

Dementia, disability and frailty in later life – mid- life approaches to delay or prevent onset

NICE 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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This guideline is the basis of QS184.

Overview

This guideline covers mid-life approaches to delay or prevent the onset of dementia, disability and frailty in later life. The guideline aims to increase the amount of time that people can be independent, healthy and active in later life.

Who is it for?

- Commissioners, managers and practitioners with public health as part of their remit, working in the public, private and third sector
- The public

What is this guideline about?

This guideline makes recommendations on approaches in mid-life to delay or prevent the onset of dementia, disability and frailty in later life. These terms describe sets of symptoms and outcomes that can be caused by a wide range of conditions.

The risk of dementia, disability and frailty will sometimes be determined by factors that cannot be changed, such as inherited conditions or injury. But changing specific risk factors and behaviours can reduce the risk of dementia, disability and frailty for many people. These changeable factors, smoking, lack of physical activity, alcohol consumption, poor diet and being overweight, are the focus of this guideline.

While various local and national interventions, policies and programmes for non-communicable chronic conditions are already in place that could reduce the risk of dementia, disability and frailty, they rarely include these conditions within their scope, nor include information on risk reduction. The aim is to delay the onset of dementia, disability and frailty, increasing the amount of time that people can be independent, healthy and active in later life (successful ageing) by:

- helping people stop smoking, be more active, reduce alcohol consumption, improve

their diet and, if necessary, lose weight and maintain a healthy weight

- reducing the incidence of other non-communicable chronic conditions that can contribute to onset of dementia, disability and frailty
- increasing people's resilience, for example by improving their social and emotional wellbeing.

The guideline is for commissioners, managers and practitioners with public health as part of their remit, working in the public, private and third sector. (For further details, see who should take action?) It may also be of interest to policy makers and members of the public.

This guideline focuses on interventions and actions delivered at national, regional and local level to reduce risk of dementia, disability and frailty in later life. It does not include recommendations about national policy or legislation, as this was specifically excluded in the remit given to NICE. There are, however, existing NICE guidelines that include recommendations on national policy to support behaviour change and assist local action, and these are cross-referenced in this guideline where appropriate. Key related guidelines include the NICE guidelines on cardiovascular disease prevention and alcohol-use disorders: prevention.

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.

Promoting healthy lifestyles

1 Encouraging healthy behaviours

National organisations and local government departments that influence public health should continue to:

- Develop and support [population-level initiatives](#) to reduce the risk of dementia, disability and frailty by making it easier for people to:
 - stop smoking
 - be more physically active
 - reduce their alcohol consumption
 - adopt a healthy diet
 - achieve and/or maintain a healthy weight.
- Use the local regulatory options and legal powers available to encourage increased adoption of healthy behaviours, and risk reduction. For example, as outlined on websites such as Healthy Places.
- Make physical activity, adopting a healthy diet and achieving and maintaining a

healthy weight as accessible, affordable and acceptable as possible.

2 Integrating dementia risk reduction prevention policies

Public Health England, NHS England, relevant national third-sector organisations and health and social care commissioners should:

- Include dementia in strategy documents aimed at preventing other non-communicable chronic conditions (for example cardiovascular disease, type 2 diabetes, stroke and chronic obstructive pulmonary disease) see NICE's guideline on type 2 diabetes prevention: population and community-level interventions.
- Make it clear that some common unhealthy behaviours can increase the risk of dementia and that addressing those behaviours will reduce the likelihood of developing dementia and other non-communicable chronic conditions.
- Ensure interventions and programmes to prevent non-communicable chronic conditions state that the risk of dementia can be reduced by encouraging healthy behaviours (see recommendation 1), including reducing loneliness, by leading a physically and mentally active life.

3 Raising awareness of risk of dementia, disability and frailty

Public Health England, Health Education England and NHS England should:

- Commission national, regional and local campaigns aimed at the public and health and social care professionals to show how the risk of dementia, disability and frailty can be reduced and to promote the concept of keeping mentally and physically healthy. Campaigns should use a range of media and formats to reach as many people as possible. See NICE's guideline on type 2 diabetes prevention: population and community-level interventions.
- Use the campaigns to provide messages such as:
 - Sustained ill health in old age is not inevitable. The risk of developing dementia, disability and frailty may be reduced and, for some, onset can be delayed and the severity of the conditions reduced.
 - Smoking, lack of physical activity, alcohol consumption, poor diet, being overweight or obese and loneliness are all avoidable risk factors for dementia,

disability and frailty.

- The earlier in life that healthy changes are made, the greater the likelihood of reducing the risk of dementia, disability and frailty.
- There are health gains that can be made by changing behaviours even in mid-life.
- Healthy behaviours are more likely to be maintained if they are built into everyday life.
- Ensure messages do not stigmatise people by suggesting that people who develop dementia, disability or frailty are at fault. Tell people that although some important risks can be reduced, there may be others such as genetic susceptibility that cannot be changed. It is still worth reducing risks where possible, even if there are unmodifiable risks, as this can increase the years spent in good health.

4 Producing information on reducing the risks of dementia, disability and frailty

Public Health England and NHS England should produce detailed information to promote specific behaviours that can improve someone's health and discourage those that can lead to poor health in later life. For example, it should:

- Encourage smokers to quit or use harm reduction measures by highlighting the immediate and long-term benefits. In particular, make it clear that there is a link between smoking and dementia, disability and frailty.
- Show how a wide range of domestic, leisure and work activities can help people to be physically active and explain how even modest increases in physical activity, at any age, can be beneficial. Include information on how physical activity:
 - reduces the risk of illness in both the short and long term, preserves memory and cognitive ability, reduces risk of falls and leads to a healthier old age, improving wellbeing and quality of life
 - is enjoyable and can have social benefits
 - should be a part of everyday life for a person's whole life course.
- Explain that alcohol consumption can increase the risk of dementia, disability and frailty and encourage people to reduce the amount they drink as much as possible.

- Explain that regularly consuming meals, snacks and beverages high in salt, fats and sugars is bad for health.
- Explain that a diet mainly based on vegetables, fruits, beans and pulses, wholegrains and fish, is likely to improve their health (see the section on dietary approaches in NICE's guideline on overweight and obesity management).
- Advise people to aim to maintain a healthy body weight (see NICE's guideline on overweight and obesity management).

5 Preventing tobacco use

Local government, Public Health England, NHS England and the National Trading Standards Board should continue to develop, deliver and enforce comprehensive local tobacco control strategies, in line with current policy. They should:

- Make smoking tobacco less accessible, affordable and acceptable.
- Continue to work to prevent illegal tobacco sales.
- Enforce smoke-free laws and tobacco display provisions.
- Extend smoke-free policies into a wider range of public places, for example, public parks, open-air markets and sports grounds.
- Promote, and support people to establish and maintain, smoke-free homes and cars.
- Make all health and social care services smoke free (see NICE's guideline on tobacco: preventing uptake, promoting quitting and treating dependence).

Local authorities and clinical commissioning groups should continue to commission smoking cessation services (see recommendations on policy, commissioning and training in NICE's guideline on tobacco) and promote quitting as the best way to reduce the risks from tobacco. Services should include strategies to encourage smokers who may not be able to quit, or who do not want to quit, to switch to less harmful sources of nicotine (see the section on supporting people who do not want, or are not ready, to stop smoking in one go to reduce their harm from smoking in NICE's guideline on tobacco).

6 Improving the environment to promote physical activity

Local government, local enterprise partnerships, transport professionals and other

organisations involved with the built and natural environment or with road safety (see [who should take action?](#)), should improve environments where people live and work to encourage and enable everyone to build physical activity into their daily lives. This should include:

- Using new and existing traffic management and highway schemes to make walking and cycling safe and attractive options (see [NICE's guidelines on physical activity and the environment and physical activity: walking and cycling](#)).
- Improving the existing built environment, and designing new developments, to promote physical activity (see [NICE's guideline on physical activity and the environment](#)).

