

Outcomes against which the success of prevention should be monitored

Summary findings

- The outcomes of prevention often form a two stage process with first stage outcomes - ‘intermediate determinants of health’, for example better social networks, greater take-up of physical activity or improved diet, leading to second stage, longer term, health related outcomes, for example improved mortality, longer healthy life expectancy or better quality of life.
- Four key areas of measurement of the effectiveness of prevention are
 1. Measures of changes in the intermediate determinants of health
 2. Direct measures of health, wellbeing and quality of life outcomes, either in the short to medium or longer term
 3. Costs
 4. Cost-effectiveness

In addition, questions of Equity and Design may feature in the evaluation process.

- Interested parties with different priorities will require different outcome measures. Older people and voluntary organisations may prioritise health and quality of life outcomes whereas service funders may be more interested in cost-effectiveness.
- Measures to evaluate immediate outcomes will depend on the particular intervention, for example number of falls, number of portion of fruit and vegetables eaten or minutes of physical activity taken, but may also include health outcomes achieved in the short to medium term including changes in the number of hospital visits or in weight, grip strength and balance.
- Short and medium term health outcomes may be assessed by clinical measures such as Body Mass Index or lung function, simple self-reported health measures such as the EU-SILC five point scale, or more complex validated health measures such as SF-12 and SF-36. For health related quality of life, measures such as the NICE recommended EuroQol EQ-5D and EQ VAS may be used.

- Longer term health outcome assessments include mortality, healthy life expectancy and disability free life expectancy.
- It may not be possible to measure the ultimate long term effects of an individual preventive intervention because of the amount of ‘noise’ in the intervening period. It may therefore be necessary to rely on the epidemiological evidence for the link between the first stage outcomes, the intermediate determinants of health, and the desired longer term outcomes.
- In prevention evaluation, experimental designs such as randomised control trials are rarely possible. ‘Difference-in-difference’ techniques are commonly used, comparing the differences between the intervention group and a comparator group (perhaps the general population) before and after the intervention.

Prevention and its effects

Prevention measures in older age are measures that seek to promote health, wellbeing, independent living and a better quality of life, improving mortality, healthy life expectancy and positive life experience while preventing a premature occurrence of ill health and disability.

The outcomes of prevention measures may occur at two stages. First stage immediate outcomes often referred to as ‘intermediate determinants of health’, for example improved diet or increased uptake of physical activity, may in turn lead to longer term outcomes including improved mortality, health, wellbeing and quality of life.

In evaluating a prevention intervention it might be possible to measure the first stage outcomes, for example improved levels of physical activity, but, because the consequential outcomes are often longer term, with a great deal of intervening ‘noise’, it may not always be possible to measure the longer term health effects of an individual prevention intervention. It is therefore necessary to rely on pre-existing epidemiological evidence of links between the immediate outcomes, for example increased levels of physical activity, improved diet or better levels of social interaction, and long term improvements in mortality, health and quality of life.

The exception is probably certain medical interventions such as vaccination, screening and the use of preventive medication where direct assessment might be possible.

The concept of prevention in older age

Prevention may sometimes be seen as a broad approach that covers more than just the delay or avoidance of poor health and a reduction in the use of health care services in older age. Prevention in this wider sense includes not only the prevention or delay of ill health or disability consequent upon ageing but also the promotion and improvement of quality of life of older people, their independence and inclusion in social and community life as well as the creation of healthy and supportive environments.¹

In its broadest sense, preventive interventions and approaches are those that maintain and enhance the physical and mental health, well-being and independence of older people and thereby prevent or delay the need for more costly, higher intensity or institutionalised care.² Prevention can take many forms and can occur at different points in the health trajectory.

¹ Wistow et al (2003), *Living well in later life: From prevention to promotion*

² Department of Health (2006), *Partnerships for Older People Projects: Guidance note for applications*

- Primary prevention – action to prevent a condition occurring at all or to delay the initial onset of the condition.
- Secondary prevention – action to ameliorate and manage an existing condition.
- Tertiary prevention – action to prevent further deterioration in an already existing condition.
- Rehabilitation – action to regain as much autonomy and independence as possible in the context of an existing condition.

In a 2010 review, Allen and Glasby³ identify ten strategies ranging through overlapping primary, secondary, tertiary and longer-term prevention. They were:

- promoting healthy life-styles, e.g. diet, physical and social activity
- vaccination, e.g. influenza and pneumococcal vaccines
- screening, e.g. breast and cervical cancer screening among sixteen possibilities listed
- falls prevention, e.g. validated home safety assessments
- housing adaptations and allied practical support, e.g. mainly low-level adjustments and repairs
- telecare and technology, e.g. use of electronic sensors and aids to sustain independence
- intermediate care, e.g. rapid response teams, one-stop shops etc
- re-ablement, e.g. shorter, intensive, more rehabilitative bouts of care
- partnership working, e.g. joint health and social care
- personalisation, e.g. personal care budgets

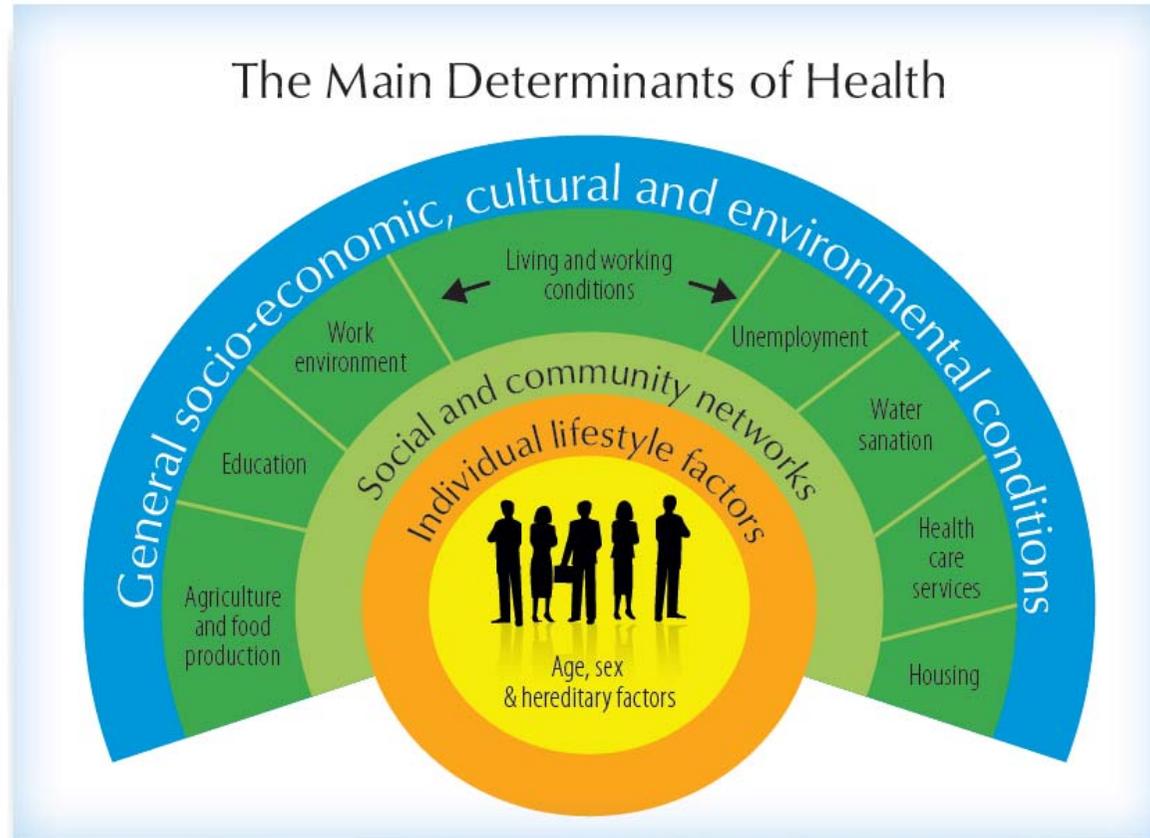
Allen and Glasby point out that 'the evidence remains under-developed', for the variables often complicate calculations about outcomes, whilst some approaches, for example joint health and social care schemes, are occasionally regarded as automatically better without due attention to evidence. Sometimes process – 'Are we working well together?' – takes precedence over outcome – 'Is it better for the older person?'.

Local Authority public health prevention initiatives can take many forms. Research from the University of Birmingham⁴ identified Reablement, Telehealth and Telecare, Information and Advice and the provision of Aids, Adaptations and Equipment as the top four most common local authority based interventions.

³ Allen and Glasby (2010), *'The billion dollar question': embedding prevention in older people's services*

⁴ Miller and Allen (2013), *Prevention services in adult social care*

Prevention against a background of health inequality



From: Whitehead M and Dahlgren C, (1991), "What can be done about inequalities and health?"

Prevention measures aimed at the individual, for example to promote lifestyle change, improving diet and levels of physical activity, and society level interventions, for example food labelling in supermarkets, operate against a background of much more deep-seated health

inequalities arising from social and economic inequality. Extensive evidence, including the Marmot Review⁵, has demonstrated a clear link between health outcomes and other underlying factors including social deprivation, economic wellbeing and even marital status.

Measuring the effectiveness of prevention interventions

Measuring the effectiveness of prevention interventions is not straight-forward for a number of reasons.

- 1) Most preventive interventions will have both immediate direct effects and also indirect, consequential, longer term effects. An intervention to increase the take up of physical activity in older age, for example, may well be considered successful, in terms of direct effects, if levels of physical activity are increased, but physical activity is not an end in itself. The reason for increasing the take up of physical activity is the demonstrated link between the level of physical activity and general health and wellbeing. The ultimate goal is to improve health and wellbeing in older age so measures of the longer term success of an intervention might look at measures of general health and wellbeing including self-reported health, mortality, the prevalence of particular long-term conditions, the number of hospital admissions or GP visits or general measures of quality of life.
- 2) Ways of evaluating the direct effectiveness of a specific prevention measure will very much depend on the focus of that particular intervention. Measures to prevent falls will have different immediate outcome measures from interventions to reduce smoking, or improve diet or different ways to improve the take up of physical activity for example through walking, cycling, dancing, Tai Chi or Yoga.
- 3) In prevention evaluation, experimental designs such as randomised control trials are rarely possible so other techniques are required.
- 4) It may not be possible to directly evaluate the indirect, longer-term, consequential, effects of an individual prevention intervention. The effects may not be short to medium term with a substantial lag or lead time before the effect is felt. Also, because of the long lead time, the prevention intervention may be just one of many occurrences, affecting outcomes, which will have taken place in the intervening period. In these circumstances it may be necessary to rely on epidemiological evidence that demonstrates overall links between the immediate outcomes, the intermediate determinants of health, for example diet, smoking, exercise, obesity or the level of social interaction, and long-term health and wellbeing outcomes.
- 5) This is particularly true for society-wide measures such as campaigns to reduce smoking or reduce salt and sugar intake through exhortation, food labelling in supermarkets or a change in food manufacturing processes. It may never be possible to disentangle the effects of a particular intervention from other societal effects and the pre-existing epidemiological evidence will remain the key justification.
- 6) For some medical preventive interventions, such as screening, vaccination or the use of preventive medication, the evaluation may be more straightforward. Using randomised control trials with large enough patient groups and by directly measuring the prevalence of the condition being addressed, it may be possible to directly assess the effectiveness of a preventive intervention.

⁵ Marmot et al (2010), *Fair society, healthy lives: Strategic review of health inequalities in England post 2010 - The Marmot Review*

- 7) Success may not always be measured by achieving improvements but sometimes by holding the line or by the situation not worsening as much as it might have done without any intervention. Public health interventions which slow the increasing prevalence of obesity and type II diabetes, for example, may well be considered successful if they resist the present worsening trend without generating any improvements.
- 8) Success in prevention may well mean different things to different people which will in turn, affect considerations of how that success should be measured. To the individual, success may mean an improvement in life expectancy, health, wellbeing or general quality of life while to a policy maker success, while including the above, may also include cost savings and the reduced use of health and other public services. Third Sector Organisations (TSOs) tend to identify the main purpose of an intervention as improving the quality of life of individual older people whereas local authorities and commissioning bodies will often emphasise a reduction in the need for services.⁶

Evaluation methods

In prevention evaluation, experimental designs such as randomised control trials are rarely possible. To assess the effect of an intervention while offsetting the effect of confounding variables - other changes that may affect outcomes, plus the fact that the participants are not randomly selected, difference-in-difference techniques are commonly used.

Difference-in-difference techniques compare the differences between the intervention group and a comparator group (perhaps the general population) before the intervention with the difference after the intervention. Changes in the comparator group will reflect overall changes that would have taken place even without any intervention.⁷

The epidemiological evidence for prevention

Hundreds, if not thousands of studies have assessed the long-term health effects of individual prevention measures. Sometimes the evidence is disputed as in the case of the use of statins as preventative medication, but sometimes the evidence is overwhelming as in the case of the beneficial effects of physical activity and social interaction.

Where the beneficial effects of prevention are longer term, the epidemiological evidence is essential to demonstrate the link between short term outcomes and long term health.

⁶ Miller et al (2013), *Older people's prevention services: Comparing perspectives of local authorities and the third sector - research findings*

⁷ Lechner (2011), *The Estimation of Causal Effects by Difference-in-Difference Methods*

Health risk factors that prevention measures seek to address include obesity, loneliness and social isolation and lifestyle factors including smoking, diet, alcohol consumption and levels of physical activity. Medical interventions include vaccination, screening and the use of preventive medication.

A sample of epidemiological evidence is presented in the second part of the reviewed literature for this report. Examples include alcohol consumption, smoking and diet; lifelong learning; living alone, loneliness and social isolation; obesity; physical activity, walking, cycling and dancing; social networks; volunteering; preventive medication, screening and vaccination; and the use of technology – telehealth and telecare.

The positive effects of a healthy lifestyle

A number of aspects of a ‘healthy lifestyle’ have been promoted to improve wellness in later life. Five key healthy lifestyle choices are: non-smoking; a low body-mass index; a ‘healthy’ diet; regular exercise and moderate drinking of alcohol.

Healthy Behaviours	Reductions In:			
	All-cause deaths	Vascular disease	Cancer*	Diabetes
Any two	15%	30%	13%	16%
Any three	30%	35%	7%	37%
Any four	35%	38%	18%	48%

*The cancer figures are not statistically significant

Source: Elwood and Pickering⁸

The Caerphilly Cohort Study is a 30-year longitudinal study which provides a basis for the evaluation of healthy behaviours. After controlling for age and social class the study shows reductions in incident disease as a result of adopting these healthy lifestyle choices both single and in combination.⁸ The study demonstrates the advantage of a multi-factorial approach.

In the context of medical interventions, but equally applicable to lifestyle changes, the National Institute for Health and Clinical Excellence 2010 modified guidelines for the primary and secondary prevention of cardiovascular disease note ‘It is important to stress that a multi-

⁸ Elwood and Pickering (2011), *Healthy behaviours and aspirin prophylaxis*

factorial approach that addresses all risk factors yields most benefit. This is because the effect of modifying several risk factors is multiplicative'.⁹

Prevention evaluation in practice – The national evaluation of the Partnership for Older People Projects¹⁰

The Partnership for Older People Projects (POPP) were funded by the Department of Health to develop services for older people, aimed at promoting their health, well-being and independence and preventing or delaying their need for higher intensity or institutional care. Twenty nine pilot sites were designated in local authorities in England, running a wide variety of projects, between 2006 and 2009.

The national evaluation of this programme¹⁰ probably represents the most comprehensive attempt to assess the population level effects of non-medical prevention interventions – so far attempted in the UK.

The evaluation addressed the issue of the programme's impact on the quality of life of older people in two ways.

A standardised questionnaire, administered both before and after the POPP intervention, measured the health-related quality of life (HRQoL) of a sample of 1,529 older people, and recorded their perception of any changes in their overall quality of life. A sample drawn from the British Household Panel Survey was used as a comparison. Changes in health-related quality of life were measured using Euro-Qol (EQ-5D) questions, with a simulation of general population EQ-5D changes over the same period, derived from BHPS data, used as a comparator.

Changes in overall quality of life were assessed by a single question asked individuals to rate their quality of life as a whole, ranging from 'my life is so bad, it could not be worse', through to 'my life is so good, it could not be better'.

The evaluation programme experienced severe difficulties both in getting agreement for questionnaire content and in administering and receiving completed before and after questionnaires from older people across the wide range of projects.

