



What are the main risk factors for disability in old age and how can disability be prevented?

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ABSTRACT

Health Evidence Network (HEN) synthesis report on main risk factors for disability in old age and how can disability be prevented

In the next twenty years, the European Union will gain 17 million people over age 65 - a 30% increase - and 5.5 million more people over age 80, a 39% increase. Disability in old age is frequent and not only lowers the quality of life of its victims, but strains society's limited resources for assistance, care and rehabilitation. Prevention of disability in old age is therefore a matter of great humanitarian and economic concern.

This report is HEN's response to a question from a decision-maker. It provides a synthesis of the best available evidence, including a summary of the main findings and policy options related to the issue.

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Summary

The issue

In the next twenty years, the European Union will gain 17 million people over age 65 - a 30% increase - and 5.5 million more people over age 80, a 39% increase. Disability in old age is frequent and not only lowers the quality of life of its victims, but strains society's limited resources for assistance, care and rehabilitation. Prevention of disability in old age is therefore a matter of great humanitarian and economic concern.

Findings

Research on disability in old age has identified non-modifiable risk factors such as age, gender and genetics, and modifiable risk factors such as age-related diseases, impairments, functional limitations, poor coping strategies, sedentary lifestyles and other unhealthy behaviours, as well as social and environmental obstacles. Many of these stem from earlier phases of life and the prevalent socioeconomic conditions. This knowledge has allowed the development of successful techniques of preventing and reducing disability in old age. Disabling chronic illness, depressive mood, functional decline and sedentary lifestyles are among the most important prevention targets.

Much evidence shows that physical activity may ameliorate diseases, reduce depressive symptoms and prevent or delay functional limitations and disabilities in the elderly. Consistent results find that long-term physical activity leads to postponed disability and sustained independence, even for the chronically ill. Several studies conclude that telephone-based efforts to encourage participation in ongoing physical activity programmes, either alone or with groups, are effective in preventing disability. Other studies show the effectiveness of moderate centre-based exercise, group activities and targeting specific at-risk populations.

There are, however, gaps and conflicting findings on the relative importance of various risk factors and the best ways of intervening. The benefits of comprehensive geriatric assessments and in-home visits have been examined in numerous studies. The results are so far inconclusive, but recent controlled studies suggest that they are effective. Environmental risk factors have largely been neglected in earlier research, as have risk factors and prevention with respect to the oldest age groups. There is essentially no evidence on the costs and benefits for various old-age disability preventive strategies.

Policy considerations

Effective programmes for disability prevention and reduction, especially among the poor, are urgently needed. An important starting point for successful prevention is to use the available evidence to dispel the old myths that the risk of disease is a normal part of old age and not amenable to change, and that an old body cannot respond positively to lifestyle changes.

Diseases, particularly multiple chronic illnesses, are the main cause of old age disability. Interventions should therefore include their prevention and effective management, including self-management. The promotion of physically active lifestyles is among the most promising strategies.

Improved disability prevention will require a change in organizational priorities, restructuring of the symptom-driven health care system, and training for providers and clients to cooperate in collaborative care. Many interventions are most effective in concert with community resources and policies.

More specific policy recommendations are:

- to develop strategic preventive plans at national and community levels;
- to promote training in gerontology and geriatric medicine for relevant professional groups;
- to develop programmes to enable older people to cope with disability risk factors and manage chronic illnesses; and
- to create initiatives to stimulate research and development on old age disability.

The author of this HEN synthesis report is:

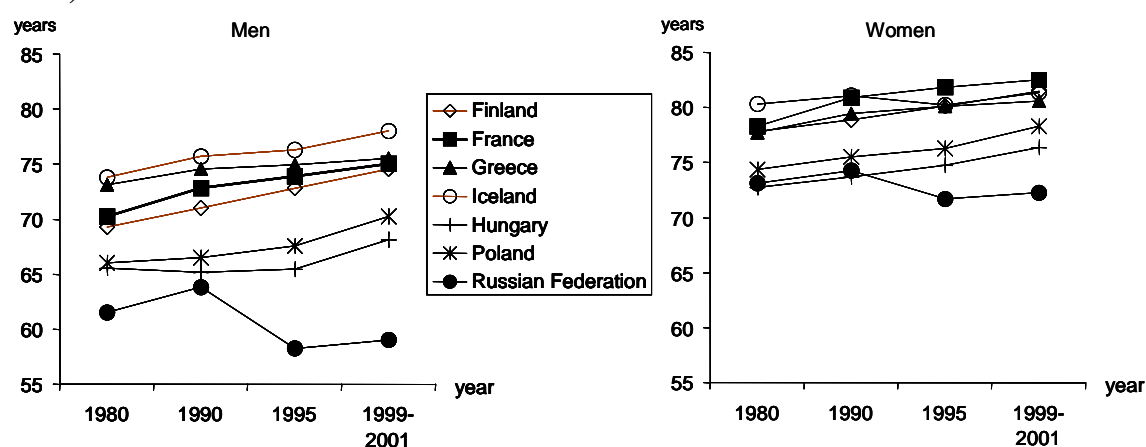
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Introduction