7 Reducing alcohol-related risk

Local government, Public Health England, the National Trading Standards Board and licensing authorities should continue to develop and implement guidance and policies to reduce alcohol consumption across the population. They could include:

- Making alcohol less [accessible, affordable and acceptable](#) (see also [NICE's guideline on alcohol-use disorders prevention](#)).
- Continuing to work to prevent illicit alcohol sales (see also the [recommendation on marketing](#) in [NICE's guideline on alcohol-use disorders: prevention](#)).
- Making best use of local information such as alcohol-related injuries and crime, to develop the local alcohol strategy. For example, use early morning restriction orders, the late night levy, designated public place orders and the cumulative impact policy as necessary to reduce alcohol related harm (see also the [recommendation on availability](#) in [NICE's guideline on alcohol-use disorders: prevention](#)).
- Ensuring plans include screening and brief interventions for people at risk of an alcohol-related harm, hazardous drinkers (increasing risk drinkers) and harmful drinkers (high-risk drinkers; see [NICE's guideline on alcohol-use disorders: prevention](#)).

8 Supporting people to eat healthily

Local government, Public Health England and NHS England should help and support

people to eat healthily by:

- Reducing availability and promotion of foods that can contribute to an unhealthy diet. For example, by reducing or limiting the number of food outlets in a given area selling foods high in salt, saturated fat, artificial trans fats and free sugars. (See the recommendation on take-away and other food outlets in NICE's guideline on cardiovascular disease prevention, and NICE's guideline on type 2 diabetes prevention: population and community-level interventions.)
- Helping people to understand what constitutes a healthy diet. (See NICE's guidelines on cardiovascular disease: risk assessment and reduction, including lipid modification and type 2 diabetes prevention: population and community-level interventions.)
- Improving access to affordable fruit and vegetables and information on how to prepare them.
- Encouraging supermarkets and other retailers to offer promotions, such as 2-for-1 deals, on fruit and vegetables.

Service organisation and delivery

9 Delivering services to promote behaviour change

Public Health England, commissioners, local authorities, providers of NHS services, NHS Health Checks and other providers of behaviour change programmes should:

- Ensure programmes to prevent non-communicable chronic diseases share resources and expertise nationally and locally to maximise coverage and impact (see NICE's guidelines on type 2 diabetes prevention: population and community-level interventions and behaviour change: individual approaches).
- Work together to deliver services that address the needs of people with multiple risk factors as well as for those with single risk factors.
- Emphasise the need for, and help people to maintain, healthy behaviours throughout life (such as stopping smoking, being physically active, drinking less alcohol, eating healthily and being a healthy weight).
- Help people identify and address their personal barriers that prevent them from

making changes to improve their health.

- Make information and services available to all (see the Equality Act 2010). Additionally, target these towards those with the greatest need whenever possible.
- Develop the NHS Health Check programme to promote opportunities in mid-life to reduce the behavioural risk factors for dementia, disability and frailty by:
 - tailoring the advice component of the NHS Health Check programme for different age groups
 - adding dementia prevention advice to all health checks.
- Use audit to help improve the effectiveness of services.

10 Providing accessible services

Commissioners and providers of local services should:

- Work with local communities to understand the range of services that they need to reduce the risks of dementia, disability and frailty.
- Provide services at convenient times and in easily accessible places. They should offer some outside office hours, and some in workplaces and community settings (for example, community and faith centres).
- Provide digital services to complement traditional services when appropriate.
- Provide information in a range of languages and culturally acceptable styles, and offer translation and interpretation facilities if appropriate.

11 Providing advice on reducing the risks of dementia, disability and frailty at every appropriate opportunity

Public and third sector providers (such as local authorities, leisure services, emergency services and health and social care providers) should:

- Use routine appointments and contacts to identify people at risk of dementia, disability and frailty (for example, appointments with a GP or practice nurse, when attending leisure centre classes, or visiting a community pharmacy).

- Take advantage of times in people's lives when substantial change occurs. (Examples include: retirement, when children leave home, when starting to care for older relatives or grandchildren, or during the menopause.) These are times when people may consider adopting new healthy behaviours, or may be at risk of adopting unhealthy ones.
- Whenever the opportunity arises give people advice on how to reduce the risk factors for dementia, disability and frailty or refer them to specialist services when necessary (see the recommendation on deliver very brief, brief, extended brief and high intensity behaviour change interventions and programmes in NICE's guideline on behaviour change: individual approaches).

12 Providing physical activity opportunities

Local authorities and third-sector organisations with a responsibility for, or who support, public health services should:

- Encourage both recreational activities and active travel (for example, walking, cycling) for local journeys.
- Provide supervised activities and exercise classes and an infrastructure to support walking and cycling. They should also maintain parks and open green spaces. The aim is to help people in mid-life to be physically active in different ways, and at different levels of intensity (see NICE's guidelines on physical activity and the environment and physical activity: walking and cycling).
- Ensure that venues provide easily accessible information for visitors using forms of active travel, such as cycle parking locations and links to local online journey planners and mapping (See NICE's guideline on walking and cycling).
- Publicise these opportunities, including where they can be found and who to contact for more information (see NICE's guidelines on physical activity: brief advice for adults in primary care, behaviour change: individual approaches and the sections on risk identification in NICE's guideline on type 2 diabetes: prevention in people at high risk).

13 Provide training

Training commissioners and providers should:

- Commission or provide training and continuing professional development programmes for local authority staff, all health and social care professionals, relevant third-sector staff and community volunteers to help to reduce the risk factors for dementia, disability and frailty in later life. Training should include how to identify people at most risk and how to advise and support people to change behaviour (see the recommendation on deliver very brief, brief, extended brief and high intensity behaviour change interventions and programmes in NICE's guideline on behaviour change: individual approaches).
- Train participants to provide brief advice and when and how to refer people to other services to address behaviour change.
- Help participants reduce their own health risks, if necessary, by changing their own behaviour (see the section on supporting staff in secondary care and closed institutions to stop or reduce harm from smoking in NICE's guideline on tobacco; also see NICE's guideline on physical activity: brief advice for adults in primary care).

14 Leading by example in the public sector

Public sector organisations should:

- Set an example by ensuring their procurement, commissioning and other policies encourage and support healthy living. For example by:
 - specifying the need to encourage a healthy diet in contracts for on-site cafes and shops
 - by restricting foods high in salt, saturated fat, artificial trans fats and free sugars and drinks high in sugar
 - by providing resources and support to help employees make behavioural changes (see recommendation 15).

15 Providing support in the workplace

All employers should:

- Develop policies and provide information and support in the workplace to help employees:

- Stop smoking (see the [sections on promoting stop-smoking support, stopping smoking in secondary care services and supporting people who do not want, or are not ready, to stop smoking in one go to reduce their harm from smoking](#) in NICE's guideline on tobacco).
- Be more physically active (see [NICE's guideline on physical activity in the workplace](#)).
- Improve their mental wellbeing (see [NICE's guideline on mental wellbeing at work](#)).
- Return to work after long-term sick leave (see [NICE's guideline on workplace health: long-term sickness absence and capability to work](#)).
- Eat healthily (see the [recommendation on public sector catering](#) in NICE's guideline on cardiovascular disease prevention).
- Reduce alcohol consumption (see [NICE's guideline on alcohol-use disorders: prevention](#)).

Terms used in this guideline

This section defines terms that have been used in a particular way for this guideline.

Acceptable

Acceptability is the extent to which a certain behaviour is considered normal and appropriate within society as a whole or within subpopulations. It is sometimes referred to as the social norm. It can be influenced by advertising, legislation, and culture.

Accessible

Accessibility is the ease with which all persons can access a commodity, facility, service or product. It includes number and location of facilities or outlets, their opening times, distance and ease of travel, and language and medium of communication.

Affordable

Affordable is the extent to which products and services are within a person's financial means to purchase. Affordability measures include the use of taxation, pricing and

subsidies to deter purchase of unhealthy commodities such as foods that have a high saturated fat or sugar content, cigarettes and alcohol, and to encourage the purchase of healthier options such as foods that are low in fat and sugar.

Behaviour change programmes

Behaviour change programmes are a coordinated set of interventions, which aim to change the health behaviours of individuals, communities or whole populations.

