Kansanterveyslaitos
Folkhälsoinstitutet
National Public Health Institute

Publications of the National Public Health Institute A 3/ 2005

Tommi Sulander

Functional Ability and Health Behaviours

Trends and Associations among Elderly People, 1985-2003

Department of Epidemiology and Health Promotion,
National Public Health Institute, Helsinki, Finland
and
Department of Social Policy , Faculty of Social Sciences,
University of Helsinki, Finland

2005

Tommi Sulander

FUNCTIONAL ABILITY AND HEALTH BEHAVIOURS

Trends and associations among elderly people, 1985-2003

Academic dissertation

To be presented with the permission of the Faculty of Social Sciences of the University of Helsinki for the public examination in Auditorium XII of the University Main Building, on the 4th of March, 2005, at 12 o'clock noon.

Department of Epidemiology and Health Promotion
National Public Health Institute
Helsinki, Finland
and
Department of Social Policy
University of Helsinki
Helsinki, Finland

Helsinki 2005

Publications of the National Public Health Institute KTL A3/2005

Julkaisija – Utgivare – Publisher

Kansanterveyslaitos (KTL)
Mannerheimintie 166
00300 Helsinki
Puh. vaihde (09) 4744 1, telefaksi (09) 4744 8408

Folkhälsoinstitute
Mannerheimvägen 166
00300 Helsingfors
Tel. växel (09) 4744 1, telefax (09) 4744 8408

National Public Health Institute
Mannerheimintie 166
FIN – 00300 Helsinki, Finland
Telephone +358 9 4744 1, telefax +358 9 4744 8408

ISBN 951-740-489-1
ISSN 0359-3584
ISBN 951-740-490-5 (PDF version)
ISSN 1458-6290 (PDF version)
http://ethesis.helsinki.fi

Edita Prima Oy
Helsinki 2005

To Marju and Eerik,* *and

to my late grandmother Olga

“We must look after our health, use moderate exercise, take just enough food and drink to recruit, but not to overload, our strength. Nor is it the body alone that must be supported, but the intellect and soul much more. For they are like lamps: unless you feed them with oil, they too go out from old age.”

Marcus Tullius Cicero (106 B.C. - 43 B.C.): Old age

“…… on pidettävä huolta terveydestä sekä harjoitettava kohtuullisia ruumiinliikkeitä, käyttäen vain niin paljon ruokaa ja juomaa, että voimat virkistyvät siitä eivätkä herpaannu. Mutta pidettäköön huolta paitsi ruumiista vielä paljoa enemmän hengestä ja mielestä! Sillä nämäkin kuluvat loppuun vanhuudesta, ellei ikäänkuin valeta öljyä lamppuun.”

Marcus Tullius Cicero (106 e.Kr. – 43 e.Kr.): Vanhuudesta

Supervised by

Docent Antti Uutela, PhD
Department of Epidemiology and Health Promotion
National Public Health Institute
Helsinki, Finland

Docent Ossi Rahkonen, PhD
Department of Social Policy
University of Helsinki
Finland

Professor Aulikki Nissinen, MD, PhD
Department of Epidemiology and Health Promotion
National Public Health Institute
Helsinki, Finland

Reviewed by

Professor Sara Arber, PhD
Department of Sociology
University of Surrey
United Kingdom

Professor Eero Lahelma, PhD
Department of Public Health
University of Helsinki
Finland

Opponent

Docent Pertti Pohjolainen, PhD
Age Institute
Kuntokallio-Foundation
Helsinki, Finland

CONTENTS

ACKNOWLEDGEMENTS

The idea for this thesis arose with the new millennium, when I joined the National Public Health Institute (KTL). As the work for this thesis has progressed I have been encouraged to see the growth of interest in gerontological research at KTL. This study was carried out mainly in the Health Promotion Research Unit of the Department of Epidemiology and Health Promotion, and I am most grateful to KTL for this opportunity. My thanks go to the Department of Social Policy, University of Helsinki, for kindly offering me a six-month research post to finalize this thesis. I am also indebted to the Ministry of Social Affairs and Health, the Academy of Finland, and the Population, Health and Living Conditions doctoral programme for financing this work.

I have been very fortunate to benefit from the expertise of an excellent trio of supervisors. Without Docent Antti Uutela I would probably not have worked at KTL in the first place; my first phone contact with Antti and the subsequent recruitment process will always be a positive memory. We have had many fruitful discussions about work and other matters beyond the academic field. Thank you Antti for your continuous support and encouragement. The input of Docent Ossi Rahkonen as a supervisor has proved vital. The breadth of his knowledge in the area of health research is admirable. I thank him especially for his constant encouragement and excellent motivational skills - on those days when my inspiration was low he had an amazing ability to restore it. My third supervisor Professor Aulikki Nissinen has also been vital for this work. Her knowledge of gerontology is admirable and her comments and support for this work are warmly acknowledged.

This study had two official reviewers. Professor Sara Arber is warmly acknowledged for her constructive comments, which reflect her profound knowledge in the area of gerontology. The other reviewer, Professor Eero Lahelma, is warmly acknowledged for his prompt and insightful reviewing. I would like to thank Professor Risto Eräsaari of the Department of Social Policy, who proved vital to my post-graduate studies in the department. I enjoyed our discussions and always felt able to turn to him when needed. I am also grateful to Professor Antti Karisto for his valuable comments and for our fruitful conversation concerning this thesis. Thanks to Richard Burton, who has done an excellent job of editing the language of all five articles and the text of this thesis.

I thank co-authors Satu Helakorpi and Tuija Martelin for their valuable comments and for advising me on methodological issues. I have always felt welcome to turn to them in relation to this work as well as other issues. I also thank my colleagues and others in the Health Promotion Research Unit for our many fruitful conversions both within and outside academic topics.

I would also like to thank my parents and two brothers. My late grandmother Olga is warmly acknowledged. She showed me that quality of life could also be something beyond physical health.

My deepest gratitude I reserve for my beloved wife Marju and our son Eerik. I am truly privileged to share my life with you. Cheers, my loves!

Helsinki, January 2005

ABSTRACT

The number of people in Finland aged 65 and over will rise by approximately 70% over the next 30 years. The increasing burden on health and social services due to the ageing population prioritizes the study of factors that promote "active ageing". Functional ability and modifiable health behaviours are vital topics for research, as they have clear associations with multiple health outcomes. As functional ability in later life is largely determined by health behaviour, it is also important to examine both in the same context.

The main purpose of this study was to examine trends in functional ability and health behaviours and associations between these factors among a nationwide sample of elderly people in Finland from 1985 to 2003. In addition, sociodemographic variations in functional ability and health behaviours were assessed.

From 1985 to 2003, the functional ability and health behaviours of 13 232 men and women of the 65-79-year-old Finnish population were monitored in biennial cross-sectional surveys. The average response rate exceeded 80%. Self-reported activities of daily living (ADL) were used to study functional ability. The indicators of health behaviours were diet, smoking, use of alcohol, physical activity and body mass index. Self-reported chronic diseases were controlled for when examining obesity trends and associations between functional ability and health behaviours. Sociodemographic variations were studied in terms of age group, main occupation before retirement, and marital status. Age-adjusted trends, and logistic and ordinal regression analyses were computed to derive the results.

This study showed improving functional ability at the national level in both sexes from the mid-1980s to the start of the new millennium. The most marked improvement was observed among 65-69-year-old respondents. Retired office employees had better functional ability than other occupational groups throughout the monitoring period. Ex-farmers had the poorest functional ability in both genders. Occupational disparities in functional ability changed slightly over time, and more positively among men than women. Married persons were found to have slightly better functional ability than non-married individuals.

These days elderly Finnish people eat healthier food and smoke slightly less than their age-matched counterparts a couple of decades ago, but they use more alcohol and are more likely to be obese. The study findings show that healthy diet, smoking and alcohol consumption were less prevalent among the oldest respondents. Healthy diet and higher alcohol consumption increased in all occupational groups over time and were more pronounced among retired office workers than other former employees. Alcohol consumption among male and female ex-farmers and smoking among female ex-farmers were at low levels throughout the study period. Healthy diet was more prevalent among married than non-married elderly people, whereas smoking was twice as prevalent among the non-married.

An upward trend of obesity was observed in all sociodemographic groups from the mid-1980s to the early 2000s. The lowest prevalence of obesity was observed among the oldest respondents and former office employees. Widowed women had a slightly higher prevalence of obesity than married women. Marital status disparities in obesity among men were minor.