Western industrialized countries have seen a significant increase in life expectancy and in the number of old people. During the past century the average life expectancy of Europeans has increased by 28 years, from 45 to 73 years. The trend observed during the last decades of the twentieth century (Fig. 1) is expected to continue in the future. It has been estimated that in the current European Union countries the proportion of people aged 80 and over will increase by 40% between 1995-2015, though this is not the case in the less developed countries. The trend is swelling the number of older people with disabilities, particularly elderly women.

Fig. 1. Life expectancy at birth in selected European countries since 1980 (Eurostat 2002).



What is disability in old age?

Old age disability is usually defined in terms of difficulties in one or more basic self-care tasks, often called physical activities of daily living, or PADLs (bathing, dressing, toileting, continence, feeding, transferring from chair to bed) or in one or more instrumental activities of daily living or IADLs (using the phone, shopping, preparing meals, housekeeping, laundry, public transportation, taking medication, handling finances). Mobility disability is increasingly used as an outcome in epidemiological studies because the ability to ambulate is essential for many activities of an independent life. Approximately 20% of people aged 70 years or older, and 50% of people aged 85 and older, report difficulty with PADLs. The prevalence of various disabilities gradually increases with advancing age, starts to accelerate after the age of 70 years and causes a growing need for help especially after the age of 80 years.

What is old age in this context?

From the disability point of view, old age can be defined as the period beyond 75 years.

Disability limits the autonomy of older people, introduces dependence, reduces the quality of life and increases the risk of nursing home admission and premature death. The economic burden presented to society by disability is enormous (1). "Mass problems require mass solutions", said Virchow. There is an urgent need for effective intervention programmes for disability prevention, which has become an important public health concern.

Sources for this review

This paper is based on a literature review, discussions with experts from the multicentre network on Burden of Disease in Old Age (<http://www.jyu.fi/BURDIS>), the EU sponsored activity, and the results of the longitudinal and comparative studies at the Finnish Centre for Interdisciplinary Gerontology. Published randomized controlled trials, meta-analyses and reviews as well as other relevant literature were sought from Medline, PubMed and Sociological abstracts, and bibliographic searches using the reference lists of relevant articles were also undertaken. Bibliographic searches related to the population aged 65 and over. Various terms were combined for different searches (for example, disability, disablement process, risk factors, interventions, comprehensive geriatric assessment, physical activity, depression, elderly). Due to the complex nature of the old age disability and limited space available for this review, only a few risk factors were considered in more detail, namely: chronic illnesses, depression and physical inactivity, and related functional decline. However, it can be assumed that successful interventions targeted to any of the above-mentioned risk factors for disability will eventually prevent and reduce old age disability.

Findings

Evidence based on findings from research

Risk factors for disability in old age

Much research has been done to identify risk factors for the onset of disability by applying the disablement model (3) (Annex 1) originally developed by Nagi (2). The main pathway of the model consists of four components: pathology, functional impairments, functional limitations, and disability. These personal characteristics are modified by behavioural factors such as physical exercise, smoking, alcohol consumption, nutrition, social activities, or influenced by permanent characteristics such as age, gender and genetic factors (3, 4). It is also clear from several studies that the prevalence of disability is lower in relatively privileged socioeconomic groups (5, 6, 7, 8). The development of disability is further conceptualized on the assumption that environmental factors such as social support, services, and physical characteristics of the living area in concert with an older person's personal capabilities influence the likelihood of becoming more or less disabled. Changes in bodily structures and functions with advancing age also modify the disablement process and increase the risk for disability (9). This is particularly important in the oldest age groups, in which ageing processes contribute to decline in sensory and motor performance and in the cardiorespiratory, musculoskeletal and nervous systems, for example.