Brief advice

Brief advice can take from 30 seconds to a couple of minutes to deliver. It is mainly about giving people information, or directing them where to go for further help. It may also include other activities such as raising awareness of risks, or providing encouragement and support for change. It follows an 'ask, advise, assist' structure. For example, brief advice on smoking would involve recording the person's smoking status and advising them that stop smoking services offer effective help to quit. Then, depending on the person's response, they may be directed to these services for additional support.

Brief interventions

Brief interventions involve spoken advice, discussion, negotiation or encouragement, with or without written or other support or follow-up. They can be delivered by a range of primary and community care professionals. These interventions are often opportunistic, typically taking no more than a few minutes for basic advice, up to around 20 minutes for a more extended, individually-focused discussion. They may also involve referral for further interventions or more intensive support.

Dementia

Dementia is a term used to describe a collection of symptoms including memory loss, problems with reasoning and communication, and a reduction in a person's ability to carry out daily activities such as washing, dressing and cooking. The most common types of dementia are Alzheimer's disease, vascular dementia, mixed dementia and dementia with Lewy bodies. Dementia is a progressive condition, which means that the symptoms will gradually get worse. This progression will vary from person to person and each will experience dementia in a different way – people may often have some of the same general symptoms, but the degree to which these affect each person will vary (Social Care

Institute for Excellence).

Disability

Any long-term restriction on a person's ability to perform an activity in the way, or within the range, considered normal. This may be because of limited body function or structure, or personal or environmental factors.

Frailty

Frailty typically means a person is at a higher risk of a sudden deterioration in their physical and mental health. Frailty is distinct from living with 1 or more long-term conditions or disabilities, although there may be overlaps in their management (British Geriatric Society 2014).

Free sugars

Free sugars include table sugar (sucrose), glucose, fructose, and lactose that are added to food and beverages by manufacturers, cooks and consumers. Free sugars also include the naturally present sugars in honey, syrups, fruit juices and fruit concentrates. The term free sugars does not include the natural sugars found in non-refined foodstuffs, such as brown rice or fruit. (Adapted from the World Health Organization definition, 2014).

Individual-level interventions

Individual-level intervention is used to mean an intervention that aims to help someone with a behaviour that may adversely affect their health. It can be delivered on a one-to-one, group or remote basis, but the focus is on creating measurable change in a specific person. This type of intervention could include a GP exercise referral programme, a community weight management class, or online application to help people monitor and change their alcohol intake.

Mid-life

Mid-life is defined as adults aged 40 to 64 years, or those aged 39 years or under from disadvantaged populations (this group is at increased risk of ill health and more likely to develop multiple morbidities).

Non-communicable chronic conditions

Non-communicable chronic conditions are conditions that are not passed from person to person. This includes the 4 broad groups of non-communicable diseases: cardiovascular diseases, cancers, chronic respiratory diseases, and diabetes. However, this term is broader and also encompasses chronic hearing and vision conditions.

Population-level initiatives

Population-level initiatives are national, regional or local policies or campaigns that address the underlying social, economic and environmental conditions of a population, with the aim of improving everyone's health. This type of intervention could include population-wide distribution of leaflets that highlight the importance of being physically active, adopting a healthy diet and being a healthy weight. It could also include taxation and legislative measures to change the availability and affordability of certain products (such as reducing the density of take-away outlets in an area).

Resilience

Resilience is usually thought of as the ability to adapt and thrive despite experiencing adversity. A resilient person has faced challenges, such as injury or illness, and has remained mentally and physically healthy (or 'bounced back' to being mentally and physically healthy by adapting to their new situation). Resilience to dementia, disability and frailty means a person will be able to withstand or delay the onset of some or all of these conditions and remain healthy for longer.

Successful ageing

Survival to an advanced age while maintaining physical and cognitive function, functional independence and a full and active life. Ill health and disability are compressed into a relatively short period before death (Fries et al. 2011).

Third sector

The part of civil society that comprises charities, community interest companies, voluntary and community organisations, social enterprises and co-operatives.

Who should take action?

Introduction

The guideline is for commissioners and service providers whose remit is public health, and also those whose work influences public health. They could be working in local government, Public Health England the NHS and other organisations in the public, private, voluntary and community sectors. It is also aimed at:

- employers
- national trading standards board
- occupational health services
- personnel departments
- planners, architects, builders and developers
- providers of social housing
- trade unions.

In addition, it will be of interest to people in or approaching mid-life and their families, and other members of the public who are at increased risk of dementia, disability or frailty, or who are their family or carers.

Who should do what at a glance

Who should take action	Recommendation
Architects, builders, developers and local authority planning and housing departments	6
Commissioners of services	2, 5, 9, 10 and 13
Directors of public health	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14 and 15

Who should take action	Recommendation
Employers, occupational health services, human resource departments, trade unions, third and private sector organisations who support workplace health	15
Health Education England	3, 13, 14 and 15
Local education and training boards, health and social care education providers, schools, colleges and universities, adult education providers	13
Health and social care services, local authorities and strategic partnerships (including health and wellbeing boards)	9, 10, 11, 12, 13 and 14
Highway authorities, road safety partnerships, transport professionals	6
Licensing authorities	7
Local enterprise partnerships	6
Local government officers	1, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14 and 15
National Trading Standards Board	5,7
NHS England	2, 3, 4, 5, 8, 13, 14 and 15
NHS Health Check providers	9
Organisations that coordinate or offer training, or that register and set standards for professionals	13
Providers of social housing	6
Public Health England	1, 2, 3, 4, 5, 7, 8, 9, 10 and 15
Third-sector organisations with a responsibility for or an interest in the health of the public	1, 2, 6, 9, 10, 11, 12, 13 and 14

Context

This guideline is about mid-life approaches to reducing the risk of dementia, disability and frailty. It focuses on changes to modifiable risk factors that are shared with a number of other non-communicable diseases, such as type 2 diabetes, cardiovascular disease, and some cancers. Risks for these conditions develop over the life course, so the beginnings of long-term ill health can occur in mid-life or even earlier. Although some people's risk will be determined by factors that cannot be changed, such as inherited conditions or injury, many people's risk for dementia, disability and frailty may be reduced by changing specific risk factors and behaviours.

Age-related change is inevitable: we all change as we get older. Some of these changes will be positive, such as in the greater skills and experience that come with education, employment or parenthood. Other changes, especially as we move through mid- and into later life, may be less positive. Reported adverse changes at mid-life include the start of a decline in various cognitive functions (such as memory, reasoning and verbal fluency) by age 45 (Newman et al. 2011; Singh-Manoux et al. 2011). An age-related decline in walking speed has been observed after the age of 30 (Newman et al. 2011). Some limitations in mobility have been identified in 18% of men and 19% of women aged 50 to 64 in England. In this age group, 11% of men and 10% of women reported difficulties with 1 or 2 activities of daily living (Gardener et al. 2006). Although many of these changes are inevitable at some point in life, the age at which they affect people, and how much they go on to become more serious health issues, will vary.

Age-related changes can be made worse by personal, social and environmental circumstances. For example, having to care for an elderly parent, can lead to a reduced income and less time for leisure activities.

Dementia, disability and frailty in later life affect individuals, families and society as a whole, and can cause reduced quality of life, ill-health and premature mortality. They have a direct effect on community resources, because people are less able to do their usual daily activities and often need support and long-term care. This impact is set to increase in the future as the population ages.

Dementia is something most people associate with Alzheimer's disease. It is generally thought that Alzheimer's disease accounts for 50% to 75% of dementia cases, with vascular dementia accounting for up to 20% (Dementia: a public health priority, World

Health Organization and Alzheimer's Disease International). However, there is increasing evidence that individual cases of dementia are often due to a combination of Alzheimer's disease and vascular dementia. Vascular disease can be prevented, and so reductions in the incidence of vascular and mixed dementias may be expected to follow. Other forms of dementia, such as dementia with Lewy bodies and fronto-temporal dementia, are much less common and less is known about how to reduce the risk of these.