Current and ex-smoking, both heavy- and non-alcohol use, unhealthy diet, physical inactivity and obesity were all associated with inferior functional ability. Alcohol consumption showed a U-shaped relation to ADL difficulties. Health behaviours and chronic diseases mediated sociodemographic differences in functional ability.

The trend of enhanced functional ability together with some improvements in health behaviour indicates a healthier future for elderly people in Finland. Despite these advances, however, sub-group disparities persist. Together with the apparently rising prevalence of alcohol use and obesity, these disparities are challenges for public health.

TIIVISTELMÄ

Suomen eläkeikäisen väestön on ennustettu kasvavan noin 70 % vuoteen 2030 mennessä. Tämä kehitys tulee lisäämään sosiaali- ja terveyspalveluiden käyttöä, jonka vuoksi on tärkeää tutkia ”aktiivista ikääntymistä” edistäviä tekijöitä. Toimintakyky ja terveyskäyttäytyminen ovat tällaisia tekijöitä, koska niiden on todettu olevan yhteydessä terveyteen ja kuolleisuuteen. Lisäksi terveyskäyttäytymisen on havaittu vaikuttavan toimintakyvyn tasoon myöhemmällä iällä. Näiden tekijöiden tutkiminen samassa viitekehyksessä on tärkeää.

Tämän tutkimuksen päätarkoituksena oli tutkia eläkeikäisten toimintakyvyn ja terveyskäyttäytymisen muutoksia ja yhteyksiä väestötasoisella aineistolla vuodesta 1985 vuoteen 2003. Lisäksi tutkittiin toimintakyvyn ja terveyskäyttäytymisen sosiodemografisia eroja.

Tutkimuksen aineistona käytettiin kahden vuoden välein toteutettua Eläkeikäisen väestön terveyskäyttäytymistutkimusta, jota on kerätty vuodesta 1985 alkaen. Tutkittaviksi valittiin 65-79-vuotiaat miehet ja naiset, joita oli vuosina 1985-2003 yhteensä 13 232. Vastausaktiivisuus oli keskimäärin hieman yli 80 %. Itse raportointiin perustuvaa päivittäisistä toiminnoista selviytymistä (ADL-toiminnot) käytettiin kuvaamaan toimintakykyä. Terveyskäyttäytymistä tutkittiin ruokavalion, tupakoinnin, alkoholinkäytön, fyysisen aktiivisuuden ja myös painoindeksin kautta. Lisäksi itse raportoidut krooniset sairaudet vakioitiin tutkittaessa lihavuuden muutoksia sekä toimintakyvyn ja terveyskäyttäytymisen yhteyksiä. Sosiodemografisina tekijöinä tarkasteltiin ikää, entistä ammattiryhmää ja siviilisäätyä. Tutkimuksen tulokset perustuvat ikävakioituihin trendeihin ja logistiseen sekä ordinaaliseen regressioanalyysiin.

Tutkimuksen mukaan miesten ja naisten toimintakyky kohentui 1980-luvun puolestavälistä uuden vuosituhannen alkuun. Toimintakyky parani eniten nuorimmassa ikäryhmässä, 65-69-vuotiailla. Toimistotyön parissa työskennelleillä oli parempi toimintakyky kuin muihin ammattiryhmiin kuuluvilla koko tutkimusjakson ajan. Maataloustyötä tehneiden toimintakyky oli heikoin sekä miehillä että naisilla.

Ammattiryhmittäiset erot kaventuivat hieman miehillä mutta eivät naisilla. Toimintakyky oli hieman parempi naimisissa kuin ei naimisissa olevilla.

Tämän päivän eläkeikäiset syövät terveellisemmin ja tupakoivat hieman vähemmän, mutta käyttävät enemmän alkoholia ja ovat useammin lihavia kuin ikätoverinsa pari vuosikymmentä sitten. Terveellinen ruokavalio, tupakointi ja alkoholinkäyttö olivat harvinaisempia vanhemmilla kuin nuoremmilla vastaajilla. Terveellinen ruokavalio ja alkoholinkäyttö lisääntyi kaikissa ammattiryhmissä ollen yleisintä toimistotyötä tehneillä. Maataloustyötä tehneiden miesten ja naisten alkoholinkäyttö ja maataloustyötä tehneiden naisten tupakointi oli vähäistä koko tutkimusjakson ajan. Terveellistä ruokavaliota noudattavia oli enemmän naimisissa kuin ei naimisissa olevilla. Tupakointi oli puolestaan selvästi yleisempää ei naimisissa olevilla.

Lihavuus lisääntyi kaikissa sosiodemografisissa ryhmissä 1980-luvun puolestavälistä 2000-luvun alkuun. Vähiten lihavia oli vanhimmissa ikäryhmissä sekä toimistotyötä tehneissä. Lihavuus oli hieman yleisempää leskillä kuin naimisissa olevilla naisilla. Miehillä lihavuuden siviilisäätyerot olivat pieniä.

Päivittäistupakoijilla ja tupakoinnin lopettaneilla, paljon tai ei lainkaan alkoholia käyttävillä, epäterveellistä ruokavaliota noudattavilla, vähän liikuntaa harrastavilla ja lihavilla oli muita huonompi toimintakyky. Alkoholinkäytöllä ja toimintakyvyn vajeilla oli U-käyrän muotoinen yhteys, paras toimintakyky oli kohtuullisesti alkoholia käyttävillä. Terveyskäyttäytymisen ja kroonisten sairauksien vakioiminen vähensi, mutta ei kokonaan poistanut toimintakyvyn sosiodemografisia eroja.

Toimintakyvyn kohentuminen yhdessä positiivisten terveyskäyttäytymismuutosten kanssa antaa aihetta odottaa terveempiä eläkevuosia tuleville eläkeläisille. Positiivisesta kehityksestä huolimatta väestöryhmittäiset erot ovat edelleen selkeitä. Nämä erot yhdessä lisääntyvän alkoholinkäytön ja lihavuuden kanssa ovat haasteita kansanterveydelle.

LIST OF ORIGINAL PUBLICATIONS

I Sulander T, Rahkonen O, Uutela A. Functional ability in the elderly Finnish population: time period differences and associations, 1985-99. Scandinavian Journal of Public Health 2003;31:100-106.

II Sulander T, Helakorpi S, Rahkonen O, Nissinen A, Uutela A. Changes and associations in healthy diet among the Finnish elderly, 1985-2001. Age and Ageing 2003;32:394-400.

III Sulander T, Helakorpi S, Rahkonen O, Nissinen A, Uutela A. Smoking and alcohol consumption among the elderly: trends and associations, 1985-2001. Preventive Medicine 2004;39:413-418.

IV Sulander T, Rahkonen O, Helakorpi S, Nissinen A, Uutela A. Eighteen-year trends in obesity among the elderly. Age and Ageing 2004;33:632-635.

V Sulander T, Martelin T, Rahkonen O, Nissinen A, Uutela A. Associations of functional ability with health-related behavior and body mass index among the elderly. Archives of Gerontology and Geriatrics 2005;40:185-199.

ABBREVIATIONS

ADL	Activities of daily living
BADL	Basic activities of daily living
BMI	Body mass index
CHD	Coronary hearth disease
CI	Confidence interval
COR	Cumulative odds ratio
CVD	Cardiovascular disease
IADL	Instrumental activities of daily living
ICF	International Classification of Functioning, Disability and Health
ICIDH	International Classification of Impairments, Disability, and Handicap
MSD	Musculoskeletal disease
OR	Odds ratio
PADL	Physical activities of daily living
WHO	World Health Organization

1. INTRODUCTION

The number of people in Finland aged 65 and over is set to rise by approximately 70% over the next 30 years, which will inevitably increase the use of health services. In Finland as well as other developed countries the functional ability and health of elderly people is thus no longer merely an issue of individual well-being, but an increasingly central challenge for health and social policy. Against this background it is vital to study factors that may promote "active ageing". "Active ageing is the process of optimising opportunities for health, participation and security in order to enhance quality of life as people age" (World Health Organization 2002). Many determinants of the process of active ageing have been identified. These include culture, gender; personal, behavioural, economic and social factors; physical environment, and health and social services. More research is needed into the role of individual determinants and their interactions.