Given that there seem to be three main underlying causes of disability - diseases, injuries and processes of ageing - it would be logical to examine the risk factors separately in relation to these causes. The borderlines between the processes of ageing and diseases of old age and consequent functional decline are in many cases poorly understood. In the studies of old age disability it is, therefore, for the time being difficult to define separate risks for accelerated ageing and diseases. In a systematic literature review Stuck et al. (10) listed various behavioural and health factors that at an individual level contribute to the development of disability in old age. The highest strength of evidence for an increased risk in functional status decline (defined as disability or physical function limitation) was found for (in alphabetical order):

- cognitive impairment

- depression
- disease burden
- increased and decreased body mass index
- lower extremity functional limitation
- low frequency of social contacts
- low level of physical activity
- no alcohol use compared to moderate use
- poor self-perceived health
- smoking
- vision impairment.

Other risk factors, usually related to different chronic diseases, include hypertension, elevated blood lipids and glucose, low bone density, alcohol and drug misuse (11, 12, 13, 14). A recent synthesis by Miller et al. (15) of 78 journal articles identified 22 risk factors as predictors of adverse outcomes including reduced physical performance. Certain risk factors (for example, nutrition and physical environment) have been largely neglected in earlier research. Research has also shown that certain psychological and psychosocial characteristics, such as poor self-efficacy, coping strategies, depression and social integration predict the development of disability (16, 17).

Interventions to prevent disability

The basic premise for any larger scale application of interventions aimed at preventing disability in old age is that the targeted factor is significantly implicated in a certain disability outcome. In addition, the prevalence of this factor in the population concerned should be taken into account and there should also be evidence that interventions aimed at this factor are effective. Table 1 gives estimates about the reliability of associations between certain risk factors and disability in old age, the importance of the risk factors at population level and the current evidence regarding the possibility of improving the situation through interventions.

Several important risk factors for disability have already been established, as indicated by the review of Stuck et al. (10). Additional research is, however, needed for the development of effective interventions, and there are obviously many other individual and environmental risk factors that have not yet been identified and properly investigated from an intervention point of view. Obesity, for example, is a major public health concern but only a few prevention programmes have been developed or implemented, and the success rates have been low (13). Randomized controlled trials are still rare in this field of research, and there seems to be considerable variation in the target populations and the intervention duration, strategies and designs. Outcome measures have included different domains of functional status, admission to hospital and institutional care, use of community services and visits to physicians, home nursing care, health status and self-rated health, quality of life and mortality.

Table 1. Evaluation of the importance of separate modifiable risk factors for disability and their prevention in older people.

Factor	Risk for disability confirmed?	Importance of risk factor at population level?	Effect on disability confirmed through intervention or other evidence
Cognitive impairment	+++	++	0
Depression	+++	++	0
Disease burden	+++	+++	++
Increased and decreased BMI	++	++	0
Lower extremity functional limitation	+++	++	++
Low frequency of social contacts	+	++	+

Low level of physical activity	+++	++	+++
No alcohol use compared to moderate use	+	++	?
Poor self-rated health	++	++	0
Smoking	+++	++	+
Vision impairment	+++	++	+

Source: based on the analysis of Stuck et al., 1999, and the author's own analysis.

+, ++, +++ = the level of reliability; 0 = the question has not been studied thoroughly; ? = the scientific evidence is contradictory.

Prevention and management of disabling chronic illnesses

Disease, particularly chronic, is the main cause of old age disability. People aged 70 years and over usually have two or three chronic conditions that account for around two-thirds of total health care expenditure (18, 19). About 90 % of all 75-year-olds have some clinical diagnosis. Interventions should, therefore, aim at the prevention and effective management of chronic illness (20). In both areas, evidence-based interventions have been identified (21). Younger age groups (those aged about 60 to 75 years) among older people do not differ much from middle-aged groups with regard to their potential to benefit from many interventions such as counselling, screening, immunizations, and chemoprophylactic interventions. For people aged 75 to 80 and over information about the effectiveness of interventions aimed at preventing or delaying disabling diseases is still scarce.

Goldberg and Chavin (11) and Mehr and Tatum (22) have reviewed the research literature and the guidelines of various professional organizations with a view to presenting summary recommendations for prevention and screening in older adults.¹ They concluded that there is evidence supporting periodic screening for many common illnesses and their risk factors in elderly populations. There is, however, no standard method for the conducting health assessments and the results therefore vary between the studies.