Disability refers to any long-term restriction on the ability to perform an activity in a normal way. This may be because of limited body function or structure, as a result of injury or disease, or personal or environmental factors. People often think of disability as difficulty walking, but problems using your hands, hearing loss, sight loss and speech impairment are just a few of the many issues people may experience which contribute to disabilities. The impact of these functional restrictions can be made worse by poor environments, but can be made easier to cope with in good environments. For example, physical mobility can be made easier by improvements to the environment. Conditions such as type 2 diabetes, arthritis and cardiovascular disease, as well as obesity, are all associated with forms of disability.

Frailty can be either physical or psychological frailty, or a combination of the two, and can occur as a result of a range of diseases and medical conditions. This guidance uses the deficit model of frailty that adds up a person's impairments and conditions to create a measure of risk and severity (Morley et al. 2013). This model includes comorbidity and disability as well as cognitive, psychological and social factors. The potential causes are therefore wide, and multiple risk factors are implicated in the various diseases and conditions (Fit for Frailty, British Geriatric Society). Some of these risk factors are shared with the types of dementia and disability described above, and are amenable to change.

Several cohort studies have found links between successful ageing and a person never having smoked (or having quit), exercising regularly, eating fruit and vegetables daily and drinking only a moderate amount of alcohol. The EPIC-Norfolk study found that people who adopted all these behaviours lived an average of 14 years longer than people who did none of them (Khaw et al. 2008). They also had more quality-adjusted life years (Myint et al. 2011). In the Whitehall study, people who adopted all 4 behaviours were 3.3 times more likely to age successfully. The association with successful ageing was linear, with people who adopt healthier behaviours having a greater likelihood of successful ageing (Sabia et al. 2012). However, other risk factors such as social isolation can have an effect.

The Department of Health and Social Care's Chief Medical Officer annual report from 2011

notes that having more than 1 of the 7 'health risk' factors of smoking, binge drinking, low fruit and vegetable consumption, obesity, diabetes, high blood pressure and raised cholesterol is common in mid-life. Among men, the proportion having 4 or more risk factors is greatest for those aged 55 to 64 (21.4%). Among women, the proportion with 4 or more risk factors is greatest in those aged 65 to 74 (16.2%).

Between 2003 and 2008, the greatest reduction in the number of adults in the general population displaying 4 behavioural risk factors (smoking, lack of physical activity, consuming alcohol, and poor diet) was seen in higher socioeconomic and more highly educated groups. People from unskilled households are more than 3 times more likely to adopt behavioural risk factors than people in professional groups (Clustering of unhealthy behaviours over time. Implications for policy and practice, The King's Fund's).

Life expectancy continues to increase in the UK, but this increase is not necessarily extra years spent in good health and free of disability. By 2035, it is estimated that 23% of the population will be aged 65 or over (Health expectancies at birth and age 65 in the United Kingdom, 2008–10, Office for National Statistics).

Estimates of life expectancy, healthy life expectancy and disability-free life suggest that, on average, a man of 65 in the UK will live a further 17.8 years. But that will include 7.7 years of poor general health and 7.4 years with a limiting chronic illness or disability towards the end of their life. On average, a woman of 65 will live a further 20.4 years. But that will include 8.8 years of poor general health and 9.2 years with a limiting chronic illness or disability (Health expectancies at birth and age 65 in the United Kingdom, 2008 to 10).

The incidence of dementia increases with age. Increases in life expectancy and in the proportion of older people in the UK population suggest that dementia incidence would also rise. However, newer information suggests that the prevalence of dementia in 2011 was lower than had been predicted from early 1990s data. This finding is consistent with findings from other high income countries. The lower prevalence is attributed to a reduction in risk factors, for example smoking, and societal changes such as better education (Matthews et al. 2013).

However, in 2012 around 800,000 people in the UK were living with some form of dementia. More than 42,000 of these people were under 65. Family and friends were acting as primary carers for about 670,000 people. In 2014 the annual cost of dementia to the NHS, local authorities and families was estimated to be £26.3 billion (Dementia UK

update 2014, Alzheimer's Society).

In 2012 to 13, it was estimated that more than 11 million adults in the UK were disabled. Of that total, 5.1 million were over the state pension age (for women this was 60 and over, for men 65 and over in 2012 to 2013; Family resources survey UK 2012 to 2013, Department for Work and Pensions). Disabled adults in the UK are twice as likely to be living in poverty as non-disabled adults. Disabled people's day-to-day living costs are 25% higher than those of non-disabled people (Disability in the UK 2012, Papworth Trust).

Sensory disability, including hearing loss and visual impairment, is estimated to be responsible for 7% to 10% of all years lived with disability among those aged 70 or over in the UK (Chief Medical Officer annual report 2012: the public's health, Department of Health and Social Care). Some form of hearing loss is reported by 42% of people over 50 in the UK (Hearing matters, Action on Hearing Loss). An estimated 80,000 people of working age have a visual impairment (Evidence base to support the UK Vision Strategy, UK Vision Strategy). Both hearing loss and visual impairment have been associated with other health and social problems, including social isolation ('Hearing matters'; 'Evidence base to support the UK Vision Strategy'; Rogers and Langa 2010).

Frailty prevalence depends on the model of frailty used. A recent international systematic review of 31 studies of frailty in people living in the community aged 65 years or more found prevalence rates between 4 and 17% (mean 9.9%) of physical frailty using the phenotypic model. This uses 5 possible physical (phenotypic) markers – weight loss, exhaustion, weakness, slowness, and reduced physical activity. Prevalence was higher when using the broader deficit model (which includes psychosocial frailty), with rates between 4.2 and 59.1%. Women were almost twice as likely as men to be frail. The prevalence of frailty is markedly increased in persons older than 80 (Collard et al. 2012).

Having 2 or more chronic conditions (multimorbidity) is common among people aged 65 and older. However, there are more people under 65 than over 65 with multimorbidity (Barnett et al. 2012, Agborsangaya et al. 2012). Multimorbidity is associated with low socioeconomic status, and it can begin 10 to 15 years earlier in people living in the most deprived areas than in those living in the most affluent ones (Barnett et al. 2012). Multimorbidity is also associated with low educational attainment (Nagel et al. 2008). Therefore, risk reduction may need to occur earlier in life in some disadvantaged groups.

Considerations

This section describes the factors and issues the Public Health Advisory Committee (PHAC) considered when developing the recommendations. Please note: this section does not contain the recommendations.

General considerations

- 1.1 This guideline focuses on the delay and primary prevention of dementia, disability and frailty. The PHAC acknowledged the importance of national policy levers in encouraging behaviour change, but recognised that it was outside the remit of this guideline.
- 1.2 The PHAC acknowledged that there are different types of dementia, with differing prevalence rates and opportunities for risk reduction. Although Alzheimer's disease is the most common type, less is known about its risk reduction than for vascular dementia, it is now thought that many people diagnosed with Alzheimer's disease have a mix of Alzheimer's disease and vascular dementia. Vascular dementia is caused by a reduced blood supply to the brain. A series of small strokes can occur that often go unnoticed or are seen as transient ischemic attacks, resulting in only temporary reductions in blood supply and brief symptoms. However, if they occur repeatedly more of the brain is damaged and dementia starts to develop. Vascular dementia therefore has the same risk factors as cardiovascular disease and stroke, and so the same preventive measures are likely to reduce risk.
- 1.3 A number of health conditions and environmental circumstances can contribute to dementia, disability and frailty. The behavioural risk and protective factors covered in the guideline will not be the same for all types of dementia, disability and frailty so risk reduction may be more effective for some conditions than others. The PHAC was satisfied that there is sufficient evidence to show the risk of developing them can be reduced through changing common behavioural risk factors. This includes quitting smoking, increasing physical activity, reducing alcohol consumption, having a healthy diet, and reaching and maintaining a healthy weight. However, key messages about risk reduction, particularly for

dementia, are not well publicised or understood by health and other professionals or the public, unlike the link between smoking and cancer.