Changes in HRQoL varied with the type of project, but improvements seemed to occur in 9 of the 11 project types, compared to the comparison group. Those receiving practical help appeared to report a notable improvement (12% increase), as simple aids or services could

⁹ National Institute for Health and Clinical Excellence (2010), *CG67 - Lipid modification cardiovascular risk assessment and the modification of blood lipids for the primary and secondary prevention of cardiovascular disease*

¹⁰ Windle et al (2009), *National evaluation of partnership for older people projects: Final report*

affect well-being, such as a grab-rail making washing easier or minor repairs reducing anxiety. An equivalent improvement (12% increase) was also reported following interventions providing exercise.

The cost and cost-effectiveness of the POPP programme was examined in four ways. First the cost of each individual project per user was assessed. The evaluation reported that these findings should be treated with caution, due to some probable inaccuracies in reporting and a high level of missing data.

The second analysis focused on the impact of the POPP projects on the use of hospital emergency beds, using areas without the POPP programme as a comparison. The analysis used data gathered by all Councils with Social Service Responsibilities (CSSRs) as part of meeting their Older Persons Public Service Agreement (OP PSA) requirements. Because the POPP data was not randomised over a specific time period a simple before and after analysis was not possible and 'difference-in-difference' estimates were used.

The projected savings vary with assumptions about management costs but, under an assumption of 10% management costs, a £1 additional spend on POPP projects would lead, on average, to approximately a £1.20 reduction in required spending on emergency bed occupants.

The third analysis explored whether the quality of life benefits delivered by the projects were cost-effective or more expensive than 'usual care'. Projects were analysed using the cost-effectiveness acceptability curve (CEAC), compared to outcomes in areas with no POPP projects, using the 'willingness to pay' cut-off figure of £30K for a point increase in QALY employed by the National Institute for Health and Care Excellence (NICE).

For the particular example of projects focused on improving well-being through the provision of practical help, small housing repairs, gardening, limited assistive technology or shopping. For an extra spend of £5,000 per person - £96.15 per week, there is a 98% probability that such projects are cost-effective compared with 'usual care'.

Finally, individuals' use of health and social care services was analysed to address whether there was a change in costs arising from changes in the type and extent of services used before and after the POPP project. This information was based on 1,529 service users who completed the standardised questionnaire before and after their involvement in the POPP programme.

Overall, hospital overnight stays appeared to be reduced by almost half (47%) and use of Accident & Emergency departments by almost a third (29%). Reductions were seen in physiotherapy/occupational therapy and clinic or outpatient appointments by almost one in ten. Such change

had a notable impact on costs with a cost reduction of £2,166 per person seemingly reported. There was considerable variation depending on the type of projects in which the older people were involved; the highest reductions were for projects focusing on hospital discharge and the lowest was for specialist falls services.

Monitoring the success of prevention

There is no single set of outcomes against which the success of prevention should be monitored. Measures of the success of a prevention intervention, in terms of immediate outcomes, will depend almost exclusively on the nature of the intervention. Measures to assess the short-term effectiveness of an intervention to promote walking will be very different from those adopted for one to encourage volunteering.

Short to medium term health effects can be evaluated, as appropriate, using standard clinical measures such as grip strength or body mass index or measures of self-rated health such as the EU-SILC five point scale, SF-12 or SF-36. Short to medium term quality of life outcomes can be monitored using, for example, EuroQol EQ-5D or the derived EuroQol EQ-VAS measure. Outcome measures relating to service use, hospital admission and re-admission, may also be appropriate.

Longer term health outcome will be measured by, for example, mortality rates, healthy life expectancy and disability free life expectancy.

It is unlikely that a deterministic link can be formed between an individual prevention measure and longer term health outcomes. In these circumstances it is necessary to rely on the epidemiological evidence linking the intermediate determinants of health, such as a healthy diet, better social networks or greater levels of physical activity, and longer term health outcomes.

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Review of the literature

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Within each section, the reviewed literature is listed in reverse chronological order with the most recent publication first.

a) Overviews - The monitoring and evaluation of prevention

Study	Findings
<p>Fernandez J-L, Marczak J and Wistow G (2014) <i>Matching methods to evidence for evaluating the outcomes of prevention in social care,</i></p>	<p>A presentation to the SSCR Annual Conference 2014, London, April 2014. Challenges of evaluating prevention in social care: Heterogeneity of social care needs - Physical health / disability, Mental health, Informal support networks, Other environmental factors, Personal traits Social care outcomes:- Outcomes are complex - Outcomes usually need to be multi-dimensional; Each dimension can be difficult to assess; Sometimes the only change to be expected is deterioration; There are multiple and sometimes competing perspectives on outcomes; Maximising independence vs. minimising risk of harm; Improving the wellbeing of carers vs. service users; Importance of process outcomes; Empowerment; Choice Long-term effects and costs: - Social care problems are often long-term; Interventions are also often long-term; The outcome effects of interventions are often slow to materialise; and so too are some of the costs Generating/using evidence about prevention:- Matching evaluation strategies to policy; Building business case before a new intervention; Evaluation of a new scheme being implemented; Piloting new ideas; Evaluation of existing services. Analysis at the margin; The methods and data requirements will depend on the nature of the intervention/aims of the evaluation. Overall, the key is to identify the contribution of services to outcomes Identifying the effect of the intervention: controlling for needs... Experimental set-ups Random allocation of intervention to intervention group (at individual or group level - e.g. geographical clustering); Difference in difference set-ups Control, Intervention, before and after Staged implementation (e.g. by area) with pre and post data available Disentangling general changes through time from effect of scheme; Matching strategies Using alternative sources of data to define comparator (e.g. from other areas; from national surveys); Regression methods Analysis “other things equal” More powerful but more complex to apply and more data “hungry” Can be used with some of the strategies above Can identify strategies for improving targeting of resources</p>

<p>Crowley D M, Coffman D L, Feinberg M E, Greenberg M T and Spoth R L (2014) Evaluating the Impact of Implementation Factors on Family-Based Prevention Programming: Methods for Strengthening Causal Inference, <i>Prevention Science</i> 15 (2) : 246-255</p>	<p>The current paper illustrates how propensity and marginal structural models can be used to improve causal inferences involving implementation factors not easily randomized (e.g., participant attendance). We first present analytic steps for simultaneously evaluating the impact of multiple implementation factors on prevention program outcome. Then, we demonstrate this approach for evaluating the impact of enrollment and attendance in a family program, over and above the impact of a school-based program, within PROSPER, a large-scale real-world prevention trial. Findings illustrate the capacity of this approach to successfully account for confounders that influence enrollment and attendance, thereby more accurately representing true causal relations.</p>
<p>Kelly J G (2013) <i>A Guide to Conducting Prevention Research in the Community: First Steps</i>, Routledge - first published 1988 by The Haworth Press</p>	<p>A first guide to prevention research focusing on two types of factors (1) Those factors in the local physical, economic or social environment that predispose the expression of the noxious condition, and (2) those factors that enhance the expression of health.</p> <p>"The public health philosophy as expressed in this volume advocates increasing knowledge of techniques for generating prevention outcomes, as well as knowledge of community processes that assist prevention research for both short term and long term positive effects. Examples of community processes are the traditions in which community activities, occasions, and social settings improve self-direction and social support."</p>
<p>Webber L, Marsh T, Mishra D, Coveney M, Rtveldadze K, Logstrup S, Kestens M, Postma M, Vemer P, O'Kelly S, Peresson S, Rito A, Ireland R and Kriaucioniene V (2013) <i>Cost-effectiveness of interventions to prevent, screen and treat chronic diseases: a review</i>, European Union - Executive Agency for Health and Consumers - EConDA project</p>	<p>In seeking a consensus to model the cost-effectiveness of interventions to prevent, screen and treat four major chronic diseases (Type 2 Diabetes (T2D), Coronary Heart Disease (CHD), Chronic Obstructive Pulmonary Disease (COPD) and Chronic Kidney Disease (CKD)), as background to an expert meeting that aimed to reach a consensus a literature review of the cost-effectiveness studies for each of the four diseases was carried out.</p> <p>This reviewed 153 studies in total. Twenty-nine studies for T2D, 84 for CHD, 22 for COPD, and 18 for CKD. For T2D, various interventions such as Intensive Lifestyle Management programmes, smoking cessation, metformin, testing glucose or albumin levels proved to be cost-effective</p> <p>A qualitative study complemented this review. It used thematic framework analysis to gain a more in-depth understanding of the methods. Three major themes emerged: 1. 'Determining a method of cost-effectiveness', 2. 'data limitations', 3. 'research recommendations'.</p>

EConDA working group (2013) *Establishing a consensus on the best methods for measuring the cost-effectiveness of interventions to prevent, screen and treat chronic diseases - final report*,

The Economics of Chronic Diseases (EConDA) project is a large two and a half year study supported by the European Commission Consumers, Health and Food Executive Agency. The project involves partners from eight European countries: Bulgaria, Finland, Greece, Lithuania, the Netherlands, Poland, Portugal and the UK. A major aim of EConDA is to establish a consensus over the best methods for measuring the cost-effectiveness interventions to prevent major chronic diseases, such as coronary heart disease, type 2 diabetes, chronic kidney disease and chronic obstructive pulmonary disease.

In an expert consensus meeting in December 2013, some consensus was gained over the methods that should be used for the EConDA modelling:

- different ICERs should be used: life-years gained; DALYs; QALYs; number of cases, direct costs and indirect costs
- a societal perspective should be taken where possible and this should be country specific.
- it was agreed that there should be no standardised CE cut-off points as comparing CE is problematic. However, it was agreed that comparing cost per QALY could be useful.
- cost per QALY should be used to compare across countries, though there was agreement that parameters should be country-specific e.g. the discount rate, currency, utility measures, way of calculating the societal perspective etc.
- use of a discreet event simulation model should be used

Data availability was highlighted as a key limitation to the quality of the modelling and confidence intervals should be presented with the outputs.

<p>Clegg A, Young J, Iliffe S, Olde-Rikkert M and Rockwood K (2013) Frailty in elderly people, <i>The Lancet</i> 381 (9868) : 752-762</p>	<p>Frailty is the antithesis of resilience in the prevention of adverse health outcome in older age. Frailty is the most problematic expression of population ageing. It is a state of vulnerability to poor resolution of homoeostasis after a stressor event and is a consequence of cumulative decline in many physiological systems during a lifetime. This cumulative decline depletes homoeostatic reserves until minor stressor events trigger disproportionate changes in health status. In landmark studies, investigators have developed valid models of frailty and these models have allowed epidemiological investigations that show the association between frailty and adverse health outcomes. There is a need to develop more efficient methods to detect frailty and measure its severity in routine clinical practice, especially methods that are useful for primary care. Such progress would greatly inform the appropriate selection of elderly people for invasive procedures or drug treatments and would be the basis for a shift in the care of frail elderly people towards more appropriate goal-directed care.</p>
<p>Perencevich E (2013) <i>How should we calculate influenza vaccine effectiveness?</i>, http://haicontroversies.blogspot.co.uk/2013/01/whats-up-with-cdc-influenza-vaccine.html</p>	<p>A blog comparing Odds Ratio and Relative Risk methods of assessing effectiveness in retrospective cohort studies. http://haicontroversies.blogspot.co.uk/2013/01/whats-up-with-cdc-influenza-vaccine.html Posted Monday, January 14, 2013</p>

<p>Miller R, Mangan C and Allen K (2013) <i>Older people's prevention services: Comparing perspectives of local authorities and the third sector - research findings</i>, NIHR School for Social Care Research</p>	<p>The relationship between local authority commissioners and TSOs appears to be principally one of trust and flexibility which has been developed through contact between individuals. However, both lack a shared understanding of how to set outcomes and measure impact on beneficiaries. This limits commissioners' capacity to understand the preventative work of individual TSOs and may lead to missed opportunities to shape and improve the local health and social care system.</p> <p>Overall TSOs and their local commissioners enjoyed positive relationships. They demonstrated shared understandings of their respective roles and largely met each other's expectations throughout the commissioning process.</p> <p>Differences can be identified in commissioner and TSO provider perspectives of the main purpose of prevention. While local authorities tended to focus on preventing older people needing social care services in the future, TSO's emphasis was on improved quality of life for individual older people. TSOs had holistic and wide ranging notions of what can constitute a preventative service for older people.</p> <p>Both TSOs and commissioners found it difficult to set outcomes for preventative services and to understand how best to measure performance in achieving these.</p> <p>TSOs stressed the importance of their relationship with the individual leading on the commissioning of their service area within the local authority.</p> <p>TSOs displayed a strong interest in developing better outcome evidence, especially in an insecure funding environment. Sometimes with limited capacity and resources, they would welcome the potential of dialogue with commissioners and researchers to developing relevant frameworks.</p>
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<p>Knapp M (2013) Prevention: wrestling with new economic realities, <i>Tizard Learning Disability Review</i> 18 (4) : 186-191</p>	<p>Economics evidence is highly relevant to decision makers in health, social care, and related systems. When resources are especially tight, economics evidence can sometimes persuade uncertain commissioners and others to adopt courses of action that improve the wellbeing of individuals, “Examining the economic case for prevention – in any field – ought to be straightforward, for the underlying principle is simplicity itself – spend now to save later – and one just needs to compare the two. But it is not always easy to populate that simple statement with convincing evidence. One reason why it is difficult is that some preventive initiatives are universal, which can make them quite expensive to launch. Others might be targeted on specific groups of people, but the identification of those people is itself a rather costly process. A second reason is that the eventual savings that flow from a successful preventive strategy might be a long way down the road.”</p> <p>“Economists do not have a box of tricks to magic away these practical difficulties, but what they can offer is a framework that has the potential to generate evidence that might connect with the concerns of hard-pressed decision makers. There are five elements to that framework: 1. cost-effectiveness; 2. costs; 3. outcomes; 4. equity; and 5. design.”</p>
<p>Kania A, Patel A B, Roy A, Yelland G S, Nguyen D T K and Verhoef M J (2012) Capturing the complexity of evaluations of health promotion interventions – a scoping review, <i>The Canadian Journal of Program Evaluation</i> 27 (1) : 65-91</p>	<p>A scoping review of evaluations of HP interventions concerning alcohol and tobacco use in the peer reviewed (PR) and grey literature (GL) to assess if such evaluations use a Complex Adaptive Systems (CAS) perspective.. The authors develop indicator questions to assess CAS aspects. None of the 45 PR and 9 GL evaluations reviewed explicitly used a CAS perspective; however most indirectly assessed complexity aspects..</p>

<p>Brown A M, Johnston L, with Currie M and Munoz S-A (2011) <i>A contribution to the evidence base for evaluating health interventions in natural environment settings - Final report</i>, A review commissioned by the Forestry Commission and conducted by the Centre for Rural Health, University of Highlands and Islands</p>	<p>This report reviews the research methods and approaches used to evaluate UK-based health interventions and programmes that are in, use, or seek to change the natural environment. Validated health measures were used by two fifths of the evaluations. Validated physical activity measures were less commonly used. A lack of economic appraisal within evaluations and overall was identified.</p> <p>Thirty two of the forty evaluations were non-experimental in design. This means they did not assign a control group as a comparator with the participants.</p> <p>On the whole, the evaluations were looking at the impact the programmes had on the participants or testing if the interventions had achieved outcomes to match their aims. Process evaluation was underused in the evaluations although it did appear as a secondary evaluation type for a small number of the impact evaluations. Impact evaluation asks 'did it work?' whereas a process evaluation would ask 'how did it work?'</p> <p>Twenty six of the evaluations included the collection of some sort of before and after data, mostly through the use of self-completed questionnaires asking if activity levels or health had changed as a result of participation. Most studies did a post-intervention follow up or during intervention follow-up but scarcely did any follow-up any later than 12 months after the baseline.</p> <p>The review has examined the extent to which validated health measures have been utilised by evaluators to gather objective self-reported health data. SF12v2. and the Rosenberg Self Esteem scale were the most commonly used questionnaires. Other clinical health measures have also been used including body mass index (BMI), waist to hip ratio, VO2Max (lung efficiency), cholesterol levels and blood pressure. These measures are generally used in the more experimental studies. Non-validated self-reported health data were collected in a number of studies using questionnaires asking participants questions about how they were feeling, if participating had made them feel any different, if they felt any benefit from taking part in the activity, if participation had increased their confidence, stamina, feeling of general health and well-being etc. This data is more prone to over or under-estimation and bias but can give clear information of the perceived health effects of participation.</p> <p>Wider buy in to the use of validated measurement tools is required to improve evaluations. Few standardised physical activity questions were used in the evaluations Most of the other studies used non-standardised self-reported measures of exercise and fitness. Only one evaluation gathered more objective data using accelerometers.</p>
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<p>Allen K and Miller R (2011) <i>Prevention services, social care and older people: much discussed but little researched?</i>, NIHR School for Social Care Research, University of Birmingham</p>	<p>This study reveals that LAs seek evidence and guidance on how best to invest in prevention services from a range of sources. Decisions to invest are determined partly by this information, but also on the views of LA political and managerial leaders. There is a common belief in the positive impact of reablement services both for outcomes set by older people and those of the LA. Beyond reablement, a number of different interventions are seen as being the most effective.</p>
<p>Lechner M (2011) <i>The Estimation of Causal Effects by Difference-in-Difference Methods</i>, University of St. Gallen, Department of Economics, Discussion Paper no. 2010-28</p>	<p>This report provides a brief overview of the literature on the difference-in-difference (DiD) estimation strategy and discusses major issues using a treatment effect perspective. In this sense, it gives a somewhat different view on DiD than the standard textbook discussion of the difference-in-difference model, but it will also not be as complete as the latter. This survey contains also a couple of extensions to the literature, for example, a discussion of and suggestions for non-linear DiD as well as DiD based on propensity-score type matching methods.</p> <p>The Difference-in-Difference (DiD) approach is a research design for estimating causal effects. It is popular in empirical economics, for example, to estimate the effects of certain policy interventions and policy changes that do not affect everybody at the same time and in the same way.</p> <p>The DiD design is usually based on comparing de facto four different groups. Three of these groups are not affected by the treatment. In many applications, 'time' is an important variable to distinguish the groups.</p> <p>The idea of this empirical strategy is that if the two treated and the two non-treated groups are subject to the same time trends, and if the treatment has had no effect in the pre-treatment period, then an estimate of the 'effect' of the treatment in a period in which it is known to have none, can be used to remove the effect of confounding factors to which a comparison of post-treatment outcomes of treated and non-treated may be subject to. This is to say that we use the mean changes of the outcome variables for the non-treated over time and add them to the mean level of the outcome variable for the treated prior to treatment to obtain the mean outcome the treated would have experienced if they had not been subject to the treatment.</p>

