevention evidence summary: broader community interventions (Community 2)
 - (4) Evidence statement 2, Section 10 Prevention evidence summary: broader community interventions (Community 2)

Cost-effectiveness evidence

The economic analysis consisted of a review of economic evaluations and a cost-effectiveness analysis.

- 'Prevention of cardiovascular disease at population level (question 1; cost-effectiveness)'
- 'Prevention of cardiovascular disease at population level: modelling strategies for primary prevention of cardiovascular disease'

Some primary prevention programmes involving education, mass media and screening with a general population were found to be effective and cost effective. They may reduce some of the risk factors for CVD, including changing behaviours which increase the risk. However, when the findings from all programmes were summarised, the overall effect on health outcomes was uncertain. In addition, as these programmes were conducted many years ago, the findings may not be generally applicable in the UK now.

The cost-effectiveness analysis strongly suggests that legislation likely to reduce the risk of CVD can be expected to produce a net cost saving to the public sector, as well as improving health. (Unless a very large sum of money needs to be spent on implementation.)

For example, implementing a CVD prevention programme based on the North Karelia project would result in an incremental cost-effectiveness ratio of approximately £7000 per quality-adjusted life year (QALY). For the Stanford Five City Project, the total healthcare cost savings almost equal the estimated cost of the project. The benefits of reducing the prevalence of smoking would also make the programme cost saving.

At the request of the Programme Development Group (PDG), the scope of the modelling was extended beyond programmes for which there was direct evidence of effectiveness. Interventions modelled included:

- The North Karelia project, including the effect of a net percentage reduction in serum cholesterol of 3% for men and 1% for women, and a reduction in systolic blood pressure of 3% for men and 5% for women.
- The Stanford Five City Project, the effect of a 4% reduction in systolic blood pressure and a 2% decrease in serum cholesterol among the general population.
- Legislation to ban trans fats and so reduce trans fatty acid (TFA) levels in the population so that it only accounts for approximately 0.7% of total energy intake.
- Legislation to reduce the population's salt intake by 3 g and 6 g per day.

The modelling made a number of conservative assumptions. It found that halving CVD events across the entire England and Wales population of 50 million would result in discounted savings of approximately £14 billion per year. Reducing mean population cholesterol or blood pressure levels by 5% would result in discounted annual savings of approximately £0.7 billion and £0.9 billion respectively. Reducing population cardiovascular risk by even 1% would generate discounted savings of approximately £260 million per year.

Additional benefits to existing CVD patients, and reductions in other diseases, were not quantified.

As the model is based on a series of conservative assumptions, it probably seriously underestimates the true health benefits to be gained from the recommendations.

Fieldwork findings

Fieldwork aimed to test the relevance, usefulness and feasibility of putting the recommendations into practice. The PDG considered the findings when developing the final recommendations. For details, go to the [fieldwork section in appendix B](#) and the [fieldwork report](#).

Feedback to the recommendations varied.

Food industry recommendations (1, 2, 3, 4, 5 and 10 in the consultation document)

It was indicated, particularly by some food industry stakeholders, that:

- It was felt that NICE has 'a lot less weight' in the food and planning sectors and that we would need to work much more closely with them to gain support for the recommendations.
- Food industry representatives generally (but not unanimously) indicated that trans fats were 'no longer an issue' and should, therefore, not be included in the recommendations. They also questioned the levels of saturated fat and salt recommended, as they were unaware of the evidence to support a reduction to these levels.
- Catering industry recommendations (6, 14 and 15 in the consultation document).

In general, stakeholders felt that the catering recommendations demonstrated how to follow good practice.

- Local authority planning recommendations (7, 8, 9, 12, 13, 16, 17 and 18 in the consultation document)

Local planning and policy representatives stated that the recommendations needed to

become part of national planning policy or law. Otherwise, it would not be possible to implement them.