- 1.4 The guideline focused on delay and primary prevention, therefore the management of obesity was not considered to be covered by the scope. However, evidence relating to change in weight and BMI from the normal range to overweight or underweight was considered.
- 1.5 Sexual health was not included in the search strategy as there was a need to prioritise the areas covered because of time and resource constraints. However, sexual health matters (for example safe sex and contraceptive advice) are still issues for both men and women in mid-life. HIV is a cause of disability and frailty, and in rare cases it can cause dementia.
- 1.6 The PHAC was aware that people often have more than 1 behavioural risk factor. They agreed an order of importance of risk factors in the guideline based on the strength of the associations reported in expert testimony 1. However, the PHAC also agreed that the most appropriate approach will come from people working with health and social care professionals to consider their own needs along with contextual and local factors. Mid-life is not too late for people to make meaningful changes. People often need more than 1 attempt to change, and mid-life can be the period in which change is finally sustained. The PHAC agreed, based on the evidence, that mid-life changes (supported by professionals and services) can help to reduce the risk of dementia, disability and frailty.
- 1.7 The early onset of non-communicable chronic conditions and early mortality in disadvantaged groups was considered at the scoping stage of the guideline. To address this, the lower age limit for the inclusion of evidence in the reviews was reduced so data were included from adults aged 39 and younger from vulnerable and disadvantaged groups.
- 1.8 The PHAC recognised that mid-life is not the only time to make changes to smoking, physical activity, alcohol intake and diet, and that these issues are important throughout life: the earlier healthy behaviours are adopted the more likely a person is to have more years free from illness, disability and frailty. The PHAC agreed that putting policies and services in place to encourage change in relevant behaviours could have huge benefits for individuals, families and the

population as a whole. The group acknowledged the range of policies currently in place; the guideline aims to ensure these provide coherent and consistent advice so that prevention services are better value for money. The group also acknowledged that the Department of Health and Social Care and Public Health England are already undertaking many of the actions outlined in the guideline and it is important that these are maintained.

- 1.9 The PHAC agreed to focus on dementia in recommendation 2. The reason for this was that the non-communicable conditions covered by current policies are significant contributors to the development of a range of disabilities and also to frailty and hence disability and frailty are to some extent included in existing policies.
- 1.10 The PHAC heard expert evidence that population approaches are more cost effective for reducing deaths from non-communicable chronic diseases than individual approaches. In particular, reductions in smoking rates led to dramatic reductions in cardiovascular disease, lung cancer and chronic obstructive pulmonary disease. It considered that population approaches are therefore key to helping people reduce exposure to risk factors.
- 1.11 The PHAC agreed that individual behaviour change approaches are likely to be more cost effective and less likely to widen health inequalities when supported by population-based approaches. NICE's guideline on behaviour change: individual approaches makes recommendations on effective and cost-effective behaviour change techniques for working with individuals.
- 1.12 The PHAC recognised that basic needs such as housing or employment have an influence on health. Therefore, other local authority services such as housing and planning or economic development and regeneration can have an effect on risk of disease. Housing and employment problems may make it difficult for people to change behaviours, however this should not prevent them from being offered help to reduce the risk of dementia, disability and frailty.
- 1.13 The PHAC agreed that interventions and services need to be accessible to the whole community, particularly the more disadvantaged. Equity issues, such as language skills, information content or service location and opening hours or lack of internet access may all affect accessibility. In turn, these factors will affect the

effectiveness and cost-effectiveness of services. Providing digital services (using, for example, computers, phones and tablets) is one way of increasing accessibility. But the digital skills of people over 40 will vary widely, so this should not be the only mechanism of delivery.

- 1.14 Raising awareness of the links between risk factors and dementia, disability and frailty is unlikely to be enough to change people's behaviour alone, because knowledge does not always lead to action. There is also a risk of widening health inequalities because more educated people and those with greater self-efficacy tend to access and act on new information more readily. Targeted interventions are needed to help get messages to those most at need and to help them make changes.
- 1.15 The PHAC noted that changes in the unhealthy behaviours covered in the guideline could also reduce the incidence of non-communicable conditions that have impacts beyond dementia, disability and frailty in later life. Also, other household members may benefit from behavioural change (for example from less exposure to second-hand smoke or a healthier diet).
- 1.16 Children and young people are influenced by what they see. By changing their own smoking, physical activity, drinking and dietary behaviours, people in mid-life may positively influence the health of children and young people.
- 1.17 Social norms can affect behavioural risks. It is becoming less usual for people to smoke, and that is an important driver for change. Social norms also exist for other behaviours, and need to be challenged. Drinking alcohol daily at home has become normal for some people, and this poses a threat to health. Reducing activity, slowing down and having earned a rest, are often seen as an expected part of growing older. However, many people continue to be fully active in later life and take up and enjoy new activities, and this is good for their health and well-being.
- 1.18 The PHAC was aware of the alcohol risk curve for cardiovascular disease reported in the literature that shows a small risk for non-drinkers, a lesser risk for very low drinkers and increasing risk with increasing consumption of alcohol. They heard evidence that this apparent relationship between alcohol and risk may be compounded by problems with the evidence base, for example, the

failure of some studies to disaggregate people who have never consumed alcohol from those who have stopped for health reasons. This means that risk observed for non-drinkers may be overstated. The risk for some cancers shows a different pattern, with lowest risk for non-drinkers and a linear increase in risk with increasing consumption.

- 1.19 The PHAC heard expert testimony suggesting that, in light of current evidence and issues with the evidence base, the overall message should be that there is no safe level of alcohol consumption. The PHAC were aware that the chief medical officer was asked to review the alcohol guidelines from 2012, and that draft conclusions from this review were likely to be published in 2015.
- 1.20 Alcohol action teams, and risk identification and brief interventions, are not always provided systematically and sufficiently scaled to address health inequalities. The PHAC was also aware that the advice given differs. It is important that all health and social care professionals are given training and information so they can take advantage of every opportunity to identify risk and provide brief advice.

The evidence

- 1.21 The evidence reviews developed to inform this guideline focused on the referral from the Department of Health and the scope questions. The reviews included primary studies and systematic reviews that investigated interventions and services that were explicitly aimed at mid-life populations and at vulnerable and disadvantaged adult populations. There is a broader evidence base that includes the general population as well as people in mid-life that could have been used when developing this guideline. However, including the general population in the reviews would have made them unmanageable in the time and resources available.
- 1.22 Literature searching without age restrictions gave more than a million results, so a search strategy was developed to identify evidence that was specific to people in mid-life. Studies of people in mid-life that did not include mid-life terms in the title or abstract may not have been found using this strategy. However, the inclusion of recent systematic reviews is likely to mean much of this literature

was covered. The review team noted that the primary study participants in many reviews were in mid-life, although there was no mention of a focus on mid-life.

- 1.23 The wider evidence base has been used across multiple topic-specific NICE guidelines; when appropriate, the PHAC considered other relevant recommendations. The decision whether or not to cross-refer to or include recommendations from other NICE guidelines was based on the PHAC's view of whether evidence from the general adult population could be applied to people in mid-life. This wider evidence base was also the subject of testimonies from a range of experts, detailed in the evidence.
- 1.24 Any lack of evidence in the commissioned reviews should not be interpreted as suggesting that a particular behaviour does not have a role in the development of or protection against dementia, disability and frailty. Nor should it be inferred that there is no evidence of its effectiveness. Instead, it implies that there is a lack of evidence exclusive to mid-life. When recommendations have been made the PHAC members used their judgment about the applicability and relevance of interventions.
- 1.25 Only a limited amount of vision and hearing loss literature was found that reported dementia, disability and frailty outcomes. This covered studies done mainly in groups of older people not in mid-life, and there was little evaluation of the effect of mid-life interventions on preventing the loss. This is relevant to this guideline because vision and hearing problems are risk factors for dementia, disability and frailty. They can make related issues, such as social isolation, depression and the risk of falls worse, as well as affecting people's ability to be involved in their own medical care.
- 1.26 Expert testimony suggested that easy access to hearing tests is important, as there is a high rate of undiagnosed hearing loss in people in mid-life. If needed, early use of a hearing aid can result in greater benefit through additional years of use and better adaptation to use (Davis 2007). Likewise, tests of vision for early detection of eye diseases such as glaucoma are important to commence early treatment and prevent sight loss. Health and Safety Executive standards regulate noise exposure and hazards to sight in the workplace but protection in domestic and social settings is equally important.