Functional ability and health behaviours are among the most important issues in active ageing. Functional ability has clear associations with many dimensions of health and mortality (Harris et al. 1989; Mor et al. 1994; Greiner et al. 1996; Bernard et al. 1997; Scott et al. 1997; Aliyu et al. 2003). Modifiable forms of behaviour such as smoking, alcohol consumption, diet and physical activity, together with obesity, play a vital role in the health of future elderly people as they have been found to be associated with major chronic diseases (Norton et al. 1987; Jensen et al. 1991; Pi-Sunyer 1991; Peto et al. 1994; Pietinen et al. 1996; Puska 2000; Klatsky 2003), functional ability (Mor et al. 1989; LaCroix et al. 1993; Seeman et al. 1995; Clark 1996; Stuck et al. 1999; Schroll 2003), use of hospital services (Longnecker and MacMahon 1988; Hodgson 1992; Hanlon et al. 1998; Luchsinger et al. 2003; Tsuji et al. 2003) and mortality (Huijbregts et al. 1997; Thun et al. 1997; Puska 2000).

According to Kalache and Kickbusch (1997), functional ability is a life course issue, as it increases in childhood and peaks in early adulthood. Thereafter it begins to attenuate, at a rate largely determined by health behaviours. Independent functioning is a priority for elderly people and has a great impact on their quality of life. In order to find ways to prevent declining functional ability and enhance well-being it is important to study functional ability and health behaviours in the same context.

Nationally representative studies are needed to provide a better basis for planning policies for elderly people (Manton 1988). It is likely that allocations for health services will not expand in line with the growing number of elderly people. Therefore, nationwide information on time trends and associations between functional ability and health behaviours are essential in the challenge to improve self-management and health equity in the population.

Relatively little is known about the trends, especially the sociodemographic patterning, of health behaviours among elderly people. Finland's Ministry of Social Affairs and Health (2001) has addressed the importance of studying, among others, socioeconomic differences in functional ability and health behaviours in the ageing population in order to identify the sub-groups in most need of health policy actions.

In this text, 'elderly', and 'elderly people', refer to persons aged 65-79 years. The present study examined trends and sociodemographic patterning of functional ability and health behaviours, and associations between these factors, among Finnish elderly people from the mid-1980s to early 2000s at the national level. The focus of the investigation was on behavioural determinants of active ageing, and partly on economic and social determinants.

2. LITERATURE REVIEW

2.1. Functional ability

Terms such as functional status, functional capacity and functional ability have been used to describe a person's physical functioning. Irrespective of the term used, impairments in physical functioning lead to functional disabilities. Among elderly people, disability can be defined as difficulty in carrying out activities of everyday life due to a health or physical problem (Verbrugge and Jette 1994). Assessments of functional ability in a broader sense include biological, psychological and social functioning (Becker and Cohen 1984). The World Health Organization (WHO) defined the bio-psycho-social disease model in the 1940s. This definition sparked increasing interest in the measurement of functional ability (Sletvold et al. 1996). Several definitions have since been presented, e.g. Branch and Jette (1981) divided functional capacity into physical, emotional, mental and social functions.

Various models have been introduced for conceptualizing the progression of impairments leading to loss of function (Räty et al. 2003). The latest model introduced by WHO is the International Classification of Functioning, Disability and Health (ICF) (World Health Organization 2001). This new model represents a progression from the earlier WHO model (International Classification of Impairments, Disability, and Handicap (ICIDH)) (World Health Organization 1993), and could be conceptualized as a shift from a "consequences of disease model" to a "components of health model". In the ICF model, functioning is seen as multiple interactions or relationships between body functions and structures, activities, participation, health condition, environmental components and personal components. The interaction of these factors is in both directions, and interventions affecting one factor can potentially modify one or more of the other factors. Thus disease may modify disability, but disability may also modify health condition.

Other well-known efforts to conceptualize disability have been introduced by Nagi (1976, 1991) and Verbrugge and Jette (1994). Nagi's model is similar to the older WHO (ICIDH) model. Disability in this model means difficulties in performing activities and social roles attached to work, the family and independent life. A socio-

medical model called The Disablement Process (Verbrugge and Jette 1994) defines disability as difficulty to perform activities in any domain of life due to a health or physical problem. In this model disability is seen as the gap between personal capability and environmental demand. Thus personal and environmental factors can contribute positively or negatively to the disablement process.

Studies have found functional ability to be related to health behaviours (Stuck et al. 1999). So adjusting these behaviours in a healthier direction would improve functional ability or at least maintain it for longer. In addition, improvement and better availability of personal aids and mechanical devices may enhance individual assessments of functional ability (Heikkinen 1990).

2.1.1. Activities of daily living

Independent functioning is important for ensuring well-being and quality of life. Ability to perform activities of daily living (ADL) is a commonly used measure for determining a person's functional status. ADLs can be divided into sub-activities: physical activities of daily living (PADL), and instrumental activities of daily living (IADL). PADL represents activities related to mobility and basic bodily maintenance. These include using stairs, walking inside and outside, bathing, dressing, using the toilet, transferring and feeding. IADLs are activities needed in independent adaptation to the environment (e.g. housekeeping, shopping, handling finances, meal preparation, transportation) (Lawton and Brody 1969; Spector et al. 1987). A certain level of upper and lower body functioning is required to perform these activities without difficulties (Jette et al. 1990; Lawrence and Jette 1996; Pohjolainen 2002).

The activities of daily living (ADL) concept dates back to the 1960s, when the Katz (Katz et al. 1963) and Barthel (Mahoney and Barthel 1965) ADL indexes were introduced. Basically these scales measure people's ability to care for themselves, and they normally rely on self-reports. They are therefore very cost effective and easy to administer in large-scale data collection settings. On the other hand, many studies use clinical measures of functional capacity. Functional disability or ability is thus a

multidimensional field requiring and using a variety of measurement methods depending on the setting.

Katz's ADL scale is perhaps the most commonly used for studying individuals' ability to function independently. The scale consists of six functions in hierarchical order: bathing, dressing, going to the toilet, transferring, continence, and feeding. Studies examining the hierarchy of ADL have found support for Katz's index (Lazaridis et al. 1994), but a different hierarchical structure has also been suggested (Dunlop et al. 1997). Dunlop and colleagues (1997) established the following hierarchical order: walking, bathing, transferring, dressing, toileting, feeding. The various ADL scales developed since Katz's scale are largely constructed to provide baseline description of the patient (Sletvold et al. 1996). In population studies, ADL assessments have traditionally been used for descriptive purposes to observe changes and to predict future health outcomes (Ostir et al. 1999).

Because traditional ADL scales were designed for studying institutionalised elderly people they did not include IADLs, which were designed to be more relevant for community dwelling elderly people. There have been many modifications of the traditional scales. For instance, Spector and colleagues (1987) have suggested that IADLs could be included in the hierarchical scale along with PADLs.

Scales have been developed for IADLs, too; perhaps the most widely used measures were formulated by Lawton and Brody (1969). IADLs are not merely physical indicators of functioning but also indicate cognitive performance, such as managing financial transactions, taking medications, travelling alone and using the telephone. In this sense IADLs can be defined as activities required in order to be involved in the community (Ostir et al. 1999). Some IADLs, like shopping, meal preparation and housework, also include an element of social roles, as performing them might be traditionally associated with female gender.

Level of physical functioning is also assessed using performance-based measures (Reuben and Siu 1990; Guralnik et al. 1995; Clark et al. 1997). These are used especially in clinical research, but also in population studies. The measures objectively assess mobility, balance, strength and gait. Objective assessments are

suggested to be less prone to variations in culture, language and educational level than self-reports (Guralnik et al. 1989). However, ADL measures have been found to associate well with objective performance tests (Kivinen et al. 1998; Pohjolainen 1999; Van den Brink et al. 2003).

2.2. Changes and associations of functional ability

Functional disabilities are not merely an individual level issue but also increasingly important for public health. Disabilities associate with increased utilization of health care services and medical costs (Fried and Bush 1988). Elderly people who develop severe or progressive disability have been shown to have two to three times greater hospitalisation rates compared to those with little or no disability (Wachtel et al. 1987; Ferrucci et al. 1997). Disability is also a major cause of institutionalisation (Foley et al. 1992; Salive et al. 1993). As functional ability is thus a major issue for public health and social policy, it is essential to examine changes and associations of functional ability in order to foresee possible problems arising and to identify sub-groups with more unfavourable functional status.

2.2.1. Changes in functional ability

A number of cross-sectional and follow-up studies of functional ability across different regions of Finland have been conducted (Heikkinen et al. 1984; Lammi et al. 1989a,b; Heikkinen et al. 1990; Heikkinen et al. 1992; Jylhä et al. 1992; Valvanne et al. 1992; Sairanen et al. 1993; Lehtonen and Tilvis 1994; Sakari-Rantala et al. 1995; Niinistö et al. 1996; Pohjolainen et al. 1997; Pitkälä et al. 2001; Winblad et al. 2001; Malmberg et al. 2002; Karisto et al. 2003). There are also a few nationwide studies including information on functional ability based on interview or postal questionnaire surveys (e.g. Tyrkkö et al., 1996; Rahkonen and Takala 1998; Sulander et al. 2004). However, only a few nationwide data sources are available that also include performance-based measures of functional ability (Aromaa et al. 1989; Aromaa and Koskinen 2002).