Communications recommendation (number 11 in the consultation document)

There was limited feedback from the industry as some of the target organisations disputed that it was relevant to them and declined the opportunity to be interviewed.

CVD programme recommendations (19 to 24 in the consultation document)

In general, representatives from the NHS and PCTs indicated that the regional CVD prevention recommendations were appropriate and that they supported current work on CVD prevention.

Appendix D: Gaps in the evidence

The Programme Development Group (PDG) identified a number of gaps in the evidence related to the programmes under examination based on an assessment of the evidence, stakeholder and expert comment and fieldwork. These gaps are set out below.

1. There is a lack of UK studies on the effectiveness of programmes to prevent CVD among black and minority ethnic groups living in the UK.
2. There is a lack of evidence on the effectiveness of interventions targeting those with high risk factors who believe their health is bad.
3. There is a lack of evidence on the effectiveness of providing emotional support and help to develop general coping skills as part of interventions to prevent CVD.
4. There is a lack of evidence on the effectiveness of CVD prevention programmes involving the families of those at risk.
5. There is a lack of controlled comparison studies looking at the effectiveness of lay health advisers in helping to prevent CVD.

The group made 6 recommendations for research.

Appendix E: supporting documents

The supporting documents include:

- Evidence reviews:
 - Review 1: Prevention of cardiovascular disease at population level (Question 1; phase 1)
 - Review 2: Prevention of cardiovascular disease at population level (Question 1; phase 2)
 - Review 3: Prevention of cardiovascular disease at population level (Question 1; phase 3)
 - Review 4: Barriers to, and facilitators for, multiple risk factor programmes aimed at reducing cardiovascular disease within a given population: a systematic review of qualitative research.
- Primary research:
 - Review 5: Population and community programmes addressing multiple risk factors to prevent cardiovascular disease: A qualitative study into how and why some programmes are more successful than others.
- Economic analysis:
 - Review 6: Prevention of cardiovascular disease at population level (Question 1; cost-effectiveness).
- Economic modelling:
 - Prevention of cardiovascular disease at population level: modelling strategies for primary prevention of cardiovascular disease.
- Expert reports:
 - Report 1: The effectiveness of physical activity promotion interventions
 - Report 2: Health policy analysis

- Report 3: Expert testimony on salt and cardiovascular disease
- Report 4: The relationship between commercial interests and risk of cardiovascular disease
- Report 5: Regional development of a population-based collaborative CVD prevention strategy: the experience of NHS West Midlands
- Report 6: NICE guidance on the prevention of CVD at population level: evidence from the Co-operative Group
- Report 7: Population and community programmes addressing multiple risk factors to prevent cardiovascular disease (CVD): addendum to qualitative study produced by Peninsula Technology Assessment Group for NICE: CVD programme – Heart of Mersey (HoM)
- Report 8: Expert testimony paper on the independent evaluation of 'have a heart Paisley' phase one (Scotland's national CHD prevention demonstration project)
- Report 9: Expert testimony on the public health harm caused by industrially produced trans fatty acids and actions to reduce and eliminate them from the food system in the UK
- Report 10: Prevention of cardiovascular disease at a population level: evidence on interventions to address dietary fats
- Report 11: CVD risk factors: paradigms and pathways
- Report 12: CVD prevention in populations: lessons from other countries
- Report 13: Will CVD prevention widen health inequalities?
- Report 14: Food manufacturer's perspective.
- Fieldwork report: Fieldwork on prevention of cardiovascular disease at population level.

Finding more information and committee details

To find NICE guidance on related topics, including guidance in development, see the [NICE topic page on acute coronary syndromes](#).

For full details of the evidence and the guideline committee's discussions, see the [evidence](#). You can also find information about [how the guideline was developed](#), including details of the committee.

NICE has produced [tools and resources to help you put this guideline into practice](#). For general help and advice on putting our guidelines into practice, see [resources to help you put NICE guidance into practice](#).

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