Watts P, Phillips G, Petticrew M, Harden A and Renton A (2011) The influence of environmental factors on the generalisability of public health research evidence: physical activity as a worked example, *International Journal of Behavioral Nutrition and Physical Activity* 8:128

It is rare that decisions about investing in public health interventions in a city, town or other location can be informed by research generated in that specific place. It is therefore necessary to base decisions on evidence generated elsewhere and to make inferences about the extent to which this evidence is generalisable to the place of interest. This paper discusses the issues involved in making such inferences, using physical activity as an example. It discusses the ways in which elements of the structural, physical, social and/or cultural environment (environmental factors [EFs]) can shape physical activity (PA) and also how EFs may influence the effectiveness of interventions that aim to promote PA. It then highlights the ways in which EFs may impact on the generalisability of different types of evidence.

The article presents a framework for thinking about the influence of EFs when assessing the generalisability of evidence from the location in which the evidence was generated (place A) to the location to which the evidence is to be applied (place B). The framework relates to similarities and differences between place A and place B with respect to: a) the distributions of EFs; b) the causal pathways through which EFs or interventions are thought to exert their effect on PA and c) the ways in which EFs interact with each other. We suggest, using examples, how this scheme can be used by public health professionals who are designing, executing, reporting and synthesising research on PA; or designing/implementing interventions.

The analysis and scheme, although developed for physical activity, may potentially be adapted and applied to other evidence and interventions which are likely to be sensitive to influence by elements of the structural, physical, social and/or cultural environment such as the epidemiology of obesity and healthy weight promotion.

<p>Brownson R C, Baker E A, Leet T L, Gillespie K N and True W R (2010) <i>Evidence-Based Public Health</i>, Oxford: Oxford University Press</p>	<p>Lessons for public health can be learned from evidence-based approaches that have been adopted in medicine.</p> <p>Evidence is limited for many public health interventions, yet approaches should be based on the best possible science, be multidisciplinary, and centre on sound planning and evaluation methods</p> <p>A systematic approach to evidence-based decision making in public health is likely to improve practice. Barriers and limitations should be proactively addressed in a variety of public health settings</p> <p>This book provides the rationale for evidence-based approaches, helping with decision making in public health; presents concepts of causality that help in determining when scientific evidence is sufficient for public health action; describes analytic tools that can be extremely useful in finding and evaluating evidence-these include economic evaluation. health impact assessment. meta-analysis. and expert guidelines, It goes on to provide a sequential framework for Conducting a community assessment; Developing an initial statement of the issue; Quantifying the issue; Searching the scientific literature and organizing information; Developing and prioritizing intervention options; Developing an option plan and implementing interventions;Evaluating the program or policy</p>
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Marmot M, Allen J, Goldblatt P, Boyce T, McNeish D, Grady M and Geddes I (2010) *Fair society, healthy lives: Strategic review of health inequalities in England post 2010 - The Marmot Review*, London

Key messages of this Review

1. Reducing health inequalities is a matter of fairness and social justice. In England, the many people who are currently dying prematurely each year as a result of health inequalities would otherwise have enjoyed, in total, between 1.3 and 2.5 million extra years of life.
2. There is a social gradient in health – the lower a person’s social position, the worse his or her health. Action should focus on reducing the gradient in health.
3. Health inequalities result from social inequalities. Action on health inequalities requires action across all the social determinants of health.
4. Focusing solely on the most disadvantaged will not reduce health inequalities sufficiently. To reduce the steepness of the social gradient in health, actions must be universal, but with a scale and intensity that is proportionate to the level of disadvantage. We call this proportionate universalism.
5. Action taken to reduce health inequalities will benefit society in many ways. It will have economic benefits in reducing losses from illness associated with health inequalities. These currently account for productivity losses, reduced tax revenue, higher welfare payments and increased treatment costs.
6. Economic growth is not the most important measure of our country’s success. The fair distribution of health, well-being and sustainability are important social goals. Tackling social inequalities in health and tackling climate change must go together.
7. Reducing health inequalities will require action on six policy objectives:
 - Give every child the best start in life
 - Enable all children young people and adults to maximise their capabilities and have control over their lives
 - Create fair employment and good work for all
 - Ensure healthy standard of living for all
 - Create and develop healthy and sustainable places and communities
 - Strengthen the role and impact of ill health prevention
8. Delivering these policy objectives will require action by central and local government, the NHS, the third and private sectors and community groups. National policies will not work without effective local delivery systems focused on health equity in all policies.
9. Effective local delivery requires effective participatory decision-making at local level. This can only happen by empowering individuals and local communities.

<p>Taekema D G, Gussekloo J, Maier A B, Westendorp R G J and de Craen A J M (2010) Handgrip strength as a predictor of functional, psychological and social health. A prospective population-based study among the oldest old, <i>Age and Ageing</i> 39 (3) : 331-337</p>	<p>Hand-grip strength as a health-outcome measure: This study aimed to assess if handgrip strength predicts changes in functional, psychological and social health among oldest old. The Leiden 85-plus Study is a prospective population-based follow-up study. Subjects: five-hundred fifty-five, all aged 85 years at baseline, participated in the study. Methods: handgrip strength was measured with a handgrip strength dynamometer. Functional, psychological and social health were assessed annually. Baseline data on chronic diseases were obtained from the treating physician, pharmacist, electrocardiogram and blood sample analysis. Results: at age 85, lower handgrip strength was correlated with poorer scores in functional, psychological and social health domains (all, $P < 0.001$). Lower baseline handgrip strength predicted an accelerated decline in activities of daily living (ADL) and cognition (both, $P = 0.001$), but not in social health ($P > 0.30$). Conclusion: poor handgrip strength predicts accelerated dependency in ADL and cognitive decline in oldest old. Measuring handgrip strength could be a useful instrument in geriatric practice to identify those oldest old patients at risk for this accelerated decline.</p>
<p>Williamson T, Prashar A, Hulme C and Warne A (2009) <i>Evaluation of Rochdale Partnerships for Older People Project (POPP): Building healthy communities for older people</i>, University of Salford/University of Leeds</p>	<p>The POPP outreach workers conducted over 2500 interviews between May 2007-March 2009 and for those interviewed social isolation and ill-health were key factors in social exclusion. As a result of these interviews outreach workers made over 2000 referrals for different physical and social activities including for general information, armchair exercise, luncheon club, IT lessons, gentle exercise and arts and crafts. Almost 1000 referrals were made to key services including to health professionals, for benefits advice, equipment advice, and to Social Services and over 2000 referrals were made to POPP funded projects. Over half of these latter referrals (1395) were for transport services which facilitated attendance at both social and health activities. Needs that have been met include: Physical Activity (e.g. Armchair Exercise, Dancing, Swimming, Tai Chi and Walking); Social Interaction (e.g. Arts and Crafts, Luncheon Clubs and Social Activity); and Social Support (e.g. Assisted Shopping, Equipment Access Service, Home Improvement, Ring and Ride and Transport). The key remaining areas of unmet needs concern Armchair Exercise (117 POPP members identified as having their needs unmet), Luncheon Clubs (96 POPP members with needs unmet), Podiatry (84 POPP members with needs unmet), Gardening (49 POPP members with needs unmet), and Handy Person (with 37 POPP members with needs unmet).</p>

<p>Windle K, Wagland R, Forder J, D'Amico F, Janssen D and Wistow G (2009) <i>National evaluation of partnership for older people projects: Final report.</i>, Canterbury, London and Manchester: PSSRU</p>	<p>The Partnership for Older People Projects (POPP) were funded by the Department of Health to develop services for older people, aimed at promoting their health, well-being and independence and preventing or delaying their need for higher intensity or institutional care. Twenty nine pilot sites were designated in local authorities in England, running a wide variety of projects, between 2006 and 2009. A standardised questionnaire, administered both before and after the POPP intervention, measured the health-related quality of life (HRQoL) of a sample of 1,529 older people, and recorded their perception of any changes in their overall quality of life. A sample drawn from the British Household Panel Survey was used as a comparison. Changes in health-related quality of life were measured using Euro-Qol (EQ-5D) questions, with a simulation of general population EQ-5D changes over the same period, derived from BHPS data, used as a comparator.</p> <p>Also, changes in overall quality of life were assessed by a single question asking individuals to rate their quality of life as a whole, ranging from 'my life is so bad, it could not be worse', through to 'my life is so good, it could not be better'.</p> <p>The cost and cost-effectiveness of the POPP programme was examined in four ways. First the cost of each individual project per user was assessed.</p> <p>The second analysis focused on the impact of the POPP projects on the use of hospital emergency beds, using areas without the POPP programme as a comparison.</p> <p>The third analysis explored whether the quality of life benefits delivered by the projects were cost-effective or more expensive than 'usual care'.</p> <p>Finally, individuals' use of health and social care services was analysed to address whether there was a change in costs arising from changes in the type and extent of services used before and after the POPP project.</p>
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<p>Curry N (2006) <i>Preventive Social Care Is it cost effective? Wanless Social Care Review - background paper</i>, The Kings Fund</p>	<p>Overall, there is a paucity of quantified information about the effectiveness of preventive services. There is a strong financial case for reducing hospitalisation (particularly through falls) and for reducing the rate of institutionalisation by maintaining independence. However, the evidence as to what is effective in bringing about these reductions is rarely quantitative.</p> <p>There is a wealth of qualitative information to suggest that low-level interventions are highly valued by older people and that they can be effective in maintaining independence. However, there is a lack of robust evidence indicating that such low-level interventions are cost effective. Some evidence obtained through small-scale trials suggests that small interventions, such as issuing older people with slippers that fit properly, could save millions of pounds through preventing falls and reducing the rate of institutionalisation. However, establishing a direct causal relationship between such interventions and long-term financial savings has proved problematic.</p> <p>There is a lack of consensus over the cost effectiveness of intermediate care. Generic intermediate care has frequently been found to be not cost effective, although some studies have found that generic intermediate care is effective in reducing lengths of stay through facilitating timely discharge. There is stronger evidence for the cost-effectiveness of intermediate care services that target specific groups/illnesses/events such as stroke and falls.</p> <p>Evidence for secondary stroke prevention services is perhaps the strongest, and most widely quantified, body of research. However, interventions vary widely as to their cost effectiveness. There is some evidence that primary prevention strategies (such as smoking cessation and reduced salt intake) have potential to reduce the incidence of stroke.</p> <p>Quantified evidence for wider community services has not been identified, although there is some effectiveness evidence around public health interventions, such as smoking cessation. Smoking cessation services tend to be relatively cost effective but it has seemingly proved too complex to measure the cost effectiveness of community services that are essential for an independent life and social inclusion (such as public transport and other amenities).</p> <p>It is evident that, in order to maximise the effectiveness of any intervention, it is important to target services carefully towards those who need them most.</p>
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Haywood K L, Garratt A M, Schmidt L J, Mackintosh A E and Fitzpatrick R (2004) *Health status and quality of life in older people: a structured review of patient-reported health instruments*, Report from the Patient-reported Health Instruments Group (formerly the Patient-assessed Health Outcomes Programme) to the Department of Health

A review of generic and older people-specific self-reported instruments measuring aspects of health and quality of life (HRQL) that have been evaluated for use with older people.

Generic instruments: 15 generic instruments met the review inclusion criteria. The SF-36, Sickness Impact Profile (SIP), and EuroQol EQ-5D have undergone more evaluations following the assessment of older people than the others. Most instruments were developed and evaluated in North America. The COOP and WONCA/COOP charts, EuroQol, Health Status Questionnaire-12 (HSQ-12), Index of Health-related Quality of Life (IHQL), Nottingham Health Profile (NHP), SF-12 and SF-36 have published UK evaluations.

All generic instruments assess physical function; most assess psychological and social well-being. Three instruments assess cognitive well-being, namely the Goteberg Quality of Life questionnaire (GQL), SIP, and the Spitzer Quality of Life index (modified) (SQL). The COOP, SF-36, and SIP assess the widest range of health domains.

The SF-36 has the most extensive evidence of reliability. Four generic instruments, namely the NHP, SF-12, SF-20, SF-36, have evidence of internal consistency and test-retest reliability. The range of reliability estimates support application at the group level and, in some instances, at the individual level. There is limited evidence supporting the application of the COOP and EuroQol EQ-5D at the group level. Four instruments do not have evidence of reliability, namely HSQ-12, IHQL, Quality of Well-being Scale (QWB), and SQL

Older people-specific instruments: 18 older people specific instruments met the review inclusion criteria. The OARS Multidimensional Functional Assessment Questionnaire (OMFAQ), the Comprehensive Assessment and Referral Evaluation (CARE), the Functional Assessment Inventory (FAI), and the Quality of Life Profile - Senior Version (QOLPSV) have undergone the highest number of evaluations. However, most evaluations for the CARE and the QOLPSV refer to the same older population. The majority of instruments were developed and evaluated in North America; most have one published evaluation. The CARE, EASY-Care, and Brief Screening Questionnaire (BSQ) have published UK evaluations; the CARE was developed in the USA and UK, and the EASY-Care in the UK and other European countries. Most instruments were evaluated in community settings.

Most instruments assess physical function, psychological well-being, and social well-being; seven instruments also assess cognitive function, namely the BSQ, EASY-Care, Geriatric Postal Screening Survey (GPSS), Iowa Self-Assessment Instrument (ISAI), LEIPAD, OMFAQ, and the Philadelphia Geriatric Centre Multilevel Assessment Inventory (PGCMAI). The EASY-Care assesses the widest range of health domains.

There is limited evidence of reliability for most instruments.