- 1.27 The PHAC received expert testimony on sleep disorders and their link with mild cognitive impairment, dementia and other non-communicable chronic conditions such as diabetes and Parkinson's disease. Particular groups of people may be at high risk of non-communicable chronic conditions as a result of disordered sleep, for example shift workers and people with untreated sleep apnoea. Sleep apnoea adversely affects cognitive function; NICE has produced guidance on its management (see [NICE technology appraisal guidance on continuous positive airway pressure for the treatment of obstructive sleep apnoea/hypopnoea syndrome](#) and [NICE interventional procedures guidance on radiofrequency ablation of the soft palate for snoring](#)). The PHAC considered that the evidence for other sleep interventions to reduce the risk of dementia and other non-communicable chronic diseases was insufficient to make recommendations, but has made a recommendation for research.
- 1.28 There is emerging evidence on the importance of psychosocial risk factors throughout life such as loneliness, isolation and depression. These factors may reduce resilience to disease onset and progression. However, there is a lack of evidence on the most effective ways to address psychosocial factors and on their effect on the development of dementia, disability and frailty. Psychosocial factors may be as important as physical factors in reducing the risk of dementia, but more evidence is needed.
- 1.29 There may also be some protective factors, such as high levels of education. Expert testimony suggested that people with high educational attainment appear to be more resilient to dementia. Access to education and training in mid-life provides an opportunity to improve lifestyle, and hence reduce risk.
- 1.30 The PHAC was aware of the limitations of the economic analysis. This focused on dementia outcomes resulting from the effect of physical activity alone. This approach was taken because time, resources and the evidence available did not allow extensive economic analyses. Also, existing economic models for tobacco and alcohol in other NICE guidance demonstrate cost-effectiveness. PHAC members were confident that changing multiple behaviours was likely to result in further benefits.
- 1.31 The model demonstrated the potential cost effectiveness of population-level interventions using a cohort of people aged 40. Population-level interventions

would have a beneficial impact on the whole population, so a model based only on a mid-life cohort is a conservative estimate of the total benefit.

- 1.32 People who increase their levels of physical activity not only reduce their probability of developing dementia, but also their probability of developing cardiovascular disease and cancer. The physical activity model showed the potential for adding healthy years to life as a result of a small change from no activity (sedentary) to low-moderate activity. Because of living longer, some people who otherwise would have died earlier will go on to develop dementia. However, the model suggests that the net overall effect of an intervention to increase physical activity is to decrease the prevalence of dementia, to increase life expectancy and to reduce the average length of disability.
- 1.33 The economic model links an increase in physical activity to future health benefits, and to future health cost savings (typically accruing to the NHS) and future social care cost savings (typically accruing to local government). Two specific interventions were modelled: exercise referral schemes and mass media campaigns. Although the evidence is that these interventions have only weak effects, the model suggested they could be cost effective. This was based on an assumption that exercise would be sustained over time, with relapse rates of no more than 10 to 20% per year. The model makes no assumption about who funded the interventions in the scenarios above, and no assumptions were made about where the future health benefits and cost savings accrue.
- 1.34 The economic model estimates that the biggest gains in reducing dementia come from interventions that raise physical activity levels from sedentary to low-level activity, and that the gains from raising activity levels beyond a low level are considerably smaller. However, this result relies on the relative risks for dementia applied to the physical activity categories in the model. There is currently no detailed information on the dose-dependent relationship between physical activity in mid-life and risk of developing dementia in later life. The study by Sofi et al. (2011) used in the base case analysis provided risk ratios for the onset of cognitive decline in people with high and low-to-moderate levels of physical activity compared with people who were sedentary. A sensitivity analysis was done using an alternative data source that suggests that targeting the sedentary group as well as targeting the low active group will be cost saving. However, more detailed information on the association between physical activity and dementia

would further improve the reliability of the model results.

- 1.35 The NHS Health Check programme is an opportunity to encourage people to change behavioural risk in mid-life. The PHAC acknowledged the updating of the programme, the work to increase availability and use, as well as the aim to take the programme directly to people. The members were concerned about the focus on vascular dementia and the limited acknowledgment of risk reduction for Alzheimer's and mixed dementias. In addition the group agreed that dementia information should be given to everyone eligible for a health check, whatever their age. The existing programme includes providing information and support for people to change behavioural risk factors as well as medical support to manage disease, although the behavioural support component needs strengthening. Systematic referral to support, preventive and care services as appropriate is an essential part of the NHS Health Check programme.
- 1.36 The Group discussed the fact that NHS Health Check could be a suitable way to deliver hearing and vision checks. Local Authority (Public Health Functions and Entry to Premises by Local Healthwatch Representatives) Regulations 2013 set out who should receive an NHS Health Check, the assessments that should be undertaken and how the check should be done. Amending or introducing new content may need the approval of the government. The Group also noted that the Expert Scientific and Advisory Panel for NHS Health Check has developed a content review process that would have to be followed.

Recommendations for research

The Public Health Advisory Committee (PHAC) 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 and duration of effect. It also takes into account any harmful or negative side effects.

All the research should aim to identify differences in effectiveness among groups, based on characteristics such as socioeconomic status, age, gender and ethnicity.

1 Risk and protective factors in mid-life

What is the prevalence of risk and protective factors in mid-life for the development of dementia, disability and frailty, and what are the longitudinal relationships between them? Are dose-response relationships evident and how strong are these? Which factors are independent and which mediate others?

2 Maintaining or adopting healthy behaviours

What are the most effective and cost-effective population-level measures to help people in mid-life maintain or adopt healthy behaviours and build up resilience to dementia, disability and frailty? What are the best methods for evaluating their effect? How do these measures affect health inequalities?

3 Services and interventions

What are the most effective and cost-effective mid-life services and interventions in the long term for reducing behavioural risk, leading to healthier ageing and preventing or delaying the development of dementia, disability and frailty in later life? How can these be delivered in a consistent and sustainable manner? How can multiple interventions be effectively packaged to maximise efficiency? What are the barriers and facilitators to the uptake of services and interventions, and to the development and maintenance of healthy behaviours of people in mid-life? What are the effects on health inequalities?

4 Hearing, visual loss and sleep patterns

How strong are the associations between hearing and visual loss, and sleep patterns and positive and negative health outcomes, in particular the development of dementia, disability and frailty? What are the most effective and cost-effective interventions to protect hearing and vision and improve sleep and what is their effect on the development of dementia, disability and frailty?

5 NHS Health Check programme

How effective and cost-effective is the NHS Health Check programme? What are the patterns of uptake in relation to the demographics of the population and their degree of behavioural risk? What is the programme's effect on the development of dementia, disability and frailty? How feasible is extending the NHS Health Check programme to a younger age range?

More detail identified during development of this guideline is provided in [gaps in the evidence](#).

References

- Agborsangaya CB, Lau D, Lahtinen M et al. (2012) Multimorbidity prevalence and patterns across socio-economic determinants: a cross-sectional survey. BMC Public Health 12: 201
- Barnett K, Mercer SW, Norbury M et al. (2012) Epidemiology of multimorbidity and implications for health care, research and medical education: a cross-sectional study. The Lancet 380 (9836): 37–43
- Collard RM, Boter H, Schoevers RA et al. (2012) Prevalence of frailty in community dwelling older persons: A systematic review. Journal of the American Geriatric Society 60:1487–1492
- Davis A, Smith P, Ferguson M et al. (2007) Acceptability, benefit and costs of early screening for hearing disability: a study of potential screening tests and models. Heath Technology Assessment 11:42.
- Fries JF, Bruce B, Chakravarty E (2011) Compression of morbidity 1980–2011: A focused review of paradigms and progress. Journal of Aging Research doi:10.4061/2011/261702
- Gardener EA, Huppert FA, Guralnik JM et al. (2006) Middle-aged and mobility-limited prevalence of disability and symptom attributions in a national survey. Journal of General Internal Medicine 21: 1091–6
- Khaw K-T, Wareham N, Bingham S et al. (2008) Combined impact of health behaviours and mortality in men and women: The EPIC-Norfolk prospective population study. PLoS Medicine 5: e12
- Matthews FE, Arthur A, Barnes LE et al. (2013) A two-decade comparison of prevalence of dementia in individuals aged 65 years and older from three geographical areas of England: results of the Cognitive Function and Ageing Study I and II. Lancet 382: 1405–12
- Morley JE, Vellas B, van Khan GA et al. (2013) Frailty Consensus: A Call to Action. Journal of the American Medical Directors Association 14: 392–397
- Myint PK, Smith RD, Luben RN et al. (2011) Lifestyle behaviours and quality-adjusted life years in middle and older age. Age and Ageing 40: 589–95