Both regional and nationwide studies in Finland have suggested improving functional ability over time (Jylhä et al. 1992; Pohjolainen et al. 1997; Laukkanen et al. 1999; Pitkälä et al. 2001; Aromaa and Koskinen 2002; Malmberg et al. 2002; Martelin et al. 2002; Kattainen et al. 2004b). In a study based on the Mini-Finland Health Examination Survey conducted in 1978-1980 and the FINRISK-97 Senior Survey conducted in 1997, clear improvement of functional ability among elderly people aged 65-74 years was found (Martelin et al. 2002). A similar result was found when the Mini-Finland Health Examination Survey was compared with the Health 2000 study (Kattainen et al. 2004b).

Many studies from other countries have also shown improving disability figures (Manton 1988; Jagger et al. 1991; Spiers et al. 1996; Manton et al. 1997; Allaire et al. 1999; Freedman and Martin 1999; Ostir et al. 1999; Ahacic et al. 2000; Crimmins and Saito 2000; Waidmann and Liu 2000; Manton and Gu, 2001; Freedman et al. 2002; Ahacic et al. 2003; Crimmins 2004; Spillman 2004). In a study defining functional ability as unable to carry out independently, improving ADL scores in both genders and IADL scores among women were found from 1984 to 1995 in the USA (Crimmins and Saito 2000). In another study which defined functional ability as a lot of difficulty or unable to carry out, PADL disability figures increased especially among men (Liao et al. 2001). Few studies have showed a declining prevalence of any disability and IADL disability and remaining levels of ADL disability including some fluctuation between study years (Crimmins et al. 1997; Schoeni et al. 2001). A study conducted by Freedman and Martin (1998, 1999) found improving scores for climbing a flight of stairs, walking 400 meters, and lifting and carrying. In another study from the USA some indications of increasing disability after 1984 were found, although this result can be interpreted more as a fluctuation than a definite trend (Crimmins et al. 1997).

2.2.2. Sociodemographic differences in functional ability

Both cross-sectional and longitudinal study findings indicate higher functional disability rates among older than younger elderly people (Jette and Branch 1981; Lammi et al. 1989a,b; Jylhä et al. 1992; Guralnik et al. 1993a; Guralnik and

Simonsick 1993; Avlund et al. 1995; Beckett et al. 1996; Era and Rantanen 1997; Rönnemaa and Karppi 1997; Rahkonen and Takala 1997; McGee et al. 1998; Sakari-Rantala et al. 1999; Leveille et al. 2000; Brayne et al. 2001). The improvement of functional ability among elderly people in Finland appears to vary by age. Martelin and colleagues (2002) found a more marked improvement in functional ability among 65-69- than 70-74-year-olds from 1978-1980 to 1997. Another Finnish study showed declining disability rates until the age of 75 years from the early 1980s to the turn of the millennium (Kattainen et al. 2004b). There are also results indicating no change in the prevalence rates of disability over 20 years among those aged 75 and over in two rural Finnish municipalities (Winblad 1993; Winblad et al. 2001). Another rural study from Finland indicated increasing rates of functional disabilities among people aged 75 years or over from 1978 to 1988 (Anttila 1991).

The deterioration of activities requiring more effort and strength (e.g. carrying a heavy load, doing heavy housework) is more pronounced with age (Jylhä et al. 1992). It is also possible that some functional difficulties improve with age, but this may be more associated with minor than major problems in functioning (Rudberg et al. 1996).

Social class is related to health in the general population: the lower the social class, the poorer the health (Townsend and Davidson 1988; Lahelma and Rahkonen 1997; Grundy and Holt 2000). Most studies of health inequality have concentrated on people of working age. Not until recently have social class differences in later life been addressed in public health research. Despite the scarcity of research examining socioeconomic differences in health among the elderly population, studies using various indicators of socioeconomic status have disclosed that higher status is associated with better functional ability (Lammi et al. 1989b; Arber and Ginn 1993; Guralnik et al. 1993a,b; Parker et al. 1994; Thorslund and Lundberg 1994; Avlund et al. 1995; Mendes de Leon et al. 1997; Rahkonen and Takala 1997; McGee et al. 1998; Grundy and Holt 2000; Crimmins and Saito 2001; Melzer et al. 2001; Rautio et al. 2001; Martelin et al. 2002; Avlund et al. 2004a).

Cross-sectional studies have found associations between former occupation and functional ability. Manual workers are suggested to have more difficulties in functional ability than non-manual workers (Arber and Ginn 1993; Rahkonen and

Takala 1998; Arber and Cooper 1999; Ahacic et al. 2003). Moreover, elderly people with lower educational status appear to have inferior functional ability compared to the higher educated (Guralnik et al. 1993b; Freedman and Martin 1999; Crimmins and Saito 2001; Rautio et al. 2001; Martelin et al. 2002). Furthermore, lower socioeconomic status at mid-life and at the beginning of retirement has been found to be associated with poorer health in later life (Breeze et al. 2001).

In a recent five-year follow-up study, Avlund and colleagues (2004a) found poor material wealth among non-disabled 75-year-old men and women to be associated with greater functional decline compared to those with good material wealth. A longitudinal study from the UK suggested that respondents with lower socio-economic status had a higher number of new incidences of disability, and severity of disability increased more, in comparison to those with higher socio-economic status during the follow-up (Grundy and Glaser 2000). Similar results from the USA have been reported by Zimmer and House (2003).

The marital status of elderly people is a principal determinant of their living arrangements (Arber and Ginn 1991), and has been found to be associated with the level of health. There is some evidence that single, widowed and divorced men and women report poorer health and functional ability than their married counterparts (Duffy and MacDonald 1990; Goldman et al. 1995). In a recent study by Arber (2004) from the UK, however, only divorced men had slightly poorer functional ability than their married counterparts. In a Finnish study, divorced elderly men aged 65 years and over had a higher prevalence of functional disabilities than married men of the same age (Rahkonen and Takala 1998). In another Finnish study, married men had better functional ability than other men. Marital status differences among women were minor (Martelin et al 2002). It is suggested that marriage appears to “benefit” men more than women, although its advantage is more pronounced among the middle-aged than elderly people (Gove 1973; Hu and Goldman 1990).

Functional ability has also been shown to be associated with social factors other than normal sociodemographic determinants. In a recent study by Avlund and colleagues (2004c) based on follow-up data from Nordic Research on Ageing, lack of social relations in the form of infrequent telephone contacts and not being a member of a

retirement club were found to be related to inferior functional ability. Other studies have also stressed the important role of social ties in disability (Mendes de Leon et al. 1999; Unger et al. 1999; Avlund et al. 2004b). Whether the sociodemographic or social disparities in functional ability are consequences of different health behaviours or varying chronic disease prevalence has not gained much attention in previous research.

2.3. Health behaviours, trends and associations

One of the first definitions of health behaviour was introduced by Kasl and Cobb (1966), who defined it as "any activity undertaken by a person believing himself to be healthy, for the purpose of preventing disease or detecting it in an asymptomatic stage". Health behaviour has also been defined as medically approved preventive behaviour (Anderson 1988). Harris and Guten (1979) defined health behaviour as "any individual behaviour regardless of actual health status, which is aimed to protect, promote or maintain health, whether such behaviour is objectively effective or not". Traditionally in health research, health behaviour has included smoking, alcohol consumption, diet and physical activity. These were also used in the present study. Furthermore, body mass index (BMI) was included as an indicator of health behaviour; even though BMI is not a health behaviour as such, it is more or less dependent on it.

2.3.1. Diet

Healthy diet is an important part of health behaviour as it plays a substantial role in the aetiology of chronic diseases (Pietinen et al. 1996; Puska 2000), and is related to reduced all cause mortality, especially from cardiovascular diseases (CVD) (Huijbregts et al 1997). Nutrition among elderly people is therefore a vital issue as the prevalence of chronic diseases is much higher in later life (Steen and Rothenberg 1998). Fortunately, CVD mortality in Finland has declined considerably (Valkonen et al. 2000) in parallel with a trend towards more healthy diet (Puska 2000; Pietinen et al. 2001). In a study by Rissanen and colleagues (2003), high consumption of

vegetable, fruits and berries was associated with reduced risk of mortality in middle-aged Finnish men.