<p>Appleby J and Devlin N (2004) <i>Measuring success in the NHS: Using patient-assessed health outcomes to manage the performance of healthcare providers</i>, Dr Foster Ltd; Kings Fund; City University</p>	<p>The potential benefits of routinely measuring patient-assessed HRQoL are wide ranging, providing basic evidence to inform the revalidation of clinicians, the performance management of hospitals, and real patient choice. Such data would have wider system impacts, helping in the re-evaluation of old and new treatments as they are delivered in the real world, providing a source of patients' own views about health and healthcare, feeding into current debates and research into the best ways to measure NHS productivity, and the tracking of changes in clinical opinion and action regarding when to admit and treat patients.</p> <p>Linking information on patient-assessed HRQoL to patients' medical records and other data sets would, for the first time, allow proper evaluation of broader government health policies as they affect equity: not just how much benefit, but who benefits.</p> <p>The failure to measure an absolutely fundamental outcome of healthcare has not been due to the lack of ways of measuring health related quality of life; measures have existed for many years, have been intensely researched, and have provided well recognised and accepted measures of outcome in clinical trials for decades. Thousands of disease- and patient group-specific self-completed questionnaires have been developed and tested along with generic measures such as the SF-36® and the EQ-5D.</p>
<p>Rootman I, Goodstadt M, Hyndman B, McQueen D V, Potvin L, Springett J and Ziglio E (2001) <i>Evaluation in health promotion: principles and perspectives.</i>, Copenhagen: WHO Europe</p>	<p>This text is the product of an international collaboration under the auspices of the WHO. Stemming from the establishment of a European working party on evaluating health promotion, this book primarily comprises working papers commissioned by the working party across a variety of areas within evaluation. It is designed to provide background reading in the theoretical and practical issues related to evaluating health promotion as conceptualised by the Ottawa Charter. Further, the rationale behind evaluating health promotion, informed by a broad view of what constitutes evidence, drives the text.</p> <p>The first three chapters of the book provide a treatment of key issues in the evaluation of health promotion initiatives. The authors take the view that health promotion is explicitly political and value-laden in direct contrast with some of its contributory disciplines. They approach health promotion as an explicitly empowering activity, focusing on community action rather than on interventions at the level of the individual and with programmes of activity that strive to be responsive and malleable to the positions of stakeholders, which include target populations.</p> <p>This book provides chapters on evaluating and tracking policy and its impact, economic evaluations of health promotion and the use of health impact assessment as an evaluation tool. The concluding chapter presents a generic model for planning and evaluating health promotion.</p>

<p>Wimbush E and Watson J (2000) An evaluation framework for health promotion: theory, quality and effectiveness., <i>Evaluation</i> 6 (3) : 301-321</p>	<p>There is increasing demand for evaluation work funded by public agencies to become more focused on demonstrating effectiveness. Focusing evaluation on outcomes and effectiveness meets the information needs of strategic planners and policy makers, but other stakeholders involved in managing, delivering or using public services and programmes may use other assessment criteria, such as improving the quality of programmes or programme design. The necessity and value of these other criteria are in danger of being obscured. Acknowledging the legitimacy of the range of stakeholder perspectives, this article presents a framework for evaluation that has been developed over a number of years within the context of evaluating health promotion programmes as part of the work of a national health promotion agency. It argues for an approach to evaluation which recognizes the contributions of theory and quality as well as effectiveness in programme development. The Health Education Board for Scotland (HEBS) framework for evaluation – and the analysis that informed it – demonstrates that there are many stages and forms of evaluation which contribute to the development of effective interventions. While outcome evaluations and effectiveness reviews tend to be the prized evaluation products for those concerned with policy and strategic planning, these forms of evaluation are just ‘the tip of the iceberg’ of what is required to build a sound evidence base, bringing together the full range of evaluation needs from the perspectives of all the different stakeholder groups.</p>
<p>Glasgow R E, Vogt T M, and Boles S M (1999) Evaluating the public health impact of health promotion interventions: the RE-AIM framework, <i>American Journal of Public Health</i> 89 (9) : 1322-1327</p>	<p>Progress in public health and community-based interventions has been hampered by the lack of a comprehensive evaluation framework appropriate to such programs. Multilevel interventions that incorporate policy, environmental, and individual components should be evaluated with measurements suited to their settings, goals, and purpose. In this commentary, the authors propose a model (termed the RE-AIM model) for evaluating public health interventions that assesses 5 dimensions: reach, efficacy, adoption, implementation, and maintenance. These dimensions occur at multiple levels (e.g., individual, clinic or organization, community) and interact to determine the public health or population-based impact of a program or policy. The authors discuss issues in evaluating each of these dimensions and combining them to determine overall public health impact. Failure to adequately evaluate programs on all 5 dimensions can lead to a waste of resources, discontinuities between stages of research, and failure to improve public health to the limits of our capacity. The authors summarize strengths and limitations of the RE-AIM model and recommend areas for future research and application.</p>

Nutbeam D (1998) Evaluating Health Promotion—Progress, Problems and solutions, *Health Promotion International* 13 (1) : 27-44

Several issues of current debate in health promotion evaluation are examined. These include the definition and measurement of relevant outcomes to health promotion, and the use of evaluation methodologies which assess both the outcome achieved and the process by which it is achieved. Considerable progress is being made in understanding the complexity of health promotion activity, and in the corresponding need for sophisticated measures and evaluation research designs which reflect this complexity.

The more powerful forms of health promotion action are those which are long term, and least easily predicted, controlled and measured by conventional means. Against this, important and valued advances in knowledge and credibility have come from more tightly defined and controlled interventions, which have been evaluated through the application of more traditional experimental designs.

This tension between ‘scientific rigour’ and the perceived advantages (in long-term effectiveness and maintenance) coming from the less-well-defined content and methods of community controlled programmes continues to pose technical problems in evaluation. It is important to foster and develop evaluation designs which combine the advantages of different research methodologies, quantitative with qualitative, in ways which are relevant to the stage of development of a programme.

The use of a diverse range of data and information sources will generally provide more illuminating, relevant and sensitive evidence of effects than a single ‘definitive’ study. Evaluations have to be tailored to suit the activity and circumstances of individual programmes—no single methodology is right for all programmes.

b) Selected epidemiological evidence – lifestyle – alcohol consumption, smoking and diet

Study	Findings
<p>Alcohol Concern (2011) <i>Making alcohol a health priority – Opportunities to reduce alcohol harms and rising costs,</i></p>	<p>In the past 60 years, the average intake of alcohol per person in the UK has risen steadily, from 5 litres a year in the 1950s, to over 11 litres a year in 2007. Over 10m adults in England now drink more than the recommended daily limit, with 2.6m of them drinking more than twice that. There has also been a dramatic rise in drinking among women, with heavy drinking increasing by almost a third in the decade prior to 2008.</p> <p>The risks of drinking to excess are well established. Long term alcohol abuse can lead to numerous health problems, including liver and kidney disease, acute and chronic pancreatitis, heart disease, high blood pressure, depression, stroke, foetal alcohol syndrome and several cancers.</p> <p>This places a huge burden on the NHS. The number of hospital admissions due to alcohol misuse was 1.1 million in 2009/10, a 100% increase since 2002/03. If the rise continues unchecked, by the end of the current Parliament a staggering 1.5 million people will be admitted to hospital every year as a result of drinking.</p> <p>The problem is not limited purely to healthcare. The damage that drinking causes echoes throughout society, contributing to 1.2 million incidents of violent crime a year, 40% of domestic violence cases and 6% of all road casualties.</p> <p>Alcohol misuse is now estimated to cost the NHS £2.7 billion a year, almost twice the equivalent figure in 2001. But the cost of alcohol to society as a whole is even greater, estimated to stand at £17-22 billion, and by some estimates is as high as £55 billion.</p>

<p>The NHS Information Centre, Lifestyles Statistics (2011) <i>Statistics on Smoking: England, 2011</i>,</p>	<p>The report aims to present a broad picture of health issues relating to smoking in England and covers topics such as smoking prevalence, smoking-related ill health and mortality and smoking-related costs. Among adults aged 16 and over, in England, in 2009:</p> <ul style="list-style-type: none">• 21% reported smoking, the same as in 2007 and 2008 and lower than the 39% in 1980.• Prevalence of cigarette smoking continues to be higher among men than women with 22% of men and 20% of women reporting smoking.• Those aged 16-19 and 20-24 reported the highest prevalence of cigarette smoking (27% and 28% respectively), while those aged 60 and over reported the lowest prevalence (14%).• Current smokers smoked an average of 13.1 cigarettes per day.• Prevalence of smoking amongst people in the routine and manual socio-economic group continues to be greater than amongst those in the managerial and professional group (28% and 14% respectively).• People who were divorced or separated were most likely to smoke (33%), while those who were widowed were least likely (12%).• Those who were divorced or separated were around twice as likely to be heavy smokers (20 or more cigarettes a day) than those who were single or married/cohabiting (12% compared to 6% and 5% respectively) and three times as likely as those who were widowed (4%).
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<p>National Institute for Health and Care Excellence (2010) <i>Prevention of cardiovascular disease. NICE public health guidance 25,</i></p>	<p>Lifetime risk of CVD is strongly influenced by diet and physical activity levels since childhood. 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).</p> <p>In more than 90% of cases, the risk of a first heart attack is related to nine potentially modifiable risk factors : smoking/tobacco use; poor diet; high blood cholesterol; high blood pressure; insufficient physical activity; overweight/obesity; diabetes; psychosocial stress (linked to people's ability to influence the potentially stressful environments in which they live); excess alcohol consumption.</p> <p>Other factors, such as maternal nutrition and air pollution may also be linked to the disease.</p> <p>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. 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.)</p> <p>Between 8% and 42% of certain cancers (endometrial, breast, and colon) are attributable to excess body fat.</p> <p>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.</p> <p>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.</p> <p>Actions which impact on the whole population most effectively reduce these risk factors 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.</p> <p>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.</p>
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<p>The NHS Information Centre, Lifestyles Statistics (2009) <i>Statistics on Alcohol: England, 2009</i>, The Health and Social Care Information Centre</p>	<p>Government recommendations at the time of publication are that adult men should not regularly drink more than 3-4 units of alcohol a day and adult women should not regularly drink more than 2-3 units a day.</p> <p>Hazardous drinking is defined as a pattern of drinking which brings about the risk of physical or psychological harm. Harmful drinking, a subset of hazardous drinking, is defined as a pattern of drinking which is likely to cause physical or psychological harm.</p> <p>Substance dependence is defined by the International Classification of Diseases and related health problems (ICD-10) as a cluster of behavioural, cognitive and physiological phenomena that can develop after repeated substance use.</p> <ul style="list-style-type: none"> • 69% of men and 55% of women (aged 16 and over) reported drinking an alcoholic drink on at least one day in the week prior to interview. 10% of men and 6% of women reported drinking on every day in the previous week. • 37% of men drank over 4 units on at least one day in the week prior to interview and 29% of women drank more than 3 units on at least one day in the week prior to interview. 20% of men reported drinking over 8 units and 13% of women reported drinking over 6 units on at least one day in the week prior to interview. • The average weekly alcohol consumption was 16.4 units for men and 8.0 units for women. • 26% of men reported drinking more than 21 units in an average week. For women, 18% reported drinking more than 14 units in an average week • The overall volume of alcoholic drinks purchased for consumption outside the home has decreased by 39% from 733 millilitres (ml) of alcohol per person per week in 2001/02 to 446 ml per person per week in 2009. This reduction is mainly due to a 45% decrease in the volume of beer purchases from 623 ml to 342 ml per person per week over the same period.
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<p>Rapuri P B, Gallagher J C and Smith L M (2007) Smoking is a risk factor for decreased physical performance in elderly women, <i>Journals of Gerontology: Series A, Biological Sciences and Medical Sciences</i> 62A (1) : 93-100</p>	<p>A study of 487 elderly women aged 65–77 years to examined the association of smoking with physical performance measures of muscle function and whether the effect of smoking on physical performance measures is mediated through its effect on vitamin D or oestrogen metabolism.</p> <p>Timed rise, timed walk at normal and fast speed, grip strength, and serum biochemical measurements were compared between smokers, past smokers, and non-smokers. Analysis of covariance was used to compare physical performance variables while adjusting for confounding variables.</p> <p>Results. Compared to non-smokers and past smokers, current smokers were significantly ($p < .05$) slower on timed rise and timed walk tests and had decreased grip strength. From multivariate analysis, smoking, age, total body fat, and serum 1,25(OH)2D examined as quartiles were predictors of physical performance measures.</p> <p>The effect of current smoking on physical performance was equivalent to a normal age-related decline in physical performance tests of 7–11 years depending on the test.</p> <p>Conclusions: Current smoking is a risk factor for decreased muscle strength leading to decreased physical performance in elderly women. The effect of smoking on physical performance is in part mediated by its effect on 1,25(OH)2D metabolism. Smoking may also have an independent effect on physical performance possibly by a direct effect on muscle or through an effect on vascular function</p>
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<p>Doll R, Peto R, Boreham J and Sutherland I (2004) Mortality in relation to smoking: 50 years' observations on male British doctors, <i>BMJ</i> 2004;328:1519</p>	<p>A prospective study of 34 439 male British doctors that has continued from 1951 to 2001 to compare the hazards of cigarette smoking in men who formed their habits at different periods, and the extent of the reduction in risk when cigarette smoking is stopped at different ages. Information about smoking habits was obtained in 1951, and periodically thereafter; cause specific mortality was monitored for 50 years. Main outcome measures: Overall mortality by smoking habit, considering separately men born in different periods. Results The excess mortality associated with smoking chiefly involved vascular, neoplastic, and respiratory diseases that can be caused by smoking. Men born in 1900-1930 who smoked only cigarettes and continued smoking died on average about 10 years younger than lifelong non-smokers. Cessation at age 60, 50, 40, or 30 years gained, respectively, about 3, 6, 9, or 10 years of life expectancy. The excess mortality associated with cigarette smoking was less for men born in the 19th century and was greatest for men born in the 1920s. The cigarette smoker versus non-smoker probabilities of dying in middle age (35-69) were 42% v 24% (a twofold death rate ratio) for those born in 1900-1909, but were 43% v 15% (a threefold death rate ratio) for those born in the 1920s. At older ages, the cigarette smoker versus non-smoker probabilities of surviving from age 70 to 90 were 10% v 12% at the death rates of the 1950s (that is, among men born around the 1870s) but were 7% v 33% (again a threefold death rate ratio) at the death rates of the 1990s (that is, among men born around the 1910s). Conclusion A substantial progressive decrease in the mortality rates among non-smokers over the past half century (due to prevention and improved treatment of disease) has been wholly outweighed, among cigarette smokers, by a progressive increase in the smoker v non-smoker death rate ratio due to earlier and more intensive use of cigarettes. Among the men born around 1920, prolonged cigarette smoking from early adult life tripled age specific mortality rates, but cessation at age 50 halved the hazard, and cessation at age 30 avoided almost all of it.</p>
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c) Selected epidemiological evidence – lifestyle – lifelong learning

Study	Findings
McNair S (2012) <i>Older people's learning in 2012 A survey</i> , National Older Learners Group and NIACE	<p>This is the report of a survey of older people in Great Britain, carried out in spring 2012. It examined their learning: what they learned, where, when and why, and with what benefits. It also examined whether, and how far, current patterns might be changed. The benefits of learning are complex. Most older people report more than one kind of benefit.</p> <ul style="list-style-type: none"> • Motivations to learn are not the same as benefits from learning. Many of the benefits reported do not match the motives which led older people to embark on learning. • The benefits of learning which older learners report most often are 'passing on knowledge and skills to others' (the most widely cited benefit), 'to improve my chances of getting or retaining paid work', 'to help me get involved in society', and 'to help improve my health'. Significant minorities, especially among the older, also report 'get involved in the digital world', 'manage my caring responsibilities', and 'coping with life crises'. • For the oldest groups, learning is important to enable them to remain socially engaged, and to maintain their health. • Almost two in five learners, particularly women, were aiming 'to improve my self-confidence', or 'to develop myself as a person'. Unlike other motivations, this does not change with age.
Jenkins A (2011) Participation in learning and wellbeing among older adults, <i>International Journal of Lifelong Education</i> 30 (3) : 403-420	<p>The objective of this research was to identify the effects of participation in learning on the subjective wellbeing of older adults. Data were from the English Longitudinal Study of Ageing (ELSA), a large-scale, nationally representative survey of those aged 50 and above. The survey contains several wellbeing measures and information on three types of learning: formal courses, music/arts/evening classes and gym/exercise classes. Multiple regression analyses were applied to the change in wellbeing outcomes between two survey waves. The key finding was that music, arts and evening classes were significantly associated with changes in each of the measures of subjective wellbeing. Formal courses and gym/exercise classes were not significantly associated with wellbeing, after controlling for other factors.</p>

<p>McNair S (2011) <i>Older people's learning: What do we Know</i>, NIACE for the Department for Business, Innovation and Skills</p>	<p>Includes a report of a 2006 survey of older peoples self assessed benefits from life-long learning: I have developed myself as a person (26%); I have met new people/ made new friends (28%); My communication skills have improved (25%); My self confidence has improved (18%); I enjoy learning more (19%)</p>
<p>Feinstein L, Budge D, Vorhaus J and Duckworth K (2008) <i>The social and personal benefits of learning: A summary of key research findings</i>, London: Centre for Research on the Wider Benefits of Learning,</p>	<p>The research explores the many benefits that learning brings to individuals and to society as a whole. It also seeks to inform the funding, planning and practice of education at every stage of the lifecourse. The researchers have looked at learning in its widest sense and its most precise: for individuals, their families, their communities and their country. They have also used the full range of social science research methods, combining fieldwork interviews and quantitative data analysis, literature reviews and statistical tools. The evidence is robust enough to underpin an understanding of how education works to sustain more than purely economic benefits.</p> <p>This report investigates how education and processes of social capital formation play out over a person's life in the context of individual well-being, family dynamics and community cohesion. We focus particularly on the impact that education has on health, crime, parenting and citizenship. It also provide a brief introduction to the theoretical work that has helped to shed light on the often complex relationships that learning has with the topics discussed in this synthesis of findings.</p> <p>Many of the findings in the report are derived from our analyses of the cohort studies that are tracking the lives of people born in Britain in 1958 and 1970i. Some findings are drawn from reports by other researchers, both in the UK and in other countries, who share our interest in the wider benefits of learning.</p> <p>Health</p> <p>People with better qualifications are more likely to have healthy lifestyles, to be fitter and slimmer – and such health advantages can be transferred to the next generation at the earliest age. Children of better-educated mothers are less likely to be born prematurely or to have a low birth weight. The following findings illustrate the powerful effects that learning can have on health and well-being.</p> <ul style="list-style-type: none"> • Cancer prevention: For every 100,000 women enrolled in adult learning in the UK an estimated 116-134 cancers could be prevented because of greater take-up of cervical smear tests. • Life expectancy: One more year of education has been shown to increase life expectancy in the United States by as much as 1.7 years. • Healthy lifestyles: People attending adult education courses take more exercise and display greater awareness of health issues than others of their age.