Nagel G, Peter R, Braig S (2008) The impact of education on risk factors and the occurrence of multimorbidity in the EPIC-Heidelberg cohort. BMC Public Health 8: 384

Newman AB, Glynn NW, Taylor CA et al. (2011) Health and function of participants in the long life family study: a comparison with other cohorts. Aging 3: 63–76

Rogers MAM, Langa KM (2010) Untreated poor vision: a contributing factor to late-life dementia. American Journal of Epidemiology. 171: 728–35

Sabia S, Singh-Manoux A, Hagger-Johnson G et al. (2012) Influence of individual and combined healthy behaviours on successful aging. Canadian Medical Association Journal doi: 10.1503/cmaj.121080

Singh-Manoux A, Marmot MG, Glymour M et al. (2011) Does cognitive reserve shape cognitive decline? Annals of Neurology 70: 296–304

Summary of the methods used to develop this guideline

Introduction

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

The minutes of the Public Health Advisory Committee (PHAC) meetings provide further detail about the Committee's interpretation of the evidence and development of the recommendations.

Guideline development

The stages involved in developing public health guidelines are outlined in the box below.

1. Draft scope released for consultation
2. Stakeholder comments used to revise the scope
3. Final scope and responses to comments published on website
4. Evidence reviews and economic modelling undertaken and submitted to PHAC
5. PHAC produces draft recommendations
6. Draft guideline (and evidence) released for consultation
7. PHAC amends recommendations
8. Final guideline published on website
9. Responses to comments published on website

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 PHAC to help develop the recommendations. The overarching questions were:

Question 1: Which mid-life behavioural risk factors are associated with successful ageing and the primary prevention or delay of dementia, non-communicable chronic conditions, frailty and disability? How strong are the associations? How does this vary for different subpopulations?

Question 2: What are the most effective and cost-effective mid-life interventions for increasing the adoption and continuation of healthy behaviours?

- To what extent do the different health behaviours prevent or delay dementia?
- To what extent do the different health behaviours prevent or delay frailty and disability related to modifiable behavioural risk factors?

- To what extent do the different health behaviours prevent or delay non-communicable chronic diseases?

Question 3: What are the key issues for people in mid-life that prevent or limit their adoption and continuation of healthy behaviours, and to what extent do they have an effect? How does this differ for subpopulations, for example by ethnicity, socioeconomic status or gender?

Question 4: What are the most effective ways of delivering interventions that increase the adoption and continuation of healthy behaviours in mid-life? For example, how do interventions targeting single versus multiple behaviours compare? How does effectiveness and cost effectiveness vary in relation to the recipient's demographic variables?

These questions were made more specific for each review.

Reviewing the evidence

Effectiveness reviews

One review of effectiveness and cost effectiveness was done.

- Review 3. Effectiveness and cost-effectiveness of mid-life interventions for increasing the uptake and maintenance of healthy lifestyle behaviours and the prevention or delay of dementia, disability, frailty and non-communicable chronic diseases related to modifiable lifestyle risk factors.

Identifying the evidence

Additional searches of electronic databases and the grey literature were carried for papers relevant to this review and also for the other 2 reviews.

The literature search for the effectiveness and cost-effectiveness review was updated in March 2014.

Selection criteria

Studies were included in the effectiveness and cost-effectiveness review if they focused

on:

- adults at mid-life (aged 40 to 64 years for the general population or aged 18 to 39 in disadvantaged populations)
- effectiveness and cost-effectiveness outcomes for interventions to promote the uptake and maintenance of healthy behaviours that may have a positive effect on successful ageing or delay the start of dementia, disability and frailty and non-communicable diseases.

Studies were excluded if:

- they were not published in English
- they were from non-Organisation for Economic Co-operation and Development (OECD) populations
- they evaluated use of drugs and food supplements
- they focused on the diagnosis and management of dementia, disability and frailty and common non-communicable diseases, including management of obesity.

Inclusion and exclusion criteria for each review varied. See each review for details of the inclusion and exclusion criteria.

Other reviews

- Review 1. Issues that prevent or limit the uptake and maintenance of healthy behaviours by people in mid-life (barriers and facilitators)
- Review 2. Behavioural risk factors in midlife associated with successful ageing and the primary prevention or delay of disability, dementia, frailty, and non-communicable chronic conditions.

One in-house pragmatic review was done. See:

- Review 4. Service delivery mid-life

Identifying the evidence

Review 1 and 2

Several databases were searched in September 2013 for systematic reviews, interventional, observational and qualitative studies for review 1 and longitudinal cohort studies for review 2, dating from January 2000.

Review 4

A targeted and pragmatic approach was taken to identifying the evidence, using the call for evidence, a specific request to the PHAC developing this guideline, re-screening of review 1 full text articles, and identification of previous reviews of healthy lifestyle programmes using in-house expertise from developing previous NICE guidance. The date limit for including studies was 31 December 2013, apart from PHAC-submitted studies, which were considered up to 21 February 2014. No limits on study type were imposed.

Selection criteria

Review 1 and 2

Studies were included in the reviews if they focused on:

- adults at mid-life (aged 40 to 64 years for the general population or aged 18 to 39 in disadvantaged populations).

Studies were excluded if:

- they were not published in English
- they focused on use of drugs and food supplements
- they focused on the diagnosis and management of dementia, disability and frailty and common non-communicable diseases, including management of obesity.

Review 4

Studies were included in the review if they focused on:

- people aged 40 to 64 years. The age range was lowered to include people aged 18 to 39 for disadvantaged groups
- evaluations of programmes that promote the uptake or maintenance of any programme that could be considered 'healthy lifestyle' delivered in a real-world UK setting
- provided a description of the service delivery factors that affected the uptake and maintenance of a programme, and other organisational factors such as staff and setting.

Studies were excluded if:

- they reported on the effectiveness of an intervention or the barriers and facilitators without any clear discussion of service delivery
- were done in a non-UK setting.

Quality appraisal

Included papers for reviews 1 to 3 were assessed for methodological rigour and quality using the NICE methodology checklist, as set out in [methods for the development of NICE public health guidance](#). A tool specifically designed to assess the quality of systematic reviews (AMSTAR) was used for reviews 1 and 3. 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.

The evidence was also assessed for its applicability to the areas (populations, settings, interventions) covered by the scope of the guideline. Each evidence statement concludes

with a statement of applicability (directly applicable, partially applicable, not applicable).

Studies included in review 4 were not quality assessed because of the type of studies included and the pragmatic real-world nature of the review.

Summarising the evidence and making evidence statements

The review data were summarised in evidence tables (see the reviews in supporting evidence).

The findings from the reviews and expert reports were synthesised and used as the basis for a number of evidence statements relating to each key question. The evidence statements were prepared by the external contractors (see supporting evidence). The statements reflect their judgement of the strength (quality, quantity and consistency) of evidence and its applicability to the populations and settings in the scope.

Cost effectiveness

There was a review of economic evaluations and an economic modelling exercise. See review 3 and 'Cost-effectiveness of interventions aimed at increasing physical activity to prevent the onset of dementia'.

Economic modelling

Assumptions were made that could underestimate or overestimate the cost effectiveness of the interventions (see review modelling report for further details).

An economic model was constructed to incorporate data from the reviews of effectiveness and cost effectiveness. The results are reported in the economic modelling report.