Nutrition is related to other health outcomes besides CVD. Nutritional reserve is one of the key issues in the frailty associated with falls, for example (Winogard et al. 1991; Wahlqvist and Savige 2000). Some dietary elements have shown protective influence against cancers. For instance, frequent intake of fruits and vegetables associates with reduced risk of various cancers (Steinmetz and Potter 1996). However, it is stated that the overall diet exerts a more important role in health and longevity than individual nutritional components (Trichopoulou et al. 1995).

Studies examining diet or food behaviour among the elderly have principally concentrated on nutrient intakes (e.g. energy), malnutrition, and on associations between food intake and diseases. Other studies have examined cross-cultural variation in food patterns (e.g. Schroll et al. 1996). Food consumption patterns among elderly people and their trends over time have not been studied in much depth. In a recent cohort study of 70-year-old Swedes, use of low-fat spreads and milk, as well as fruits and vegetables, increased from 1971 to 2000 (Eiben et al. 2004). A few studies in the USA have also shown improving dietary habits among elderly people from 1977 to 1987 (Popkin et al. 1992) and from 1990 to 2000 (Mokdad et al. 2004).

Diet among Finnish people traditionally included high levels of dairy fat and low intakes of vegetables and fruits. The high prevalence of CVDs in Finland back in 1960s was the impetus for strategies to prevent CVDs through modifying health behaviour, including changes in nutritional habits. The North Karelia Project was launched in the early 1970s as the first response to this challenge (Puska et al. 1995). The most important dietary changes stressed then and since have been decreased consumption of dairy fat and increased consumption of vegetables and fruits (Puska et al. 1995; Puska 2000; Pietinen et al. 2001). Positive changes in these habits have duly been observed among the Finnish working age population (Berg 2000).

2.3.2. Smoking

Smoking increases health care costs, being a health risk throughout the life course. Its associations to various diseases, including cancers and CVDs, are well-established (Peto et al. 1994; Luoto et al. 1998b; Jacobs et al. 1999). It is also associated with both functional and mental impairments (Stuck et al. 1999; Arday et al. 2003; Zhou et al. 2003). In Finland, smoking prevalence in later life is lower than in younger age groups, most probably because of cohort differences (Martelin 1984; Helakorpi et al. 2004) and a higher prevalence of mortality among smokers before retirement age. Nevertheless, smoking forms an important issue among elderly people as the prevalences of chronic diseases associated with smoking are much higher among older people.

Most studies examining smoking among the elderly have concentrated on its associations with chronic diseases. Trends in smoking prevalence and sociodemographic differentials in smoking among elderly people have attracted less attention. However, smoking among elderly US citizens appears to have declined from the mid-1960s to the mid-1990s (Husten et al. 1997) and from 1990 to 2000 (Mokdad et al. 2004). A few Finnish studies based on certain geographically defined areas have shown decreasing smoking prevalence among elderly men (Nissinen et al. 1993; Pohjolainen et al. 1997), but not women (Pohjolainen et al. 1997).

2.3.3. Alcohol consumption

Compared to diet and smoking, alcohol consumption has more complicated associations with health. The adverse effects of alcohol consumption are well established. Heavy drinking associates with functional impairments, falls, cardiovascular diseases, certain cancers, liver cirrhosis, accidents and mortality. Yet the consumption of small to moderate amounts of alcohol appears to be beneficial for vascular events and to reduce mortality from cardiovascular diseases (Boffetta and Garfinkel 1990; Rimm et al. 1991; Doll 1997; Simons et al. 2000a; Klatsky 2003).

U-shaped curves for alcohol consumption and mortality have been found both for middle-aged and elderly people (Groenbaek et al. 1998). As far as we know, a U-shaped association between alcohol consumption and functional disability has not been reported. Nevertheless, while heavy compared to moderate drinking has been shown to be associated with an increased risk of functional status decline (LaCroix et al. 1993), those consuming small to moderate amounts of alcohol were found to be more likely to maintain mobility than non-drinkers (LaCroix et al. 1993; Nelson et al. 1994). Moreover, moderate drinking appears to be protective against falls (O'Loughlin et al. 1993). It is also suggested that history of alcohol use among elderly women may predict impairments in ADLs (Ensrud et al. 1994).

Even though alcohol consumption and its health-related effects have been studied among the elderly, there is a shortage of information on trends in alcohol consumption and how drinking varies across sociodemographic groups. However, there is some evidence from certain areas of Finland indicating increasing alcohol consumption over recent years in the elderly of both sexes (Pohjolainen et al. 1997).

2.3.4. Obesity

Obesity is a known risk factor for both morbidity and mortality (Pi-Sunyer 1991; Inelmen et al. 2003). In population studies, obesity has been traditionally measured with the body mass index (BMI), which is a simple and useful anthropometric index. BMI is defined as weight (kg) divided by the square of height (m^2). The most commonly used limit for obesity is BMI $\geq$ 30 kg/m^2, as recommended by the WHO (World Health Organization, 2000). BMI correlates positively with body fatness (Revicki and Israel 1986).

Despite evidence that overweight (BMI = 25-29.9) elderly may not have higher mortality than those with normal weight (BMI = 18.5-24.9) (Inelmen et al. 2003), obesity has been found to be a health hazard among elderly people (Stuck et al. 1999; Burke et al. 2001; Inelmen et al. 2003). For instance CVDs, diabetes and physical disability are associated with obesity (Pi-Sunyer 1991; Launer et al. 1994; Stuck et al.

1999). Information on obesity trends among the elderly is thus important for public health.

Obesity is a growing health burden, especially in industrialised countries, and studies have shown it to be increasing among the elderly. Dey and colleagues (2001b) reported increasing BMI among 70-year-olds over a period of 21 years in Gothenberg, Sweden. Another geographically restricted study from Sweden showed an upward trend in obesity between 1986 and 1994 among older age groups (Lindstrom et al. 2003). A recent national study reported an increasing prevalence of obesity in the Swedish population (including elderly people) from the late 1990s to the early 2000s (Sundquist et al. 2004). A study from the USA (Arnett et al. 2002) found an increase of BMI from the beginning of the 1980s to the late 1990s among adults, including those 65-74 years of age. An increasing trend of overweight and obesity between 1987 and 1997 (BMI $\geq$ 25 kg/m^2) was also found in the general population of Spain, including those aged 65 and over (Rodriguez-Artalejo et al. 2002).

2.3.5. Sociodemographic differences in health behaviours

It is clear that healthy diet, smoking and alcohol consumption among elderly people are age-dependent for both men and women. All of these health behaviours become less prevalent with age (Adams et al. 1990; Cooper et al. 1999; Moore et al. 1999; Arday et al. 2002). BMI among the elderly has also been shown to decline with advancing age (Kaplan et al. 2003).

Even though most studies examining sociodemographic disparities in health behaviours have concentrated on working age people, there is some evidence indicating higher intake of healthier foods and alcohol among the elderly with higher socioeconomic status (Rothenberg et al. 1994; Cooper et al. 1999; Moore et al. 1999; Ganry et al. 2001). In a nationwide cross-sectional study among 18-80-year-old Danish people, higher consumption of vegetables and fruits and lower percentage of energy from fat was observed among the higher educated (Groth et al. 2001). Social class-related differences in milk and butter consumption among working aged Finns diminished from the early 1980s to the 1990s (Prättälä et al. 1992). Although smoking

among the working population is more prevalent in disadvantaged social groups, its relation to socioeconomic background among elderly people is less consistent (Cooper et al. 1999; Cavelaars et al. 2000; Osler et al. 2001).

How obesity varies by sociodemographic background has not been widely examined in previous studies among elderly people (Kaplan et al. 2003). There is some evidence that elderly people with lower education are more likely to be obese than those with higher education (Himes 2000; Kaplan et al. 2003; Sundquist et al. 2004).

Smoking has been found to be more prevalent among widow(er)s and divorcees than married persons, while divorced men and married women use more alcohol than their counterparts (Cooper et al. 1999). In the same study, married men had healthier diets than widowed men, whereas single women followed a healthier diet than married women (Cooper et al. 1999). Non-married elderly women have been found slightly more prone to obesity than married women (Kaplan et al. 2003). There is also a suggestion that marital status is not related to body size (Himes 2000).

2.4. Associations of functional ability with health behaviours

Various health behaviours have been shown to predict functional disability. Smoking has a clear association with functional impairments; this holds true for both current and ex-smoking (Stuck et al. 1999; Ostbye et al. 2002). Studies which have differentiated current and ex-smoking have found the former to be a stronger predictor of functional impairments (Stuck et al. 1999; Arday et al. 2003). Furthermore, smoking in midlife and late adulthood seems to predict subsequent disability (Vita et al. 1998).