d) Selected epidemiological evidence – lifestyle – living alone, loneliness and social isolation

Study	Findings
<p>Luo Y, Hawkey L C, Waite L J and Cacioppo J T (2012) Loneliness, health, and mortality in old age: A national longitudinal study, <i>Social Science and Medicine</i> 74 (6) : 907-914</p>	<p>This study examined the relationship between loneliness, health, and mortality using a U.S. nationally representative sample of 2101 adults aged 50 years and over from the 2002 to 2008 waves of the Health and Retirement Study. The research estimated the effect of loneliness at one point on mortality over the subsequent six years, and investigated social relationships, health behaviours, and health outcomes as potential mechanisms through which loneliness affects mortality risk among older Americans. It operationalised health outcomes as depressive symptoms, self-rated health, and functional limitations, and we conceptualized the relationships between loneliness and each health outcome as reciprocal and dynamic. The research found that feelings of loneliness were associated with increased mortality risk over a 6-year period, and that this effect was not explained by social relationships or health behaviours but was modestly explained by health outcomes. In cross-lagged panel models that tested the reciprocal prospective effects of loneliness and health, loneliness both affected and was affected by depressive symptoms and functional limitations over time, and had marginal effects on later self-rated health. These population-based data contribute to a growing literature indicating that loneliness is a risk factor for morbidity and mortality and point to potential mechanisms through which this process works.</p>

<p>Perissinotto C M, Cenzer I S and Covinsky K E (2012) Loneliness in Older Persons: A Predictor of Functional Decline and Death, <i>JAMA Internal Medicine</i> 172 (14)</p>	<p>This study examined the relationship between loneliness, functional decline, and death in adults older than 60 years in the United States.</p> <p>Methods This is a longitudinal cohort study of 1604 participants in the psychosocial module of the Health and Retirement Study, a nationally representative study of older persons. Baseline assessment was in 2002 and follow-up assessments occurred every 2 years until 2008. Subjects were asked if they (1) feel left out, (2) feel isolated, or (3) lack companionship. Subjects were categorized as not lonely if they responded hardly ever to all 3 questions and lonely if they responded some of the time or often to any of the 3 questions. The primary outcomes were time to death over 6 years and functional decline over 6 years on the following 4 measures: difficulty on an increased number of activities of daily living (ADL), difficulty in an increased number of upper extremity tasks, decline in mobility, or increased difficulty in stair climbing. Multivariate analyses adjusted for demographic variables, socioeconomic status, living situation, depression, and various medical conditions.</p> <p>Results The mean age of subjects was 71 years. Fifty-nine percent were women; 81% were white, 11%, black, and 6%, Hispanic; and 18% lived alone. Among the elderly participants, 43% reported feeling lonely. Loneliness was associated with all outcome measures. Lonely subjects were more likely to experience decline in ADL (24.8% vs 12.5%; adjusted risk ratio [RR], 1.59; 95% CI, 1.23-2.07); develop difficulties with upper extremity tasks (41.5% vs 28.3%; adjusted RR, 1.28; 95% CI, 1.08-1.52); experience decline in mobility (38.1% vs 29.4%; adjusted RR, 1.18; 95% CI, 0.99-1.41); or experience difficulty in climbing (40.8% vs 27.9%; adjusted RR, 1.31; 95% CI, 1.10-1.57). Loneliness was associated with an increased risk of death (22.8% vs 14.2%; adjusted HR, 1.45; 95% CI, 1.11-1.88).</p> <p>Conclusion Among participants who were older than 60 years, loneliness was a predictor of functional decline and death.</p> <p>.In older persons, health outcomes, such as worsening disability and death, are influenced not just by biomedical factors but also by psychosocial distress. The hypothesis that loneliness may be a risk factor for adverse health outcomes in older persons is supported by previous studies that show that other forms of psychosocial distress lead to adverse health outcomes. For example, several studies link depression to higher risks of disability and mortality. Other studies have shown that measures of social isolation—the number of social contacts and the amount of social engagement—are associated with poor health outcomes. Yet, these quantitative measures of relationships may not adequately capture the distress that an individual may subjectively feel. The concept of loneliness is only starting to be recognized as a separate entity from social isolation and depression, and therefore few studies have examined it as an independent risk factor.</p> <p>Continued.....</p>
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Perissinotto et al (2012) ...continued	<p>...Loneliness is an important contributor to human suffering, especially in elderly persons, among whom prevalence rates may be higher. Loneliness is the subjective feeling of isolation, not belonging, or lacking companionship. While persons who are lonely are more likely to experience depressive symptoms, feelings of loneliness are only weakly associated with enjoyment, energy, and motivation—emotions that are central to a diagnosis of depression. Loneliness is also distinct from several quantitative measures of social isolation such as living alone, marital status, and number of relationships. For example, it is possible for persons who live alone to not feel lonely, while some who are married or living with others will still experience loneliness. Loneliness can be explained as the discrepancy between one's desired relationships and one's actual relationships.</p> <p>The subjective distress of loneliness may be a more important measure of suffering and quality of life rather than objective measures of social isolation. Given the number of health and social issues that health care providers must prioritize, the identification and amelioration of loneliness may seem to be outside of the scope of medical practice. Yet, by separating suffering and distress into medical and nonmedical spheres, health care providers may be missing a key risk factor for poor health.</p> <p>To quantify the prevalence of loneliness and determine whether older persons who are lonely are at risk for poor health outcomes, we used the Health and Retirement Study (HRS),⁷ a national, population-based study of community living older adults. After adjusting for common measures of medical risk, we examined the impact of loneliness on mortality and several measures of worsening disability that are of particular importance in older persons.</p>
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<p>Windle K, Francis J and Coomber C (2011) <i>Preventing loneliness and social isolation: interventions and outcomes</i>, Social Care Institute for Excellence (SCIE)</p>	<p>Older people are particularly vulnerable to social isolation or loneliness owing to loss of friends and family, mobility or income.</p> <ul style="list-style-type: none"> • Social isolation and loneliness impact upon individuals' quality of life and wellbeing, adversely affecting health and increasing their use of health and social care services. • The interventions to tackle social isolation or loneliness include: befriending, mentoring, Community Navigators, social group schemes. • People who use befriending or Community Navigator services reported that they were less lonely and socially isolated following the intervention. • The outcomes from mentoring services are less clear; one study reported improvements in mental and physical health, another that no difference was found. • Where longitudinal studies recorded survival rates, older people who were part of a social group intervention had a greater chance of survival than those who had not received such a service. • Users report high satisfaction with services, benefiting from such interventions by increasing their social interaction and community involvement, taking up or going back to hobbies and participating in wider community activities. • Users argued for flexibility and adaptation of services. One-to-one services could be more flexible, while enjoyment of group activities would be greater if these could be tailored to users' preferences. • When planning services to reduce social isolation or loneliness, strong partnership arrangements need to be in place between organisations to ensure developed services can be sustained. • We need to invest in proven projects. Community Navigator interventions have been shown to be effective in identifying those individuals who are socially isolated. Befriending services can be effective in reducing depression and cost-effective. • Research needs to be carried out on interventions that include different genders, populations and localities. • There is an urgent need for more longitudinal, randomised controlled trials that incorporate standardised quality-of-life and cost measures.
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<p>Kharicha K, Iliffe S, Harari D, Swift C, Gillmann G and Stuck A E (2007) Health risk appraisal in older people 1: are older people living alone an 'at-risk' group?, <i>British Journal of General Practice</i> 57 (537) : 271-276</p>	<p>In the UK, population screening for unmet need has failed to improve the health of older people. Attention is turning to interventions targeted at 'at-risk' groups. Living alone in later life is seen as a potential health risk, and older people living alone are thought to be an at-risk group worthy of further intervention.</p> <p>Secondary analysis of baseline data from a randomised controlled trial of health risk appraisal in older people in four group practices in suburban London to explore the clinical significance of living alone and the epidemiology of lone status as an at-risk category, by investigating associations between lone status and health behaviours, health status, and service use, in non-disabled older people.</p> <p>Method:</p> <p>Sixty per cent of 2641 community-dwelling non-disabled people aged 65 years and over registered at a practice agreed to participate in the study; 84% of these returned completed questionnaires. A third of this group, (n = 860, 33.1%) lived alone and two-thirds (n = 1741, 66.9%) lived with someone else.</p> <p>Results</p> <p>Those living alone were more likely to report fair or poor health, poor vision, difficulties in instrumental and basic activities of daily living, worse memory and mood, lower physical activity, poorer diet, worsening function, risk of social isolation, hazardous alcohol use, having no emergency carer, and multiple falls in the previous 12 months. After adjustment for age, sex, income, and educational attainment, living alone remained associated with multiple falls, functional impairment, poor diet, smoking status, risk of social isolation, and three self-reported chronic conditions: arthritis and/or rheumatism, glaucoma, and cataracts.</p> <p>Conclusion</p> <p>Clinicians working with independently-living older people living alone should anticipate higher levels of disease and disability in these patients, and higher health and social risks, much of which will be due to older age, lower educational status, and female sex. Living alone itself appears to be associated with higher risks of falling, and constellations of pathologies, including visual loss and joint disorders. Targeted population screening using lone status may be useful in identifying older individuals at high risk of falling.</p>
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<p>Iliffe S, Kharicha K, Harari D, Swift C, Gillmann G and Stuck A E (2007) Health risk appraisal in older people 2: the implications for clinicians and commissioners of social isolation risk in older people, <i>British Journal of General Practice</i> 57 (537) : 277-282</p>	<p>Social isolation is associated with poorer health, and is seen by the World Health Organisation (WHO) as one of the major issues facing the industrialised world.</p> <p>The study carried out a secondary analysis of baseline data from a randomised controlled trial of health risk appraisal to explore the significance of social isolation in the older population for GPs and for service commissioners. A total of 2641 community-dwelling, non-disabled people aged 65 years and over in suburban London were assessed for demographic details, social network and risk for social isolation based on the 6-item Lubben Social Network Scale, measures of depressed mood, memory problems, numbers of chronic conditions, medication use, functional ability, self-reported use of medical services.</p> <p>Results</p> <p>More than 15% of the older age group were at risk of social isolation, and this risk increased with advancing age. In bivariate analyses risk of social isolation was associated with older age, education up to 16 years only, depressed mood and impaired memory, perceived fair or poor health, perceived difficulty with both basic and instrumental activities of daily living, diminishing functional ability, and fear of falling. Despite poorer health status, those at risk of social isolation did not appear to make greater use of medical services, nor were they at greater risk of hospital admission. Half of those who scored as at risk of social isolation lived with others. Multivariate analysis showed significant independent associations between risk of social isolation and depressed mood and living alone, and weak associations with male sex, impaired memory and perceived poor health.</p> <p>Conclusion</p> <p>The risk of social isolation is elevated in older men, older persons who live alone, persons with mood or cognitive problems, but is not associated with greater use of services. These findings would not support population screening for individuals at risk of social isolation with a view to averting service use by timely intervention.</p> <p>Awareness of social isolation should trigger further assessment, and consideration of interventions to alleviate social isolation, treat depression or ameliorate cognitive impairment.</p>
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e) Selected epidemiological evidence – lifestyle - obesity

Study	Findings
<p>The NHS Information Centre, Lifestyles Statistics (2011) <i>Statistics on obesity, physical activity and diet: England, 2011</i>,</p>	<p>This statistical report presents a range of information on obesity, physical activity and diet, drawn together from a variety of sources. The topics covered include:</p> <ul style="list-style-type: none"> • Overweight and obesity prevalence among adults and children; • Physical activity levels among adults and children; • Trends in purchases and consumption of food and drink and energy intake; and • Health outcomes of being overweight or obese. <p>This report contains seven chapters:</p> <p>Chapter 1: Introduction; this summarises Government plans and targets in this area, as well as providing sources of further information and links to relevant documents. Note, many of these were introduced by the previous government but were relevant at the time the data were collected.</p> <p>Chapters 2 to 6 cover obesity, physical activity and diet providing an overview of the key findings from a number of sources of previously published information, whilst maintaining useful links to each section of the reports. Additional analysis has been undertaken of the Health Survey for England (HSE) to provide more detailed information previously unpublished.</p> <p>Chapter 7: Health Outcomes; presents a range of information about the health outcomes of being obese or overweight which includes information on health risks, hospital admissions and prescription drugs used for treatment of obesity. Figures presented in Chapter 7 have been obtained from a number of sources and presented in a user-friendly format. Most of the data contained in the chapter have been published previously by The NHS Information Centre or the National Audit Office. Previously unpublished figures on obesity-related Finished Hospital Episodes and Finished Consultant Episodes for 2009/10 are presented using data from The NHS Information Centre's Hospital Episode Statistics as well as data from the Prescribing Unit at The NHS Information Centre on prescription items dispensed for treatment of obesity.</p>

<p>Brown M, Byatt T, Marsh T and McPherson K; National Heart Forums (2010) <i>Obesity Trends for Adults: Analysis from the Health Survey for England 1993-2007</i>,</p>	<p>This report presents analysis that uses the most recent Health Survey for England data to predict future obesity trends and their consequences in terms of the increase incidence of BMI related diseases. The incidence of disease is modelled using a micro-simulation. The simulation makes use of the most recently available disease incidence, prevalence, mortality and relative-risk statistics to present predictions for arthritis, coronary heart disease, diabetes, gall bladder disease, hypertension, stroke and the following cancers: breast, colorectal, endometrial, kidney, oesophageal and liver. An important development to the disease-modelling is the inclusion of hypertension: it is a significant illness in its own right but it also plays an important intermediate role in raising the relative risks of other diseases. Micro-simulation can easily capture and model such dependencies.</p>
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Selected epidemiological evidence – lifestyle – physical activity, walking cycling and dancing

Study	Findings
<p>Norton S, Matthews F E, Barnes D E, Yaffe K and Brayne C (2014) Potential for primary prevention of Alzheimer's disease: an analysis of population-based data, <i>The Lancet Neurology</i> 13 (8) : 788-794</p>	<p>Recent estimates suggesting that over half of Alzheimer's disease burden worldwide might be attributed to potentially modifiable risk factors do not take into account risk-factor non-independence. We aimed to provide specific estimates of preventive potential by accounting for the association between risk factors. Using relative risks from existing meta-analyses, we estimated the population-attributable risk (PAR) of Alzheimer's disease worldwide and in the USA, Europe, and the UK for seven potentially modifiable risk factors that have consistent evidence of an association with the disease (diabetes, midlife hypertension, midlife obesity, physical inactivity, depression, smoking, and low educational attainment). The combined PAR associated with the risk factors was calculated using data from the Health Survey for England 2006 to estimate and adjust for the association between risk factors. The potential of risk factor reduction was assessed by examining the combined effect of relative reductions of 10% and 20% per decade for each of the seven risk factors on projections for Alzheimer's disease cases to 2050.</p> <p>Worldwide, the highest estimated PAR was for low educational attainment (19.1%, 95% CI 12.3—25.6). The highest estimated PAR was for physical inactivity in the USA (21.0%, 95% CI 5.8—36.6), Europe (20.3%, 5.6—35.6), and the UK (21.8%, 6.1—37.7). Assuming independence, the combined worldwide PAR for the seven risk factors was 49.4% (95% CI 25.7—68.4), which equates to 16.8 million attributable cases (95% CI 8.7—23.2 million) of 33.9 million cases. However, after adjustment for the association between the risk factors, the estimate reduced to 28.2% (95% CI 14.2—41.5), which equates to 9.6 million attributable cases (95% CI 4.8—14.1 million) of 33.9 million cases. Combined PAR estimates were about 30% for the USA, Europe, and the UK. Assuming a causal relation and intervention at the correct age for prevention, relative reductions of 10% per decade in the prevalence of each of the seven risk factors could reduce the prevalence of Alzheimer's disease in 2050 by 8.3% worldwide.</p> <p>After accounting for non-independence between risk factors, around a third of Alzheimer's diseases cases worldwide might be attributable to potentially modifiable risk factors. Alzheimer's disease incidence might be reduced through improved access to education and use of effective methods targeted at reducing the prevalence of vascular risk factors (eg, physical inactivity, smoking, midlife hypertension, midlife obesity, and diabetes) and depression.</p>