As most old people have some chronic illness and co-morbidity is common, it is important that interventions are also aimed at the effective management of chronic illness by providing both clients and service providers with adequate information, skills, incentives and resources. The development of new medical technologies, which can successfully be used in the treatment of serious conditions in middle-age (e.g. different events of coronary heart disease), may in later life lead to an increased need for effective tertiary prevention and chronic disease management in order to prevent physical and mental decline in these patients.

Prevention and treatment of depression

Depression is one of the most common mental health disorders in older people. According to a recent comprehensive review by Blazer (23), the prevalence of clinically important depressive symptoms among community-dwelling older adults ranges from approximately 8% to 16%. For example, in the UK depression affects from 10% to 15% of people over 65 living at home (24). Depressive symptoms are more frequent among the oldest, but the higher frequency is explained by factors associated with ageing, such as a higher proportion of women, more physical disability, more cognitive impairment, and lower socioeconomic status. Older men and women with a major disability and serious chronic conditions have substantially more symptoms of depression than those with no limitation. Depression is often accompanied by decreased physical activity, resulting in functional limitations and disability (25, 26, 27). On the other hand exercise may reduce depressive symptoms among older persons (25).

Depression is associated with physical illness and disability (28). In addition, many underlying causes of depression have a social, economic or environmental background (for example, loneliness, social isolation, poverty, poor living conditions and negative life events including losses). These factors are often neglected in service systems, and only few studies document the efficacy of primary prevention efforts. Despite a favourable response to treatment, late-life depression remains largely undetected and untreated (24, 23).

Promotion of physical activity.

In their review Lee and Tanaka (29) discussed the significance of health fitness appraisal in the aged society, giving examples of successful programmes implemented in different countries. There is a wealth of data demonstrating that physical activity and exercise may ameliorate diseases, reduce depressive symptoms and prevent and delay the occurrence of functional limitations and disabilities in elderly populations (30, 31, 32, 33, 34, 35, 36). The most consistent results were that long-term

¹ For example, the American College of Physicians, American Geriatric Society, Canadian Task Force on the Periodic Health Examination, US Preventive Services Task Force.

physical activity is related to postponed disability and independent living in elderly people, and that even in individuals with chronic disease, physical activities enhance physical function (35). A critical review on physical activity interventions targeting older adults (31) comprising 29 studies that were community-based and that employed a randomized or quasi-experimental design with an appropriate comparison group concluded that telephone-based strategies for encouraging ongoing physical activity participation, either alone or in combination with group-based formats, have received the largest amount of empirical support. A meta-analysis has shown that the most effective interventions include centre-based exercise, recommending moderate levels of activity, delivering interventions in groups, and targeting specific patient populations at risk for disease (37).

Other evidence

The new definitions and categories proposed for age groups among older people suggest that significant improvements are occurring in health and functional capacity, particularly among people in the so-called third age, from 55 or 60 to 75 or 80 years (38). This age period is characterized by an increasing desire for active involvement in social life and personal leisure activities, and by growing demands for an adequate provision of services (39). The notion of "active ageing" also suggests that remaining active physically, socially and mentally prevents disabilities and predicts successful ageing (40).

Gaps in evidence and conflicting evidence

Despite the growing thrust on possibilities to prevent, delay and reduce old age disability, there still remain many concerns about the ways to effectively deal with the risk factors. There is only scarce high-quality evidence on which to base recommendations for those older than 80 years. More disease-oriented and therapeutic research as well as studies of preventive measures are needed for the oldest age groups. On the other hand, there is a growing recognition of the importance of assessing older people as individuals rather than as average members of their age group. The emerging life course approach to old age disability emphasizes the cumulative effects of behavioural, environmental and genetic factors across the life span as well as the impact of resources acquired throughout life such as level of education and personal resources to cope with health and function in old age. It has been observed, for instance, that muscle strength in middle age predicts old age disability (41). This approach needs to be further developed in both research and programmes focusing on the occurrence of disability with age. The application of new technology to the prevention and management of old age disability would also require research work and careful explorations.

The geriatric approach, or comprehensive geriatric assessment (CGA), as compared with conventional care, has been extensively studied over the past 20 years in various settings.

CGA comprises the evaluation and treatment of the medical, functional, psychosocial and environmental problems of elderly patients (42). The results on outcomes have been partly conflicting as described in several reviews and meta-analyses (43, 44, 45, 46). The same applies to trials of in-home CGA and preventive home visits, which have shown variable results (44, 46, 47). However, recent randomized trials (48, 49, 50) have shown that in-home preventive programmes can delay the onset of disability among low-risk older people. The competence of the intervention personnel is probably a key factor in such programmes.