Those drinking small to moderate amounts of alcohol appear to have better functional ability than non-drinkers (Lammi et al. 1989a; LaCroix et al. 1993; Nelson et al. 1994). Furthermore, heavy drinkers have poorer functional ability than moderate drinkers (LaCroix et al. 1993). Even though U-shaped associations of alcohol consumption with mortality have been found (Thun et al. 1997; Gronbaek et al. 1998), the possible U-shaped association between alcohol consumption and functional

disability among elderly people is practically unexplored. However, Ostbye and colleagues (2002) recently found a J-shaped relationship between alcohol consumption and ill health (including functional disability). Exploring the health consequences of alcohol use is complicated by the variety of definitions of alcohol consumption and health outcomes used in different studies (Moore et al. 2003).

Associations between diet and functional ability have been somewhat neglected in research, although nutrition has been shown to influence cognitive impairment (Solfrizzi et al. 2003), which is a predictor of functional decline (Aguero-Torres et al. 2002; Black & Rush 2002; Mehta et al. 2002; Wang et al. 2002). Despite suggestions that dietary intake may not be linked to activities of daily living (Sonn et al. 1998; Haveman-Nies et al. 2003), the reverse indication has also been found (Rothenberg et al. 1994)

Physical activity, including walking, is positively associated with functional ability (Mor et al. 1989; Lawrence and Jette 1996; Stuck et al. 1999; Seeman and Chen 2002; Branch et al. 2003; Haveman-Nies et al. 2003; Schroll 2003). This holds true for people with or without chronic diseases, at least among men (Young et al. 1995). Increasing walking frequency has been found to associate with better functional outcomes (Clark 1996). Both moderate and strenuous physical activity are more favourable to functional ability than low physical activity (Seeman et al. 1995). Regular physical activity may be the most important single behaviour associated with maintaining mobility compared to such health behaviours as smoking, alcohol consumption and BMI (LaCroix et al. 1993).

High body mass index (BMI) among the elderly is associated with poorer functional ability (Ferraro & Booth 1999; Stuck et al. 1999; Kaplan et al., 2003; Wannamethee et al. 2004), but there are indications that this holds true only for obesity and not overweight (Heiat 2003). However, in one study involving middle aged and elderly women, overweight was associated with inferior functional ability, even when controlling for chronic diseases, (Launer et al. 1994).

2.5. Implications from previous research for the present study

Previous studies, both cross-sectional and longitudinal, from different countries have established positive changes in functional ability over time. However, nationally representative studies examining differences in functional ability between sub-groups have not been conducted in such detail. Furthermore, investigations examining factors that may explain sub-group disparities in functional ability are very scarce. The present study contributes to these issues. Even though associations between health behaviours and health status have been extensively explored, there is an absence of nationally representative studies from Finland on health behaviour changes and their sociodemographic patterning among the elderly, and only a few studies from other countries. The improvement in functional ability in Finland has drawn attention to the factors related to it, but detailed focus on associations between functional ability and health behaviours has been largely neglected until now.

3. AIMS OF THE STUDY

This study set out to examine trends and associations of functional ability and health behaviours and their sociodemographic patterning from 1985 to 2003 among elderly men and women in Finland aged 65-79 years.

The specific objectives of the study were as follows:

1. To study time period differences and the sociodemographic patterning of functional ability among the Finnish elderly from 1985 to 1999 (I).

2. To examine time trends in healthy diet, smoking and alcohol consumption and their sociodemographic patterning among the Finnish elderly population over the period 1985-2001 (II, III).

3. To present the 18-year trends (1985-2003) and sociodemographic patterning of obesity among Finnish elderly people (IV).

4. To examine the relationship between functional ability and health behaviours among Finnish elderly people (V)

5. To study whether health behaviours and chronic diseases are mediators of sociodemographic differences in functional ability (V).

4. SUBJECTS AND METHODS

4.1. Subjects and procedures

The study was based on the consecutive biennial nationwide surveys on health behaviour among elderly people conducted by the Department of Epidemiology and Health Promotion of the National Public Health Institute since 1985 (except 1991, when data were not collected) (Kivelä et al. 1986; Sulander et al. 2004). The primary purpose of this monitoring system is to obtain information about the state of health, functional ability, health behaviours and coping with everyday life demands among residents of Finland aged 65-84 years.

The postal surveys have involved stratified random samples of 300 men and women in the five-year age groups. Until 1989 the age range was 65-79 years, thereafter 65-84. Thus the first three rounds of data gathering involved a total sample of 1800, and the later ones of 2400 persons. Non-respondents have been reminded twice and response rates have surpassed 80% on average (Table 1). The total number of 65 to 79-year-old respondents during 1985-2003 was 13 232: 6564 men and 6668 women.

Table 1. Response rates in health behaviour studies among the Finnish elderly population by study year, gender and 5-year age groups.

	Men					**Women**						
	Age group					**Age group**						
				(%)	**(n)**				**(%)**	**(n)**	**(%)**	**(N)**
Year	65-69	70-74	75-79	**Total**	**Total**	65-69	70-74	75-79	**Total**	**Total**	**TOTAL**	**TOTAL**
1985	78	70	72	**73**	**(648)**	73	79	77	**76**	**(683)**	**75**	**(1331)**
1987	90	88	86	**88**	**(786)**	91	90	82	**87**	**(783)**	**88**	**(1569)**
1989	84	91	85	**87**	**(779)**	88	89	84	**87**	**(785)**	**87**	**(1564)**
1993	83	91	89	**87**	**(784)**	85	87	82	**84**	**(760)**	**86**	**(1544)**
1995	81	82	84	**82**	**(740)**	87	79	78	**81**	**(733)**	**82**	**(1473)**
1997	80	83	81	**81**	**(733)**	82	82	78	**81**	**(725)**	**81**	**(1458)**
1999	72	74	72	**72**	**(654)**	81	83	75	**80**	**(716)**	**76**	**(1370)**
2001	88	81	80	**83**	**(746)**	86	80	80	**82**	**(738)**	**83**	**(1484)**
2003	76	78	78	**77**	**(694)**	87	80	81	**83**	**(745)**	**80**	**(1439)**
Total (N)	**(2195)**	**(2201)**	**(2168)**		**(6564)**	**(2278)**	**(2249)**	**(2141)**		**(6668)**		**(13232)**

The contents and timing of the field phase of each survey in the set were kept largely the same to maintain comparability. The measures used are based on the ongoing

FINRISK study (Laatikainen et al. 2003) and the Health Behaviour and Health Among the Finnish Adult Population study (Helakorpi et al. 2003), both being conducted at the National Public Health Institute. The initial questionnaire for the working age population was modified in 1985 to be more suitable to the needs of elderly people. For instance, measures of smoking, food habits and alcohol consumption were simplified, but in a way that allows comparisons between working age and elderly people to remain possible. Measures of physical exercise were altered, since the vigorousness of physical exercise diminishes in later years. Furthermore, questions measuring functional ability were included and questions on sociodemographic background adapted to be more appropriate for elderly people.

4.2. Study variables

4.2.1. Functional ability

All the measures in this study were based on responses to identical questions in each year of data collection from 1985 to 2003. All the questions used in this study appear in Appendix 1. Functional ability in study I was examined using six different items of activities of daily living (ADL). Physical activities of daily living (PADL) comprised five items: using stairs, walking outside, bathing, dressing and eating. The instrumental activity of daily living (IADL) was doing light housework. Ability to perform these daily activities was assessed with the following alternatives: ”I cannot do this even with assistance”, ”yes, if someone assists me”, ”yes, I can perform it alone but it is difficult”, “yes, alone without difficulty”. The first three responses were combined to indicate difficulties in functional ability.

In study V the same procedure, excluding the IADL measure, was the basis for the six-point scale ranging from zero to five limitations. This scale proved to be reasonably hierarchical: for example 95% of those with one limitation and 99% with two limitations had difficulty in using stairs or walking outside. The hierarchy of the items was exploited when imputing data in cases where information on one item was missing but it was possible to deduce it based on the values of the other four items with reasonable certainty, i.e. where the missing value could be replaced

unambiguously with either 0 or 1 to obtain a logical set of the five responses. The respondent was excluded from the analyses if this rule did not apply or if more than one item was missing. Nine percent of the respondents were thereby excluded because of insufficient data on the ADL.