<p>Sabia S, Dugravot A, Kivimaki M, Brunner E, Shipley M J and Singh-Manoux A (2011) Effect of intensity and type of physical activity on mortality: Results from the Whitehall II cohort study, Published ahead of print (September 2011) as 10.2105/AJPH.2011.300257 <i>American Journal of Public Health</i></p>	<p>This study examined the association of intensity and type of physical activity with mortality. It assessed the duration of physical activity by intensity level and type in 7456 men and women from the Whitehall II Study by questionnaire in 1997–1999 (mean 6SD age=55.9 66.0 years) and 5 years later. All-cause mortality was assessed until April 2009.</p> <p>Results. A total of 317 participants died during the mean follow-up of 9.6 years (SD=2.7). Reporting at least 1 hour per week of moderate activity was associated with a 33% (95% confidence interval [CI]=14%, 45%) lower risk of mortality compared with less than 1 hour. For all physical activity types examined, except housework, a duration of physical activity greater than 0 (3.5 hours for walking) was associated with lower mortality in age-adjusted analyses, but only the associations with sports (hazard ratio [HR]=0.71; 95% CI=0.56, 0.91) and do-it-yourself activity (HR=0.68; 95% CI=0.53, 0.98) remained in fully adjusted analyses.</p> <p>Conclusions. It is important to consider both intensity and type of physical activity when examining associations with mortality.</p>
<p>Hrobonova E, Breeze E and Fletcher A E (2011) Higher levels and intensity of physical activity are associated with reduced mortality among community dwelling older people, <i>Journal of Aging Research</i> ID 651931</p>	<p>People aged 75–84 years (n =1449) participating in a randomized trial of health screening in UK general practice were interviewed about their physical activity (PA) and were assessed for a wide range of health and social problems. Mortality data were collected over 7 years of follow-up.</p> <p>Results. Full information on PA and potential confounders was available in 946 people. Those in the highest third of duration of PA had a lower mortality, confounder-adjusted Hazard Ratio (HR) = 0.74, and 95% Confidence Interval (CI) 0.56–0.97, compared to the lowest third. Similar benefits were seen when categorized by intensity of PA, with those in the highest group having a lower mortality, confounder-adjusted HR = 0.61, and 95% CI 0.47–0.79, compared to the lowest category.</p> <p>Conclusions. The results suggest the importance of providing older people with opportunities for physical activity.</p>

<p>Bupa and Centre for Policy on Ageing (2011) <i>Keep dancing ... the health and well-being benefits of dance for older people</i>, Bupa</p>	<p>This report identifies a number of issues around exercise for older people and draws together the key health benefits of dance for older people. These benefits can promote both physical and emotional wellbeing.</p> <p>Older people don't get enough exercise. Only 20% of men and 17% women aged 65-74 get the recommended levels of physical exercise. For people aged over 75 this falls to 9% for men and 6% for women. This lack of exercise matters because taking part in physical activity improves both health and life expectancy.</p> <p>Regular physical activity by older people reduces the occurrence of a number of chronic conditions including cardiovascular disease, diabetes, cancer, hypertension, obesity, depression and osteoporosis. Older people who engage in physical activity live longer and those who carry out more intense physical activity for longer periods live longest on average.</p> <p>Dance benefits the body and the mind: Dance is a good source of aerobic exercise and a well-designed dance session can also provide low-level resistance exercise.</p> <p>Dance has physical health benefits including improvements in balance, strength and gait, which help reduce the risk of falls, a significant health hazard in later life.</p> <p>Dance has been shown to be beneficial in the direct treatment of a number of conditions including arthritis, Parkinson's disease, dementia and depression. Taking part in ballroom dancing has been shown to reduce the chances of getting dementia by 76%.</p> <p>Taking part in dance also improves the mental health of older people including reaction times and cognitive performance.</p> <p>Dance promotes emotional wellbeing of older people and combats isolation Older people enjoy dance sessions and are more likely to continue to attend them - thereby gaining proportionately more physical benefits than they would from ordinary exercise sessions.</p> <p>The social aspects of dance help to overcome feelings of social isolation and depression.</p> <p>Dance is inclusive - there no targets, and no failures, which contrasts with the philosophy of sports-based activities.</p>
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<p>Woodcock J, Franco O H, Orsini N and Roberts I (2011) Non-vigorous physical activity and all-cause mortality: Systematic review and meta-analysis of cohort studies, <i>International Journal of Epidemiology</i> 40 (1) : 121-138</p>	<p>Although previous studies have found physical activity to be associated with lower mortality, the dose–response relationship remains unclear. In this systematic review and meta-analysis we quantify the dose–response relationship of non-vigorous physical activity and all-cause mortality.</p> <p>Methods We aimed to include all cohort studies in adult populations with a sample size of more than 10,000 participants that estimated the effect of different levels of light or moderate physical activity on all-cause mortality. We searched Medline, Embase, Cochrane (DARE), Web of Science and Global Health (June 2009). We used dose–response meta-regression models to estimate the relation between non-vigorous physical activity and mortality.</p> <p>Results We identified 22 studies that met our inclusion criteria, containing 977,925 (334,738 men and 643,187 women) people. There was considerable variation between the studies in their categorization of physical activity and adjustment for potential confounders. We found that 2.5h/week (equivalent to 30min daily of moderate intensity activity on 5 days a week) compared with no activity was associated with a reduction in mortality risk of 19% [95% confidence interval (CI) 15–24], while 7h/week of moderate activity compared with no activity reduced the mortality risk by 24% (95% CI 19–29). We found a smaller effect in studies that looked at walking alone.</p> <p>Conclusion Being physically active reduces the risk of all-cause mortality. The largest benefit was found from moving from no activity to low levels of activity, but even at high levels of activity benefits accrue from additional activity.</p>
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<p>Brown W J, McLaughlin D, Leung J, McCaul K A, Flicker L, Almeida O P, Hankey G J, Lopez D and Dobson A J (2011) Physical activity and all-cause mortality in older women and men, <i>British Journal of Sports Medicine</i> doi:10.1136/bjsports-2011-090529</p>	<p>Regular physical activity is associated with reduced risk of mortality in middle-aged adults; however, associations between physical activity and mortality in older people have been less well studied. The objective of this study was to compare relationships between physical activity and mortality in older women and men.</p> <p>Methods The prospective cohort design involved 7080 women aged 70–75 years and 11 668 men aged 65–83 years at baseline, from two Australian cohorts – the Australian Longitudinal Study on Women's Health and the Health in Men Study. Self-reported low, moderate and vigorous intensity physical activity, socio-demographic, behavioural and health characteristics were assessed in relation to all-cause mortality from the National Death Index from 1996 to 2009; the median follow-up of 10.4 (women) and 11.5 (men) years.</p> <p>Results There were 1807 (25.5%) and 4705 (40.3%) deaths in women and men, respectively. After adjustment for behavioural risk factors, demographic variables and self-reported health at baseline, there was an inverse dose – response relationship between physical activity and all-cause mortality. Compared with women and men who reported no activity, there were statistically significant lower hazard ratios for women who reported any activity and for men who reported activities equivalent to at least 300 metabolic equivalent.min/week. Risk reductions were 30–50% greater in women than in men in every physical activity category.</p> <p>Conclusions Physical activity is inversely associated with all-cause mortality in older men and women. The relationship is stronger in women than in men, and there are benefits from even low levels of activity.</p>
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<p>de Hartog J J, Boogaard H, Nijland H and Hoek G (2010) Do the health benefits of cycling outweigh the risks?, <i>Environmental Health Perspectives</i> 118 (8) : 1109-1116</p>	<p>Although from a societal point of view a modal shift from car to bicycle may have beneficial health effects due to decreased air pollution emissions, decreased greenhouse gas emissions, and increased levels of physical activity, shifts in individual adverse health effects such as higher exposure to air pollution and risk of a traffic accident may prevail.</p> <p>This study describes whether the health benefits from the increased physical activity of a modal shift for urban commutes outweigh the health risks.</p> <p>The researchers have summarized the literature for air pollution, traffic accidents, and physical activity using systematic reviews supplemented with recent key studies.</p> <p>They quantified the impact on all-cause mortality when 500,000 people would make a transition from car to bicycle for short trips on a daily basis in the Netherlands. They have expressed mortality impacts in life-years gained or lost, using life table calculations. For individuals who shift from car to bicycle, we estimated that beneficial effects of increased physical activity are substantially larger (3–14 months gained) than the potential mortality effect of increased inhaled air pollution doses (0.8–40 days lost) and the increase in traffic accidents (5–9 days lost). Societal benefits are even larger because of a modest reduction in air pollution and greenhouse gas emissions and traffic accidents.</p> <p>Conclusions</p> <p>On average, the estimated health benefits of cycling were substantially larger than the risks relative to car driving for individuals shifting their mode of transport.</p>
<p>Murtagh E, Murphy M and Boone-Heinonen J (2010) Walking: the first steps in cardiovascular disease prevention, <i>Current Opinion in Cardiology</i> 25 (5) : 490-496</p>	<p>Purpose of review: Health professionals are presented with the challenge of prescribing physical activity that is likely to be sustained by the sedentary majority. Walking is eminently suited to physical activity prescription for inactive individuals as it is accessible to men and women of all ages and social groups and poses little risk of injury. This paper reviews recent evidence of the health benefits of walking and promotion of walking behaviour.</p> <p>Recent findings: Large observational studies consistently show associations between walking and cardiovascular disease endpoints over long periods of follow-up. Intervention studies further support the health benefits of walking, showing improvements in clinical biomarkers and measures after shorter periods of follow-up. Walking appears to have cardiovascular disease-related health benefits in younger, middle-aged, and older men and women, in both healthy and patient populations. Pedometer-based, mobile phone-based, and computer-based programs are effective in increasing walking levels. Neighbourhood and workplace amenities and programs may be important supports for walking behaviours.</p> <p>Summary: Walking has the potential to play a key role in the primary and secondary prevention of cardiovascular disease. Clinicians can prescribe walking to assist patients meet physical activity recommendations and help identify supports available to the patient.</p>

<p>Stamatakis E, Hamer M and Primatesta P (2009) Cardiovascular medication, physical activity and mortality: cross-sectional population study with ongoing mortality follow up, <i>Heart</i> 95 : 448-453</p>	<p>Objective: to establish physical activity levels in relation to cardiovascular medication and to examine if physical activity is associated with benefit independently of medication among individuals with no diagnosis of cardiovascular disease (CVD). Design: Cross-sectional surveys in 1998 and 2003 with ongoing mortality follow up. Setting: Household-based interviews in England and Scotland. Participants: Population samples of adults aged 35 and over living in households, respondents of the Scottish Health Survey and the Health Survey for England. Main outcome measure: Moderate to vigorous physical activity (MVPA) levels and CVD mortality. Results: Fifteen percent (N=3,116) of the 20,177 respondents (8,791 men); were prescribed at least one cardiovascular medication. Medicated respondents were less likely than those unmedicated to meet the physical activity recommendations (OR:0.89, 95%CI: 0.81 to 0.99, p=0.028). The mean follow up ()SD) was 6.6 (2.3) years. There were 1,509 any-cause deaths and 427 CVD deaths. Increased physical activity was associated with all-cause and CVD mortality among both unmedicated (all-cause mortality HR for those with .150 min/wk of MVPA compared with those who reported no MVPA): 0.58, 95%CI: .48 to 0.69, p<0.001) ; CVD mortality: 0.65, 0.46 to 0.91, p=0.036) and medicated respondents (all-cause death: 0.54, 0.40 to 0.72, p<0.001; CVD death: 0.46 (0.27 to 0.78, p=0.008). Conclusions: Although physical activity protects against premature mortality among both medicated and unmedicated adults, cardiovascular medication is linked with lower uptake of health enhancing physical activity. These results highlight the importance of physical activity in the primary prevention of CVD over and above medication.</p>
<p>Keogh J W L, Kilding A, Pidgeon P, Ashley L and Gillis D (2009) Physical benefits of dancing for healthy older adults: A review, <i>Journal of Aging and Physical Activity</i> 17 : 1-23</p>	<p>Dancing is a mode of physical activity that may allow older adults to improve their physical function, health, and well-being. However, no reviews on the physical benefits of dancing for healthy older adults have been published in the scientific literature. Using relevant databases and keywords, 15 training and 3 cross-sectional studies that met the inclusion criteria were reviewed. Grade B–level evidence indicated that older adults can significantly improve their aerobic power, lower body muscle endurance, strength and flexibility, balance, agility, and gait through dancing. Grade C evidence suggested that dancing might improve older adults' lower body bone-mineral content and muscle power, as well as reduce the prevalence of falls and cardiovascular health risks. Further research is, however, needed to determine the efficacy of different forms of dance, the relative effectiveness of these forms of dance compared with other exercise modes, and how best to engage older adults in dance participation.</p>

<p>Zheng H, Orsini N, Amin J, Wolk A, Nguyen V T and Ehrlich F (2009) Quantifying the dose-response of walking in reducing coronary heart disease risk: Meta-analysis, <i>European Journal of Epidemiology</i> 24 (4) : 181-192</p>	<p>The evidence for the efficacy of walking in reducing the risk of and preventing coronary heart disease (CHD) is not completely understood. This meta-analysis aimed to quantify the dose-response relationship between walking and CHD risk reduction for both men and women in the general population. Studies on walking and CHD primary prevention between 1954 and 2007 were identified through Medline, SportDiscus and the Cochrane Database of Systematic Reviews. Random-effect meta-regression models were used to pool the relative risks from individual studies. A total of 11 prospective cohort studies and one randomized control trial study met the inclusion criteria, with 295,177 participants free of CHD at baseline and 7,094 cases at follow-up. The meta-analysis indicated that an increment of approximately 30 min of normal walking a day for 5 days a week was associated with 19% CHD risk reduction (95% CI = 14–23%; P-heterogeneity = 0.56; I² = 0%). We found no evidence of heterogeneity between subgroups of studies defined by gender (P = 0.67); age of the study population (P = 0.52); or follow-up duration (P = 0.77). The meta-analysis showed that the risk for developing CHD decreases as walking dose increases. Walking should be prescribed as an evidence-based effective exercise modality for CHD prevention in the general population.</p>
<p>Hamer M and Chida Y (2008) Walking and primary prevention; a meta-analysis of prospective cohort studies, <i>British Journal of Sports Medicine</i> 42 : 238-243</p>	<p>Objective: To quantify the association between walking and the risk of cardiovascular disease (CVD) and all-cause mortality in healthy men and women. Data sources: Medline, Cochrane Database of Systematic Reviews, and Web of Science databases were searched to May 2007. Study selection: Prospective epidemiological studies of walking and CVD and all-cause mortality. Results: 18 prospective studies were included in the overall analysis, which incorporated 459 833 participants free from CVD at baseline with 19 249 cases at follow-up. From the meta-analysis the pooled hazard ratio of CVD in the highest walking category compared with the lowest was 0.69, (95% CI 0.61 to 0.77, p<0.001), and 0.68 (0.59 to 0.78, p<0.001) for all-cause mortality. These effects were robust among men and women, although there was evidence of publication biases for the associations with CVD risk. Walking pace was a stronger independent predictor of overall risk compared with walking volume (48% versus 26% risk reductions, respectively). There was also evidence of a dose–response relationship across the highest, intermediate, and lowest walking categories in relation to the outcome measures.</p>