Very little information is currently available about the costs and benefits of various interventions. Gaps have been shown to exist in the understanding of how housing, market mechanisms, overall health and social policies, etc. possibly effect the development of disability in old age (15).

Generalizability

The general pattern of an increase in disability with advancing age is fairly similar across industrialized societies, even though there may be significant differences in the prevalence of particular disabilities and underlying factors. Differences in health policies and health care systems

mean that differing emphasis is placed on interventions aimed at age-related disability and on the relative importance given to individual decisions versus those of service providers. There are significant national differences in the responsibility allocated to medical and social services for the prevention of disability. As health, social and long-term care use are closely related to disability (34), it is important to develop both health and welfare organizations to provide older people with efficient services for disability prevention.

Other aspects

In the European Region there have been no national or larger programmes for the prevention of old age disability. The field is still mainly in the exploratory phase, with attempts to either further define the underlying factors of old age disability or to confirm with local programmes the effects of interventions targeted at them. An important starting point for successful preventive interventions is discounting the old myth that the risk of diseases is a normal part of old age and therefore not amenable to change, and that the old body cannot respond positively to changes in lifestyle. Improved disability prevention, including chronic illness management, would require a reorientation of organizational priorities and incentives, a restructuring of the present symptom-driven health care system, and training for providers and clients to work as partners in collaborative care processes (21). Many interventions are most effectively implemented through linkages with community resources, organizations and policies.

Conclusions

The growing number of elderly in Europe is giving rise to a growing burden of old age disability, that is, to reduced independence, an increased use of various services and decreased quality of life. There is increasing evidence that many of the risk factors for old age disability are modifiable. Disabling chronic illnesses, depressive mood, functional decline and sedentary lifestyle are among the most important targets for interventions. Many of these risk factors are related to socioeconomic and living conditions, and they have been created and modified during the individual's previous phases of life.

There are both gaps in knowledge and conflicting results concerning the effectiveness of various intervention strategies and their costs and benefits. There is an urgent need for health services research and health economic studies related to old age disability. Evidence is particularly scanty regarding risk factors and interventions among people aged 80 and over. Environmental risk factors have largely been neglected in earlier research.

Policy options

A World Health Organization expert group suggested as early as 1984 that a sensible strategy for ageing populations should be based upon the prevention and reduction of disability. This target has been recognized in many countries and included in national public health priorities. However, the implementation strategies have not been developed in parallel with the expressed aims and the new emerging knowledge about modifiable risk factors and effective interventions.

- It is important that in the future, appropriate priority is given to timely and effective medical and social interventions focusing on disability prevention and reduction. This will require better adaptation to the needs of older people regarding the design of services, the improvement of clinical practice in both primary care and any speciality that cares for older patients.
- An adequate monitoring system of functional status and disabilities is required for improving the assessment of these conditions and evaluating the interventions at population level.

- The promotion of training in gerontology and geriatric medicine is an important challenge and a necessary prerequisite for implementing effective services for older people. Gerontological education should be increased in the curriculum of all the relevant professional groups, and opportunities for specialization in gerontology and geriatric medicine ought to be enhanced.
- The ability of older people themselves to better cope with disability risk factors and to manage chronic illness could be increased and improved through educational and counselling programmes.
- At the community level, greater effort should be invested in making use of existing knowledge and increasing sensitivity to the prevention of disability and the maintenance of satisfactory function among older people. Useful strategies might include programmes for promoting healthy behaviours such as regular physical and social activity, and for the relevant use of new technologies, thus strengthening responsive service delivery, and building up a supportive policy culture tied to community resources. A thorough discussion of organizational questions for the care of elderly people is needed.
- The problems of old age disability are complex and call for more scientific research. The results of the European Union research programme on population ageing (<http://www.cordis.lu/life/>) should be put to the best possible use. There are many research areas and questions where different institutions and organizations could take an initiative for concerted research and development effort. These could include, for example, health services research, production of a standardized protocol for studies of risk factors for disability and preventive measures against old age disability of all kinds, and a definition of age-dependent disability on the basis of performance measures, in relation to the social and physical environment.
- While emphasizing the importance of new research and development, it is important to use the existing knowledge and recognize that in addressing such a complex problem as disability in old age it may not be possible to solve all the problems with scientific research and an evidence-based approach. Some recommendations and initiatives may well be based on personal experience and experiences from other countries, observational studies, common sense and available resources.

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Annex 1. The disablement process (3).