4.2.2. Health behaviours

The determinants of diet were type of fat on bread, type of milk, and vegetable and fruit consumption. A three-item diet index was constructed to represent healthy diet. Items in the index were: 1) avoidance of butter / butter-oil mixture on bread 2) avoidance of high-fat milk 3) daily use of vegetables and/or fruits. The diet index was dichotomised. In study II those people reporting all three behaviours were considered to follow a healthy diet. In study V those who had none or only one of these behaviours were classified as having unhealthy diet.

When examining smoking in studies III and V, current smokers were defined as those who reported smoking regularly for at least one year and most recently today or yesterday. Occasional smoking was very unusual among Finnish elderly; they were excluded from the daily smokers in study III. The smoking variable was dichotomised as: 0 = non-, ex- or occasional smoker, 1 = current daily smoker. In study V smoking status was studied using three categories: current smoker (including occasional use), ex-smoker (those who had quit at least one month ago), and never smoker. Almost all those who had quit smoking had done so at least one year ago. On average, less than 1% of elderly people have quit smoking in the past 1-6 months (Sulander et al. 2004).

Alcohol consumption was based on respondents' reports of how much they have drunk of beer, cider/light wine (alcohol content approx. 5%), wine and distilled spirits in the past week. The sum of these alcoholic beverages was counted as units consumed per week. In study III, cutpoints indicating higher use of alcohol were set as follows: at least eight units per week for men and at least five units per week for women. Even though these limits are relatively low they agree fairly well with recommendations by the National Institute on Alcohol Abuse and Alcoholism (1995). Accordingly, a low risk of drinking for elderly people is set as one to seven drinks per

week. Furthermore, limits used in sub-study III are the same as in an earlier study among the Finnish working age population (Luoto et al. 1998a). In study V alcohol consumption was arranged in four categories to test the possible U-shaped relation between functional disability and alcohol consumption. As there is evidence of the beneficiary effect of low alcohol consumption on health among otherwise healthy older adults (Oslin 2000), two higher drinking categories in addition to non-drinking and low drinking (less than eight units) were composed. The two excessive drinking thresholds were the same as used in a previous study by Moore and colleagues (2003). The lower excessive drinking limit was eight to 14 units per week for both genders. This threshold is recommended by National Institute on Alcohol Abuse and Alcoholism (1995) and the American Geriatrics Society (1997). The higher excessive limit was more than 14 units per week.

BMI in studies IV and V was calculated as weight (kg) divided by the square of height (m^2). In study V BMI was classified into the following strata: normal weight (BMI < 25 kg/m^2), overweight (BMI 25 to < 30 kg/m^2), and obesity (BMI ≥ 30 kg/m^2). In study IV BMI was dichotomised as obese elderly people (BMI ≥ 30 kg/m^2) and others (BMI < 30 kg/m^2).

4.2.3. Sociodemographic factors

The demographic variables used in this study were gender, age, main occupation before retirement and marital status. Participants were divided into three five-year age groups (65-69, 70-74, 75-79). Former occupation was asked in the questionnaire as: "What kind of work have you done most of your life?" Occupational categories were office employee (including desk and service jobs), industrial employee (including construction and mining), farmer (including forestry), housewife, and other employee. Those who answered other employee (in study I, n=412; in studies II, III and V, n=449; in study IV, n=473) were omitted from the study because their occupations turned out to be very heterogenous (e.g. actor, artist, bus-driver, laboratory worker, musician, railway worker). Education was not used as a sociodemographic variable, as information on education was not collected before 1993. However, the occupational categories used in this study associate well with education. For instance,

in 1993 there were approximately ten times more higher educated people among ex-office employees compared to ex-farmers (Sulander et al. 2004). Four categories of marital status were used in studies I, IV and V: married, single, separated/divorced and widowed. In studies II and III marital status was dichotomised as married and non-married (single, separated/divorced and widowed) to give more power for statistical analyses. The distributions of respondents by background variables are shown in Tables 2 and 3.

Table 2. Number of male respondents by sociodemographic variables (n and %).

	1985-1989		1993-1995		1997-1999		2001-2003		
MEN	n	(%)	n	(%)	n	(%)	n	(%)	**Total N**
Age group									
65-69	755	(34)	489	(32)	458	(33)	493	(34)	**2195**
70-74	738	(33)	517	(34)	470	(34)	475	(33)	**2200**
75-79	720	(33)	518	(34)	458	(33)	472	(33)	**2168**
Total	**2213**	**(100)**	**1524**	**(100)**	**1386**	**(100)**	**1440**	**(100)**	**6563**
Former occupation									
Office employee	566	(28)	386	(27)	429	(34)	480	(36)	**1861**
Industrial employee	697	(34)	574	(40)	512	(40)	529	(40)	**2312**
Farmer	779	(38)	478	(33)	339	(26)	328	(25)	**1924**
Total	**2042**	**(100)**	**1438**	**(100)**	**1280**	**(100)**	**1337**	**(100)**	**6097**[a]
Marital status									
Married	1723	(79)	1194	(79)	1071	(78)	1081	(75)	**5069**
Non-married	467	(21)	314	(21)	309	(22)	351	(25)	**1441**
Total	**2190**	**(100)**	**1508**	**(100)**	**1380**	**(100)**	**1432**	**(100)**	**6510**[b]

[a] Totals exclude other employee category, n = 277 and those not reporting their former occupation, n = 189.
[b] Totals exclude those not reporting their marital status n = 53.

Table 3. Number of female respondents by sociodemographic variables (n and %).

	1985-1989		1993-1995		1997-1999		2001-2003		
WOMEN	n	(%)	n	(%)	n	(%)	n	(%)	**Total N**
Age group									
65-69	754	(34)	517	(35)	487	(34)	520	(35)	**2278**
70-74	773	(34)	498	(33)	497	(34)	481	(32)	**2249**
75-79	724	(32)	478	(32)	457	(32)	482	(33)	**2141**
Total	**2251**	**(100)**	**1493**	**(100)**	**1441**	**(100)**	**1483**	**(100)**	**6668**
Former occupation									
Office employee	629	(30)	477	(34)	632	(47)	774	(55)	**2512**
Industrial employee	241	(11)	223	(16)	201	(15)	169	(12)	**834**
Farmer	817	(39)	450	(32)	336	(25)	304	(22)	**1907**
Housewife	431	(20)	262	(19)	170	(13)	152	(11)	**1015**
Total	**2118**	**(100)**	**1412**	**(100)**	**1339**	**(100)**	**1399**	**(100)**	**6268**[a]
Marital status									
Married	841	(38)	636	(43)	639	(45)	716	(48)	**2832**
Non-married	1395	(62)	843	(57)	794	(55)	761	(52)	**3793**
Total	**2236**	**(100)**	**1479**	**(100)**	**1433**	**(100)**	**1477**	**(100)**	**6625**[b]

[a] Totals exclude other employee category, n = 196 and those not reporting their former occupation, n = 204.
[b] Totals exclude those not reporting their marital status, n = 43.

4.2.4. Other independent variables

In studies IV and V three chronic disease variables were formed for control purposes. Based on the question: “In the past year, have you been diagnosed with or treated for the following illnesses by a doctor”, three variables were constructed to indicate whether the subject had CVD (high blood pressure/hypertension, myocardial infarction, angina pectoris/coronary disease, heart failure, diabetes), musculoskeletal disease (MSD) (rheumatoid arthritis, other arthritic illness, degenerative disk disease/other back illness), or chronic bronchitis/emphysema. Disease variables were dichotomised as: 0 = no disease present, 1 = one or more diseases present.

4.3. Statistical methods

All analyses were conducted separately for men and women. The biennial surveys were pooled as follows: 1985-1989 and 1993-1999 (I), 1985-1989, 1993-1995, 1997-2001 (II and III), and 1985-1989, 1993-1995, 1997-1999, 2001-2003 (IV). In study V, data from 1985-2001 were pooled into a single database after testing that no statistically significant changes in associations of functional ability with health behaviours had occurred over that time span. To make the time periods comparable, age-adjustment based on the general population of Finland was performed in every sub-study. Age-adjusted trends were computed in studies II, III and IV. Logistic regression models were computed in studies I, II, III and IV to evaluate differences in functional ability, healthy diet, smoking, alcohol use and obesity between categories of age, occupation, marital status and time periods. Crude and adjusted odds ratios (OR) with their 95 % confidence intervals (CI) were calculated. In studies II, III and IV independent variables were adjusted for one-by-one into the model in the following order: age, occupation, marital status and time period. In study IV chronic diseases were adjusted for as well. In studies II, III and IV, interactions of the study period with age, previous occupation and marital status were included separately in the adjusted main effect model to assess changes over time by categories of each variable.