<p>Carlsson S, Andersson T, Lichtenstein P, Michaëlsson K and Ahlbom A (2007) Physical activity and mortality: is the association explained by genetic selection?, <i>American Journal of Epidemiology</i> 166 (3) : 255-259</p>	<p>Public health recommendations promote physical activity to improve health and longevity. Recent data suggest that the association between physical activity and mortality may be due to genetic selection. Using data on twins, the authors investigated whether genetic selection explains the association between physical activity and mortality. Data were based on a postal questionnaire answered by 13,109 Swedish twin pairs in 1972. The national Cause of Death Register was used for information about all-cause mortality (n = 1,800) and cardiovascular disease mortality (n = 638) during 1975–2004. The risk of death was reduced by 34% for men (relative risk = 0.64, 95% confidence interval: 0.50, 0.83) and by 25% for women (relative risk = 0.75, 95% confidence interval: 0.50, 1.14) reporting high physical activity levels. Within-pair comparisons of monozygotic twins showed that, compared with their less active co-twin, the more active twin had a 20% (odds ratio = 0.80, 95% confidence interval: 0.65, 0.99) reduced risk of all-cause mortality and a 32% (odds ratio = 0.68, 95% confidence interval: 0.49, 0.95) reduced risk of cardiovascular disease mortality.</p> <p>Results indicate that physical activity is associated with a reduced risk of mortality not due to genetic selection. This finding supports a causal link between physical activity and mortality.</p>
<p>Warburton D E R, Nicol C W and Bredin S S D (2006) Health benefits of physical activity: The evidence, <i>Canadian Medical Association Journal</i> 174 (6) : 801-809</p>	<p>The primary purpose of this narrative review was to evaluate the current literature and to provide further insight into the role physical inactivity plays in the development of chronic disease and premature death. The review confirms that there is irrefutable evidence of the effectiveness of regular physical activity in the primary and secondary prevention of several chronic diseases (e.g., cardiovascular disease, diabetes, cancer, hypertension, obesity, depression and osteoporosis) and premature death. We also reveal that the current Health Canada physical activity guidelines are sufficient to elicit health benefits, especially in previously sedentary people. There appears to be a linear relation between physical activity and health status, such that a further increase in physical activity and fitness will lead to additional improvements in health status.</p>

f) Selected epidemiological evidence – lifestyle – social networks

Study	Findings
<p>Webb E, Netuveli G and Millett C (2011) Free bus passes, use of public transport and obesity among older people in England, <i>Journal of Epidemiology and Community Health</i></p>	<p>Background All residents of England aged 60 years and older became entitled to free travel on local buses on 1 April 2006. This study examines the impact of this policy on public transport use, a mode of active transport and levels of obesity.</p> <p>Methods Logistic regression analyses using three waves of data (2004, 2006 and 2008) from the English Longitudinal Study of Ageing. Our main outcome measures were changes in self-reported public transport use, body mass index, waist circumference and obesity.</p> <p>Results Eligibility for free bus travel was associated with increased use (adjusted odds ratio (AOR) 1.51, 95% CI 1.14 to 2.00) of public transport among older people. Older people who used public transport had reduced odds of being obese in 2008 compared with those who did not (AOR 0.75, 95% CI 0.65 to 0.86), as did those who were eligible for free local bus travel (AOR 0.75, 95% CI 0.59 to 0.97). Older people who used public transport had reduced odds of becoming obese between 2004 and 2008 (AOR 0.79, 95% CI 0.63 to 0.98).</p> <p>Conclusion The introduction of free bus travel for older residents of England appears to have increased public transport use and may have conferred a protective effect against obesity.</p>
<p>Agahi N, Silverstein M and Parker M G (2011) Late-life and earlier participation in leisure activities: Their importance for survival among older persons, <i>Activities, Adaptation & Aging</i> 35 (3) : 210-222</p>	<p>Is activity participation in old age important for survival independent of one's earlier history of participation? A nationally representative sample of 457 older persons was followed for 25 years with data from the Level-of-Living Survey and the SWEOLD study. Cox regressions showed that regardless of earlier activities and health, late-life leisure engagement was associated with enhanced survival, especially among men. Among women, earlier activities (study groups) also seem important, perhaps by providing social networks. Results suggest that it is worthwhile to encourage elderly people to participate in leisure activities and to facilitate their participation in the community even at high ages.</p>

<p>Agahi N and Parker M G (2008) Leisure activities and mortality: Does gender matter?, <i>Journal of Ageing and Health</i> 20 (7) : 855-871</p>	<p>This study examines the association between participation in leisure activities and mortality risk among older men and women.</p> <p>A representative sample of 1,246 men and women ages 65 to 95, interviewed in 1991-1992, were followed for 12 years. Cox regressions analyzed mortality risk.</p> <p>Participating in only a few activities doubled mortality risk compared to those with the highest participation levels, even after controlling for age, education, walking ability, and other health indicators. Women had a dose-response relationship between overall participation and survival. Strong associations with survival were found for engagement in organizational activities and study circles among women and hobby activities and gardening among men.</p> <p>Results suggest gender differences in the association between leisure activities and mortality. Women display a decreasing mortality risk for each additional activity. Social activities have the strongest effects on survival among women, whereas men seem to benefit from solitary activities.</p>
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g) Selected epidemiological evidence – lifestyle – volunteering

<p>Study</p>	<p>Findings</p>
<p>Nazroo J and Matthews K (2012) <i>The impact of volunteering on well-being in later life</i>, WRVS</p>	<p>Key findings:</p> <p>Self-reported health is strongly related to volunteering, with increases in health related to increases in likelihood of being a volunteer. Around one in twelve of those with the poorest health volunteered, compared with more than two in five of those with the best health. Among those who were volunteers levels of self-reported health were not related to frequency of volunteering.</p> <p>There is a strong positive effect of volunteering on subsequent well-being.</p> <p>The impact of volunteering on change in well-being depends on whether the respondent reports feeling appreciated in their volunteering role.</p> <p>Volunteers continue to register improvements in depression and life satisfaction even after they stop volunteering.</p> <p>A higher frequency of volunteering appears to be related to better well-being for each of the well-being outcomes. For depression there is a clear linear relationship, with coefficients increasing in size with increasing frequency of volunteering.</p>

<p>Casiday R, Kinsman E, Fisher C and Bambra C (2008) <i>Volunteering and health: What impact does it really have?</i>, Volunteering England</p>	<p>A systematic review was undertaken to ascertain the health effects of volunteering on volunteers and health service users. 24,966 articles were identified from database searches, of which 87 papers were included. The review identified qualified evidence that volunteering can deliver health benefits both to volunteers and to health service users. Volunteering was shown to decrease mortality and to improve self-rated health, mental health, life satisfaction, social interaction, healthy behaviours and coping ability. There was also evidence that volunteers can make a difference to the health and well-being of service users, including increased self esteem, disease management and acceptance, parenting skills, mental health, survival time, healthy behaviours and improved relationships with health professionals. Volunteering programmes were highly context-dependent, and further research on the training and management of volunteers in healthcare settings is needed.</p>
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h) Selected epidemiological evidence – preventive medication, screening and vaccination

Study	Findings
<p>Lee W-J, Chen L-K, Tang G-J and Lan T-Y (2014) The Impact of Influenza Vaccination on Hospitalizations and Mortality Among Frail Older People, <i>Journal of the American Medical Directors Association</i> 15 (4) : 256-260</p>	<p>A population-based retrospective cohort study to evaluate the benefits of influenza vaccination against hospitalization and mortality on frail elderly people using Taiwan's National Health Insurance claims data.</p> <p>Participants were 5063 frail seniors, followed up for four years.</p> <p>Measurements included age, gender, socioeconomic status, living areas, use of annual health examinations, comorbid conditions, use of influenza vaccine, frailty as defined by the Adjusted Clinical Group, hospitalization, and mortality in the observation period. The efficacy was presented as comparing ever versus never vaccinated people during the entire study period without regard to seasons.</p> <p>Results: Compared with those without influenza vaccination, vaccinated elderly individuals were younger, more likely to be men, have higher socioeconomic status, live in rural areas, have a higher rate of receiving a health examination, and have similar medical conditions. In the Cox proportional hazards analysis, influenza vaccination reduced by 7% the risk of hospitalization (95% confidence interval [CI] 0.86–0.99) and by 44% the risk of mortality (95% CI 0.51–0.62).</p> <p>Conclusion: Influenza vaccination was effective against hospitalization and mortality among the frail elderly. These results uphold the current universal influenza vaccination policy, and encourage policymakers to adopt strategies to improve vaccination use.</p>

<p>Rothwell P M, Fowkes F G R, Belch J FF, Ogawa H, Warlow C P and Meade T W (2011) Effect of daily aspirin on long-term risk of death due to cancer: Analysis of individual patient data from randomised trials, <i>The Lancet</i> 377 (9759) : 31-41</p>	<p>Treatment with daily aspirin for 5 years or longer reduces subsequent risk of colorectal cancer. Several lines of evidence suggest that aspirin might also reduce risk of other cancers, particularly of the gastrointestinal tract, but proof in man is lacking. We studied deaths due to cancer during and after randomised trials of daily aspirin versus control done originally for prevention of vascular events.</p> <p>Methods: The study used individual patient data from all randomised trials of daily aspirin versus no aspirin with mean duration of scheduled trial treatment of 4 years or longer to determine the effect of allocation to aspirin on risk of cancer death in relation to scheduled duration of trial treatment for gastrointestinal and non-gastrointestinal cancers. In three large UK trials, long-term post-trial follow-up of individual patients was obtained from death certificates and cancer registries.</p> <p>Results: In eight eligible trials (25 570 patients, 674 cancer deaths), allocation to aspirin reduced death due to cancer (pooled odds ratio [OR] 0.79, 95% CI 0.68—0.92, $p=0.003$). On analysis of individual patient data, which were available from seven trials (23 535 patients, 657 cancer deaths), benefit was apparent only after 5 years' follow-up (all cancers, hazard ratio [HR] 0.66, 0.50—0.87; gastrointestinal cancers, 0.46, 0.27—0.77; both $p=0.003$). The 20-year risk of cancer death (1634 deaths in 12 659 patients in three trials) remained lower in the aspirin groups than in the control groups (all solid cancers, HR 0.80, 0.72—0.88, $p<0.0001$; gastrointestinal cancers, 0.65, 0.54—0.78, $p<0.0001$), and benefit increased (interaction $p=0.01$) with scheduled duration of trial treatment ($=7.5$ years: all solid cancers, 0.69, 0.54—0.88, $p=0.003$; gastrointestinal cancers, 0.41, 0.26—0.66, $p=0.0001$). The latent period before an effect on deaths was about 5 years for oesophageal, pancreatic, brain, and lung cancer, but was more delayed for stomach, colorectal, and prostate cancer. For lung and oesophageal cancer, benefit was confined to adenocarcinomas, and the overall effect on 20-year risk of cancer death was greatest for adenocarcinomas (HR 0.66, 0.56—0.77, $p<0.0001$). Benefit was unrelated to aspirin dose (75 mg upwards), sex, or smoking, but increased with age—the absolute reduction in 20-year risk of cancer death reaching 7.08% (2.42—11.74) at age 65 years and older.</p> <p>Interpretation: Daily aspirin reduced deaths due to several common cancers during and after the trials. Benefit increased with duration of treatment and was consistent across the different study populations. These findings have implications for guidelines on use of aspirin and for understanding of carcinogenesis and its susceptibility to drug intervention.</p>
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<p>Hellquist B N, Duffy S W, Abdsaleh S, Björnelid L, Bordás P, Tabár L, Viták B, Zackrisson S, Nyström L and Jonsson H (2011) Effectiveness of population-based service screening with mammography for women ages 40 to 49 years, <i>Cancer</i> 117 (4) : 714-722</p>	<p>he effectiveness of mammography screening for women ages 40 to 49 years still is questioned, and few studies of the effectiveness of service screening for this age group have been conducted.</p> <p>Breast cancer mortality was compared between women who were invited to service screening at ages 40 to 49 years (study group) and women in the same age group who were not invited during 1986 to 2005 (control group). Together, these women comprise the Mammography Screening of Young Women (SCRY) cohort, which includes all Swedish counties. A pre-screening period was defined to facilitate a comparison of mortality in the absence of screening. The outcome measure was refined mortality, ie, breast cancer death for women who were diagnosed during follow-up at ages 40 to 49 years. Relative risks (RRs) with 95% confidence intervals (CIs) were estimated.</p> <p>There was no significant difference in breast cancer mortality during the pre-screening period. During the study period, there were 803 breast cancer deaths in the study group (7.3 million person-years) and 1238 breast cancer deaths in the control group (8.8 million person-years). The average follow-up was 16 years. The estimated RR for women who were invited to screening was 0.74 (95% CI, 0.66-0.83), and the RR for women who attended screening was 0.71 (95% CI, 0.62-0.80).</p> <p>Conclusions: In this comprehensive study, mammography screening for women ages 40 to 49 years was efficient for reducing breast cancer mortality.</p>
<p>National Institute of Health and Clinical Excellence (2010) <i>CG67 - Lipid modification cardiovascular risk assessment and the modification of blood lipids for the primary and secondary prevention of cardiovascular disease</i>, NICE</p>	<p>This guideline addresses the identification of those at high risk, and the modification of lipids in these people and people with established CVD. Treatment should be aimed at reducing overall risk.</p> <p>“It is important to stress that a multifactorial approach that addresses all risk factors yields most benefit. This is because the effect of modifying several risk factors is multiplicative.”</p>