How the PHAC formulated the recommendations

At its meetings in April and May 2014, the Public Health Advisory Committee (PHAC) considered the evidence, 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, programme or activity can be effective or is inconclusive
- where relevant, the typical size of effect
- whether the evidence is applicable to the target groups and context covered by the guideline.

The PHAC developed 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 and 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 the [evidence](#) for details). Where a recommendation was inferred from the evidence, this was indicated by the reference 'IDE' (inference derived from the evidence).

The evidence

Introduction

The evidence statements from 3 reviews are provided by Cambridge Institute of Public Health. The summary points are from review 4 that was done in-house by NICE.

This section lists how the evidence statements and expert papers link to the recommendations and sets out a brief summary of findings from the economic analysis.

How the evidence and expert papers link to the recommendations

The evidence statements are short summaries of evidence, in a review, report or paper (provided by an expert in the topic area). Each statement has a short code indicating which document the evidence has come from.

Evidence statement number 1.3.1PA indicates that the linked statement is numbered 3.1 in review 1; the letters refer to the risk factors: PA for physical activity; DI for diet; SM for smoking, AL for alcohol; EC for Eye Care; H for health prevention interventions (in general). **SP5** indicates that summary point 5 in review 4 is linked to a recommendation. **EP7** indicates that expert paper 7 is linked to a recommendation.

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).

Recommendation 1: EP1, 2, 3, 5, 6; IDE

Recommendation 2: evidence statements EP1, 5, 9; IDE

Recommendation 3: evidence statements 1.2.2PA, 1.2.3PA, 1.2.4PA, 1.2.5PA, 1.2.10PA, 3.3.5PA; EP 1, 2, 3, 5, 9; SP12: IDE

Recommendation 4: evidence statements 1.2.2PA, 1.2.3PA, 1.2.4PA, 1.2.5PA, 1.2.10PA, 2.3.3PA, 2.3.2PA, 2.3.3PA, 2.3.4PA, 2.3.5PA, 2.5.1DI, 2.6.1SM, 2.6.3SM, 2.6.4SM, 2.6.5SM,

2.6.6SM, 2.6.7SM, 2.7.2AL, 2.9.3LC, 3.3.1PA, 3.3.3PA, 3.3.5PA, 3.3.7PA, 3.3.8PA, 3.5.1SM, 3.5.2SM, 3.9.1DM, 3.9.2DM; SP12; EP2, 3, 5, 9

Recommendation 5: evidence statements 1.2.1SM, 1.3.1SM, 1.4.1SM, 1.5.1SM, 1.5.2SM, 1.5.3SM, 2.6.1SM, 2.6.3SM, 2.6.4SM, 2.6.5SM, 2.6.6SM, 2.6.7SM; EP 1, 3, 5

Recommendation 6: evidence statements 1.4.1PA, 1.4.3PA, 1.7.8PA, 1.7.15PA, 2.3.2PA, 2.3.3PA, 2.3.4PA, 2.3.5PA, 2.3.6PA, 3.3.2PA; EP9

Recommendation 7: evidence statements 1.3.1AL, 1.3.2AL, ; EP2; IDE

Recommendation 8: evidence statements 1.3.1DI, 1.3.5DI, 1.3.9DI 1.5.1DI, 1.5.2DI, 1.5.4DI, 1.7.1DI, 2.5.1.1DI; EP5, 9

Recommendation 9: SP1; EP8; IDE

Recommendation 10: evidence statements 1.5.4PA, 1.5.5PA, 3.3.3PA, 3.6.1AL, 3.9.1DM, 3.9.2DM, 3.9.3DM, 3.9.4DM: SP1, 2, 3, 4, 5, 6, 7, 8, 9

Recommendation 11: evidence statements SP3, 4, 5, 6, 7, 8, 9, 10, 11

Recommendation 12: evidence statements 3.3.1PA, 3.3.3PA, 3.3.7PA, 3.3.8PA, 3.9.1DM, 3.9.2DM; SP1, 10, 11

Recommendation 13: SP1

Recommendation 14: evidence statements EP5; IDE

Recommendation 15: evidence statements 1.2.10PA, 1.3.1PA, 3.3.2PA; SP10; IDE

Expert papers

Expert papers 1 to 10. See evidence.

Economic modelling

The model was exploratory in nature and as such did not report a single estimate of

cost-effectiveness but presented a series of threshold analyses to see the conditions under which cost-effectiveness can be achieved.

Overall, the model found that population-level and individual-level interventions that aim to increase the physical activity of people in mid-life have the potential to be highly cost-effective. Population-level interventions were found to have a slightly greater potential of being cost-effective at lower thresholds of willingness to pay than individual-level interventions when aimed at the general population. However, individual-level interventions were found to be cost-effective at acceptable willingness to pay thresholds (below £20,000) when targeted at inactive people under certain assumptions.

The results for both types of intervention were varied extensively in a number of sensitivity and scenario analyses. The most crucial determinant for interventions to be cost-effective is whether people succeed in maintaining increased levels of physical activity over their lives. The dose-response relationship between physical activity in mid-life and risk of developing dementia in later life also influences the cost-effectiveness.

The specific scenarios considered and the full results can be found in the economic modelling report.

Gaps in the evidence

The Public Health Advisory Committee (PHAC) identified a number of gaps in the evidence related to the programmes under examination based on an assessment of the evidence and stakeholder comments. These gaps are set out below.

1. There is a lack of evidence on the relationship between psychosocial risk and protective factors in mid-life and the development of dementia, disability and frailty in later life, including cognitive and social activities. (Source: Expert paper 7; Evidence review 2)
2. There is a lack of evidence on the effectiveness and cost-effectiveness of interventions for people in mid-life to address behavioural and psychosocial risk factors and their long-term impact on the delay or prevention of dementia, disability and frailty. (Source: Evidence review 3)
3. There are a lack of epidemiological studies that relate changes in behavioural risk factors and protective factors designed to detect trends in dementia disease prevalence and incidence. (Source: Evidence review 2)
4. There is a lack of long-term follow up, retention data and reporting of disease and mortality outcomes and compression of morbidity data from intervention studies. (Source: Evidence review 3)
5. There is a lack of evidence on the clustering of the different physical and psychosocial risk factors, the relationships between the risk factors, compensatory behaviours when a risk factor is changed and which risk factors to address first. (Source: Evidence review 2)
6. There is a lack of evidence on the associations between hearing loss, visual loss and dementia, disability and frailty, the effectiveness and cost-effectiveness of interventions to prevent and manage hearing and visual loss on the development of dementia, disability and frailty. (Source: Evidence reviews 2 and 3; Expert paper 10)
7. There is a lack of evidence on the associations of sleep disorders and the development of dementia, disability and frailty and the effectiveness and cost-effectiveness of interventions to improve sleep. (Source: Expert paper 4; Evidence reviews 2 and 3)
8. There is a lack of evidence on the effectiveness and cost-effectiveness of interventions

in mid-life to prevent falls in later life. (Source: Evidence review 3)

9. There is a lack of evidence on the effectiveness and cost-effectiveness, and acceptability of different ways of communicating risk to increase the person's understanding of their risk and to motivate them to make changes.
10. There is a lack of evidence on whether dementia can truly be preventable or whether it is only the onset that can be delayed, and on which types of dementia are most influenced by modifiable risk factors. (Source: Evidence review 3)
11. There is a lack of evidence on the effects of the NHS Health Check Programme on delaying or preventing of dementia, disability and frailty. (Source: Expert paper 8)
12. There is a lack of evidence on the effectiveness and cost-effectiveness of financial and other incentives to change behaviours that increase risk, and their impact on dementia, disability and frailty outcomes. (Source: Evidence review 3).

The Committee made 5 recommendations for research into areas that it believes will be a priority for developing future guidelines. These are listed in [recommendations for research](#).

Finding more information and committee details

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

For full details of the evidence and the guideline committee's discussions, see the [evidence reviews](#). 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](#).

Update information

Minor changes since publication

March 2025: We updated links following publication of NICE's guideline on overweight and obesity management.

January 2022: Minor changes to redirect NICE Pathways links.

August 2019: Updates were made in line with the UK chief medical officers' low risk drinking guidelines.

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