<p>Hol L, van Leerdam M E, van Ballegooijen M, van Vuuren A J, van Dekken H, Reijerink J C I Y, van der Toet A C M, Habbema J D F and Kuipers E J (2010) Screening for colorectal cancer: randomised trial comparing guaiac-based and immunochemical faecal occult blood testing and flexible sigmoidoscopy, <i>Gut</i> 59 (1) : 62-66</p>	<p>Background: Screening for colorectal cancer (CRC) is widely accepted, but there is no consensus on the preferred strategy. This study conducted a randomised trial comparing participation and detection rates (DR) per screenee of guaiac-based faecal occult blood test (gFOBT), immunochemical FOBT (FIT), and flexible sigmoidoscopy (FS) for CRC screening.</p> <p>Methods: A representative sample of the Dutch population (n=15 011), aged 50–74 years, was 1:1:1 randomised prior to invitation to one of the three screening strategies. Colonoscopy was indicated for screenees with a positive gFOBT or FIT, and for those in whom FS revealed a polyp with a diameter >10 mm; adenoma with >25% villous component or high grade dysplasia; serrated adenoma; >3 adenomas; >20 hyperplastic polyps; or CRC.</p> <p>Results: The participation rate was 49.5% (95% confidence interval (CI) 48.1 to 50.9%) for gFOBT, 61.5% (CI, 60.1 to 62.9%) for FIT and 32.4% (CI, 31.1 to 33.7%) for FS screening. gFOBT was positive in 2.8%, FIT in 4.8% and FS in 10.2%. The DR of advanced neoplasia was significantly higher in the FIT (2.4%; OR, 2.0; CI, 1.3 to 3.1) and the FS arm (8.0%; OR, 7.0; CI, 4.6 to 10.7) than the gFOBT arm (1.1%). FS demonstrated a higher diagnostic yield of advanced neoplasia per 100 invitees (2.4; CI, 2.0 to 2.8) than gFOBT (0.6; CI, 0.4 to 0.8) or FIT (1.5; CI, 1.2 to 1.9) screening.</p> <p>Conclusion: This randomised population-based CRC screening trial demonstrated superior participation and detection rates for FIT compared to gFOBT screening. FIT screening should therefore be strongly preferred over gFOBT screening. FS screening demonstrated a higher diagnostic yield per 100 invitees than both FOBTs.</p>
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<p>Baigent C, Blackwell L, Collins R, Emberson J, Godwin J, Peto R, Buring J, Hennekens C, Kearney P, Meade T, Patrono C, Roncaglioni M C and Zanchetti A (2009) Aspirin in the primary and secondary prevention of vascular disease: collaborative meta-analysis of individual participant data from randomised trials., <i>Lancet</i> May 30;373(9678) : 1849-1860</p>	<p>Low-dose aspirin is of definite and substantial net benefit for many people who already have occlusive vascular disease. This study assessed the benefits and risks in primary prevention.</p> <p>The study undertook meta-analyses of serious vascular events (myocardial infarction, stroke, or vascular death) and major bleeds in six primary prevention trials (95,000 individuals at low average risk, 660,000 person-years, 3554 serious vascular events) and 16 secondary prevention trials (17,000 individuals at high average risk, 43,000 person-years, 3306 serious vascular events) that compared long-term aspirin versus control. It reports intention-to-treat analyses of first events during the scheduled treatment period.</p> <p>In the primary prevention trials, aspirin allocation yielded a 12% proportional reduction in serious vascular events (0.51% aspirin vs 0.57% control per year, $p=0.0001$), due mainly to a reduction of about a fifth in non-fatal myocardial infarction (0.18%vs 0.23% per year, $p<0.0001$). The net effect on stroke was not significant (0.20%vs 0.21% per year, $p=0.4$: haemorrhagic stroke 0.04%vs 0.03%, $p=0.05$; other stroke 0.16%vs 0.18% per year, $p=0.08$). Vascular mortality did not differ significantly (0.19%vs 0.19% per year, $p=0.7$). Aspirin allocation increased major gastrointestinal and extracranial bleeds (0.10%vs 0.07% per year, $p<0.0001$), and the main risk factors for coronary disease were also risk factors for bleeding. In the secondary prevention trials, aspirin allocation yielded a greater absolute reduction in serious vascular events (6.7%vs 8.2% per year, $p<0.0001$), with a non-significant increase in haemorrhagic stroke but reductions of about a fifth in total stroke (2.08%vs 2.54% per year, $p=0.002$) and in coronary events (4.3%vs 5.3% per year, $p<0.0001$). In both primary and secondary prevention trials, the proportional reductions in the aggregate of all serious vascular events seemed similar for men and women.</p> <p>Interpretation: In primary prevention without previous disease, aspirin is of uncertain net value as the reduction in occlusive events needs to be weighed against any increase in major bleeds. Further trials are in progress.</p>
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<p>Thompson S G, Ashton H A, Gao and Scott R A P on behalf of the Multicentre Aneurysm Screening Study Group (2009) Screening men for abdominal aortic aneurysm: 10 year mortality and cost effectiveness results from the randomised Multicentre Aneurysm Screening Study, <i>BMJ</i> 338 : b2307</p>	<p>Randomised trial with 10 years of follow-up to assess whether the mortality benefit from screening men aged 65-74 for abdominal aortic aneurysm decreases over time, and to estimate the long term cost effectiveness of screening.</p> <p>A population based sample of 67,770 men aged 65-74 from four centres in the UK. Screening and surveillance was delivered mainly in primary care settings, with follow-up and surgery offered in hospitals</p> <p>Interventions: Participants were individually allocated to invitation to ultrasound screening (invited group) or to a control group not offered screening. Patients with an abdominal aortic aneurysm detected at screening underwent surveillance and were offered surgery if they met predefined criteria.</p> <p>Main outcome measures: Mortality and costs related to abdominal aortic aneurysm, and cost per life year gained.</p> <p>Results: Over 10 years 155 deaths related to abdominal aortic aneurysm (absolute risk 0.46%) occurred in the invited group and 296 (0.87%) in the control group (relative risk reduction 48%, 95% confidence interval 37% to 57%). The degree of benefit seen in earlier years of follow-up was maintained in later years. Based on the 10 year trial data, the incremental cost per man invited to screening was £100 (95% confidence interval £82 to £118), leading to an incremental cost effectiveness ratio of £7600 (£5100 to £13000) per life year gained. However, the incidence of ruptured abdominal aortic aneurysms in those originally screened as normal increased noticeably after eight years.</p> <p>Conclusions: The mortality benefit of screening men aged 65-74 for abdominal aortic aneurysm is maintained up to 10 years and cost effectiveness becomes more favourable over time. To maximise the benefit from a screening programme, emphasis should be placed on achieving a high initial rate of attendance and good adherence to clinical follow-up, preventing delays in undertaking surgery, and maintaining a low operative mortality after elective surgery. On the basis of current evidence, rescreening of those originally screened as normal is not justified.</p>
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<p>Stevenson M, Lloyd-Jones M and Papaioannou D (2009) Vitamin K to prevent fractures in older women: Systematic review and economic evaluation, <i>Health Technology Assessment</i> 13 (45) : 14pp</p>	<p>Objective: To determine the clinical and cost-effectiveness of vitamin K in preventing osteoporotic fractures in postmenopausal women.</p> <p>Review methods: Following online searching, selected studies were assessed and subjected to data extraction and quality assessment using standard methods. Where appropriate, meta-analysis was carried out. A mathematical model was constructed to estimate the cost-effectiveness of vitamin K1.</p> <p>Results: The electronic literature searches identified 1078 potentially relevant articles. Of these, 14 articles relating to five trials that compared vitamin K with a relevant comparator in postmenopausal women with osteoporosis or osteopenia met the review inclusion criteria. The double-blind ECKO trial compared 5 mg of phylloquinone (vitamin K1) with placebo in Canadian women with osteopenia but without osteoporosis. Four open-label trials used 45 mg of menatetrenone (vitamin K2) in Japanese women with osteoporosis; the comparators were no treatment, etidronate or calcium. The methodological quality of the ECKO trial was good; however, all four menatetrenone trials were poorly reported and three were very small (n < 100 in each group). Phylloquinone was associated with a statistically significant reduction in the risk of clinical fractures relative to placebo [relative risk 0.46, 95% confidence interval (CI) 0.22 to 0.99]; morphometric vertebral fractures were not reported. The smaller menatetrenone trials found that menatetrenone was associated with a reduced risk of morphometric vertebral fractures relative to no treatment or calcium; however, the larger Osteoporosis Fracture (OF) study found no evidence of a reduction in vertebral fracture risk. The three smaller trials found no significant difference between treatment groups in non-vertebral fracture incidence. In the ECKO trial, phylloquinone was not associated with an increase in adverse events. In the menatetrenone trials, adverse event reporting was generally poor; however, in the OF study, menatetrenone was associated with a significantly higher incidence of skin and skin appendage lesions. No published economic evaluations of vitamin K were found and a mathematical model was thus constructed to estimate the cost-effectiveness of vitamin K1. Comparators were alendronate, risedronate and strontium ranelate. Vitamin K1 and alendronate were markedly more cost-effective than either risedronate or strontium ranelate. The base-case results favoured vitamin K1, but this relied on many assumptions, particularly on the efficacy of preventing hip and vertebral fractures. Calculation of the expected value of sampled information was conducted assuming a randomised controlled trial of 5 years' duration comparing alendronate with vitamin K1. The costs incurred in obtaining updated efficacy data from a trial with 2000 women per arm were estimated to be a cost-effective use of resources.</p> <p>Conclusions: There is currently large uncertainty over whether vitamin K1 is more cost-effective than alendronate; further research is required. It is unlikely that the present prescribing policy (i.e. alendronate as first-line treatment) would be altered.</p>
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<p>Lanham-New S A (2008) Symposium on 'Diet and bone health' : Importance of calcium, vitamin D and vitamin K for osteoporosis prevention and treatment, <i>Proceedings of the Nutrition Society</i> 67 : 163-176</p>	<p>Throughout the life cycle the skeleton requires optimum development and maintenance of its integrity to prevent fracture. Bones break because the loads placed on them exceed the ability of the bone to absorb the energy involved. It is now estimated that one in three women and one in twelve men aged >55 years will suffer from osteoporosis in their lifetime and at a cost in the UK of >£1.7 · 10⁹ per year. The pathogenesis of osteoporosis is multifactorial. Both the development of peak bone mass and the rate of bone loss are determined by key endogenous and exogenous factors. Ca supplements appear to be effective in reducing bone loss in women late post menopause (>5 years post menopause), particularly in those with low habitual Ca intake (<400 mg/d). In women early post menopause (<5 years post menopause) who are not vitamin D deficient, Ca supplementation has little effect on bone mineral density. However, supplementation with vitamin D and Ca has been shown to reduce fracture rates in the institutionalised elderly, but there remains controversy as to whether supplementation is effective in reducing fracture in free-living populations. Re-defining vitamin D requirements in the UK is needed since there is evidence of extensive hypovitaminosis D in the UK. Low vitamin D status is associated with an increased risk of falling and a variety of other health outcomes and is an area that requires urgent attention. The role of other micronutrients on bone remains to be fully defined, although there are promising data in the literature for a clear link between vitamin K nutrition and skeletal integrity, including fracture reduction.</p>
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<p>Ward S, Lloyd Jones M, Pandor A, Holmes M, Ara R, Ryan A, Yeo W and Payne N (2007) A systematic review and economic evaluation of statins for the prevention of coronary events, <i>Health Technology Assessment</i> 11 (14) : 6pp</p>	<p>Thirty-one randomised studies were identified that compared a statin with placebo or with another statin, and that reported clinical outcomes. Meta-analysis of the available data from the placebo-controlled studies indicates that, in patients with, or at risk of, CVD, statin therapy is associated with a reduced relative risk of all-cause mortality, cardiovascular mortality, CHD mortality and fatal MI, but not of fatal stroke. It is also associated with a reduced relative risk of morbidity (non-fatal stroke, non-fatal MI, TIA, unstable angina) and of coronary revascularisation. It is hardly possible, on the evidence available from the placebo-controlled trials, to differentiate between the clinical efficacy of atorvastatin, fluvastatin, pravastatin and simvastatin. However, there is some evidence from direct comparisons between statins to suggest that atorvastatin may be more effective than pravastatin in patients with symptomatic CHD. There is no evidence from randomised controlled trials (RCTs) for the effectiveness of the 10-mg over-the-counter dose of simvastatin in preventing clinical events.</p> <p>No relevant studies of rosuvastatin were identified that reported clinical outcomes. Thus, although there is RCT evidence to suggest that rosuvastatin is more effective than atorvastatin, pravastatin and simvastatin in reducing both total and low-density lipoprotein cholesterol, it is not possible to prove that these reductions translate into comparable reductions in clinical events.</p> <p>There is limited evidence for the effectiveness of statins in different subgroups. There is no evidence that statins differ in their effectiveness, measured in terms of relative risk reduction, in primary compared with secondary prevention, in women compared with men at a similar level of cardiovascular risk, in people with diabetes compared with those without, or in people aged 65 and over compared with those younger than 65. In renal transplant patients, statin therapy is associated with a reduced risk of CHD death or non-fatal MI. However, no benefit has been demonstrated in cardiac transplant patients. For ethical reasons, no placebo-controlled trials have been carried out in patients with familial hypercholesterolaemia. The only randomised trial in this group compared two statins, and found no significant difference between them. People from the Indian subcontinent are known to be at increased risk of CVD. However, no placebo-controlled studies were found that studied the clinical effectiveness of statins in this population</p>
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<p>Nichol K L, Nordin J D, Nelson D B, Mullooly J P and Hak E (2007) Effectiveness of influenza vaccine in the community-dwelling elderly, <i>The New England Journal of Medicine</i> 357 (14) : 1373-1381</p>	<p>Reliable estimates of the effectiveness of influenza vaccine among persons 65 years of age and older are important for informed vaccination policies and programs. Short-term studies may provide misleading pictures of long-term benefits, and residual confounding may have biased past results. This study examined the effectiveness of influenza vaccine in seniors over the long term while addressing potential bias and residual confounding in the results.</p> <p>Methods: Data were pooled from 18 cohorts of community-dwelling elderly members of one U.S. health maintenance organization (HMO) for 1990–1991 through 1999–2000 and of two other HMOs for 1996–1997 through 1999–2000. Logistic regression was used to estimate the effectiveness of the vaccine for the prevention of hospitalization for pneumonia or influenza and death after adjustment for important covariates. Additional analyses explored for evidence of bias and the potential effect of residual confounding.</p> <p>Results: There were 713,872 person-seasons of observation. Most high-risk medical conditions that were measured were more prevalent among vaccinated than among unvaccinated persons. Vaccination was associated with a 27% reduction in the risk of hospitalization for pneumonia or influenza (adjusted odds ratio, 0.73; 95% confidence interval [CI], 0.68 to 0.77) and a 48% reduction in the risk of death (adjusted odds ratio, 0.52; 95% CI, 0.50 to 0.55). Estimates were generally stable across age and risk subgroups. In the sensitivity analyses, we modeled the effect of a hypothetical unmeasured confounder that would have caused overestimation of vaccine effectiveness in the main analysis; vaccination was still associated with statistically significant — though lower — reductions in the risks of both hospitalization and death</p> <p>Conclusions: During 10 seasons, influenza vaccination was associated with significant reductions in the risk of hospitalization for pneumonia or influenza and in the risk of death among community-dwelling elderly persons. Vaccine delivery to this high-priority group should be improved</p>
<p>Mangin D, Sweeney K and Heath I (2007) Preventive health care in elderly people needs rethinking, <i>BMJ</i> August 11; 335 (7614) : 285-287</p>	<p>This article argues that a single disease model is not appropriate to assess preventive medication in older people but that changes in all cause mortality should be considered.</p> <p>The article argues single disease models should not be applied to preventive treatments in elderly people; preventive treatments in elderly people may select cause of death without the patient's informed consent; preventive use of statins shows no overall benefit in elderly people as cardiovascular mortality and morbidity are replaced by cancer; amore sophisticated model is needed to assess the benefits and harms of preventive treatment in elderly people.</p>

<p>NHS Centre for Reviews and Dissemination (1996) Influenza vaccination and older people, <i>Effectiveness Matters</i> 2 (1) : 1-4</p>	<p>Most deaths related to influenza occur in people over 65, and those with underlying chronic medical conditions are at particularly high risk.</p> <p>Modern influenza vaccines are effective and free from serious side effects.</p> <p>Research evidence shows that annual influenza vaccination of all older people is a cost effective way of reducing influenza-related deaths and illness.</p> <ul style="list-style-type: none"> • All people over 65 should be considered for influenza vaccination. • If supplies are insufficient to offer vaccine to all people over 65, priority should be given to people in high risk groups, hospitals, nursing homes and long stay facilities. • People should be offered vaccination annually in October/early November to ensure maximum protection. • Local policies are needed to promote high rates of influenza vaccination for older people and others at high risk. <p>The influenza vaccine has been shown to be effective in reducing infection, associated illness, hospitalisation and mortality in older people when the infectious and vaccine strains are closely related. A recent randomised placebocontrolled trial established that the vaccination of people over the age of 60 halved the risk of influenza infection confirmed by a blood test.</p> <p>A number of observational studies on influenza vaccination in older people, judged by strict selection criteria to be of high quality, have been systematically reviewed. These were predominantly based on institutionalised older people in the United States. The most comprehensive review, based on a comparison of 8,000 people vaccinated with 20,000 unvaccinated, indicates that the vaccine is highly effective. Cases of respiratory illness, pneumonia, hospitalisations (resulting from influenza related illness) and mortality were reduced by over 50% in institutionalised elderly people .</p> <p>Recent observational studies, two from the UK, have shown that the vaccine is equally effective in reducing mortality in older people living in the community and those not classed as medically at high risk.</p> <p>Annual vaccination is important for continued protection. Older people who are vaccinated annually have a greater protection against death than those vaccinated for the first time prior to an influenza season.</p>
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i) Selected epidemiological evidence – the use of technology – telehealth and telecare

Study	Findings
Steventon A and Bardsley M (2012) <i>The impact of telehealth on use of hospital care and mortality</i> , Nuffield Trust	<p>Main findings</p> <ul style="list-style-type: none"> • Over the 12 months that they spent in the trial, patients allocated to receive the telehealth intervention had fewer emergency hospital admissions; they experienced an average of 0.54 emergency admissions per person, compared with 0.68 per person for control patients – a difference of around 20 per cent. • Over the twelve months, 4.6 per cent of intervention patients died, compared with 8.3 per cent of controls. • These differences in emergency admissions and mortality were statistically significant, so were unlikely to have been caused by chance. • For intervention patients, the overall costs of hospital care (including emergency admissions, elective admissions and outpatient attendances) were £188 per patient less than those for controls. However, this cost difference was not statistically significant. • Detailed estimates of the cost of the telehealth intervention have not yet been released, but will need to be offset against these cost estimates.
Department of Health (2011) <i>Whole System Demonstrator Programme: Headline findings - December 2011</i> ,	These early indications show that if used correctly telehealth can deliver a 15% reduction in A&E visits, a 20% reduction in emergency admissions, a 14% reduction in elective admissions, a 14% reduction in bed days and an 8% reduction in tariff costs. More strikingly they also demonstrate a 45% reduction in mortality rates.

<p>Barlow J, Singh D, Bayer S and Curry R (2007) A systematic review of the benefits of home telecare for frail elderly people and those with long-term conditions, <i>Journal of Telemedicine and Telecare</i> 13 (4) : 172-179</p>	<p>The authors conducted a systematic review of home telecare for frail elderly people and for patients with chronic conditions. They searched 17 electronic databases, the reference lists of identified studies, conference proceedings and Websites for studies available in January 2006. They identified summaries of 8666 studies, which were assessed independently for relevance by two reviewers. Randomized controlled trials of any size and observational studies with 80 or more participants were eligible for inclusion if they examined the effects of using telecommunications technology to (a) monitor vital signs or safety and security in the home, or (b) provide information and support.</p> <p>The review included 68 randomized controlled trials (69%) and 30 observational studies with 80 or more participants (31%). Most studies focused on people with diabetes (31%) or heart failure (29%). Almost two-thirds (64%) of the studies originated in the US; more than half (55%) had been published within the previous three years.</p> <p>Based on the evidence reviewed, the most effective telecare interventions appear to be automated vital signs monitoring (for reducing health service use) and telephone follow-up by nurses (for improving clinical indicators and reducing health service use). The cost-effectiveness of these interventions was less certain. There is insufficient evidence about the effects of home safety and security alert systems. It is important to note that just because there is insufficient evidence about some interventions, this does not mean that those interventions have no effect.</p>
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