In study V the simultaneous contribution of several factors to functional ability was examined by means of an ordinal regression analysis method (SPSS Inc. 1999) using the SPSS statistical program (version 11.0). The results were presented as cumulative odds ratios (COR) with 95% confidence intervals (CI). Cumulative models examine the relations between the categories of an ordinal dependent variable. Thus COR expresses the incidence of upper values of the dependent variable compared to the lower values in various categories of independent variables.

For ordinal regression analyses four age-adjusted models were constructed. In model 1, each independent variable was studied individually in comparison to functional ability. In model 2, all health behaviours were examined simultaneously, while model 3 included all background variables and health behaviours. In addition, CVDs (inc. diabetes), MSDs and chronic bronchitis/emphysema were adjusted for in model 4.

5. RESULTS

5.1. Changes and associations of functional ability

According to the findings of study I, functional ability improved in both genders from the 1980s to the 1990s in all indicators of ADL (Figure 1, study I; Table III). In study V, when the six-point sum-index was composed of physical activities of daily living items, this same improvement was seen and it continued to the turn of the millennium when controlled only for age (Table 2). Irrespective of different adjustments, functional ability among men improved over time. Among women, adjusting for health behaviours and then chronic diseases weakened this improving trend (Table 2). According to single ADL items the most prominent improvements in both genders were seen in walking outside, doing light housework, washing oneself, and dressing and undressing (study I; Table III).

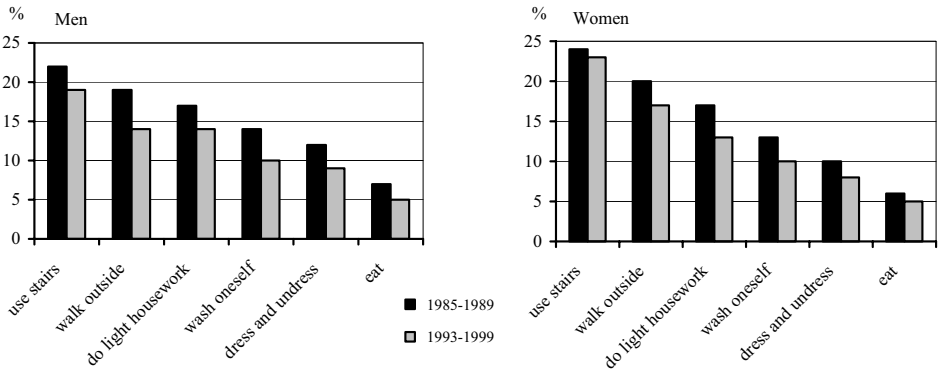


Figure 1. Difficulties in activities of daily living among elderly men and women aged 65-79 years by study period (%). Age-adjusted (I).

Table 4. Changes in functional ability[a]. Cumulative odds ratios and their 95 % confidence intervals. Reference group is 1997-2001 (V).

Time period	Model 1[b]	Model 2[c]	Model 3[d]
MEN			
1985-1989	1.51 (1.30-1.76)***	1.45 (1.19-1.61)***	1.43 (1.17-1.75)***
1993-1995	1.32 (1.11-1.56)**	1.32 (1.07-1.62)**	1.29 (1.05-1.59)*
1997-2001	1.00	1.00	1.00
WOMEN			
1985-1989	1.26 (1.09-1.45)**	1.17 (0.97-1.41)	1.13 (0.93-1.37)
1993-1995	1.09 (0.93-1.28)	0.94 (0.77-1.16)	0.91 (0.74-1.13)
1997-2001	1.00	1.00	1.00

[a]Six-point sum scale.
[b]Age-adjusted.
[c]Adjusted for age, smoking, alcohol use, diet, physical activity, BMI, occupation and marital status.
[d]In addition to the variables in model 2, CVDs, MSDs and chronic bronchitis/emphysema were adjusted for.
***p<.001; **p<.01; *p<.05

5.1.1. Age

According to single ADLs, functional ability among 65-69-year-olds improved from the mid-1980s to the 1990s, especially among men (I) (Table 5). There was also a slight improvement among 70- to 74-year-olds, but the functional ability of 75 to 79-year-olds remained approximately the same between the study periods, or at least it did not reach statistical significance. However, the prevalence based on the sum-index of ADLs indicates improving functional ability in all age groups (Figure 2), both men and women, from 1985-1989 to 2001-2003.

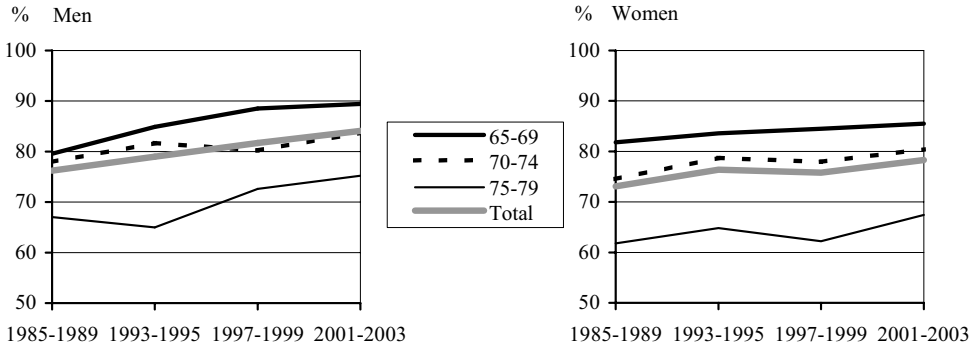


Figure 2. Trends in good functional ability (zero ADL limitations in sum-index) by age groups and in age-adjusted total from 1985-1989 to 2001-2003 (%).

Table 5. Difficulties in functional ability among men and women in five-year age groups by study period (%) (I).

	Difficulties in ability to											
	use stairs		walk outside		do light housework		wash oneself		dress and undress		eat	
Age	1985-1989	1993-1999	1985-1989	1993-1999	1985-1989	1993-1999	1985-1989	1993-1999	1985-1989	1993-1999	1985-1989	1993-1999
Men:												
65-69	19	13*	16	9*	14	8*	10	6*	10	6*	5	2*
70-74	20	19	18	14*	17	13*	13	8*	12	8*	7	6
75-79	30	30	28	24	26	25	22	18	18	17	12	10
Women:												
65-69	18	16	12	11	11	8*	8	5*	6	4	4	3
70-74	23	22	21	16*	15	13	12	10	10	8	7	5*
75-79	34	36	31	27	25	21*	20	17	16	13	8	8

*Statistically significant. Tested with logistic regression model.

5.1.2. Occupational group and marital status

Former office employees had the best functional ability, while ex-farmers had the greatest difficulties (study I; Table IV). Differences in functional ability between retired female farmers and office employees by all indicators widened from the 1980s to 1990s. Among males the reverse was true, except in ability to use stairs. In general, men's occupational disparities narrowed slightly from the 1980s to 1990s, whereas among women the trend was opposite, though equally mild. Divorced and widowed men and women, especially in the 1990s, had more difficulties in functional ability than single and married people, though with only mild statistical significance.

5.2. Time trends in health behaviours

Diet among Finnish elderly people became healthier over time (II) (Figures 3 and 4). This trend was quite similar for both genders; the prevalence of healthy eating among men increased from 11% in the 1980s (1985-1989) to 24% in the early 2000s (1997-2001). The corresponding figures for women were 14% and 29%.

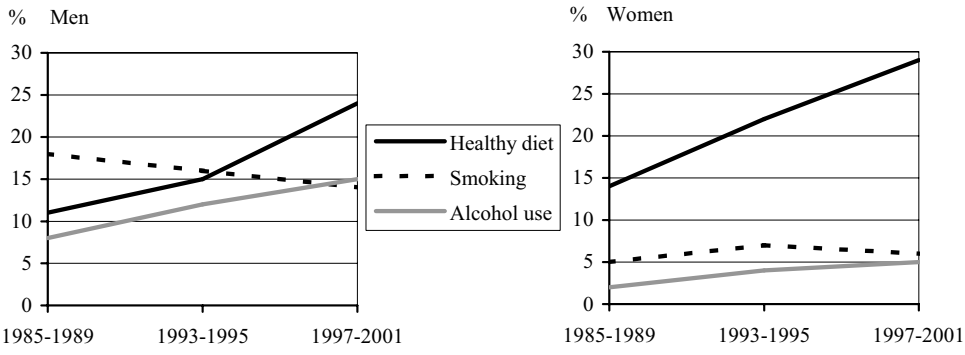


Figure 3. Age-adjusted trends in healthy diet, smoking and alcohol use (men: at least 8 units per week, women: at least 5 units per week) among 65-79-year-old men and women (%) (II and III).

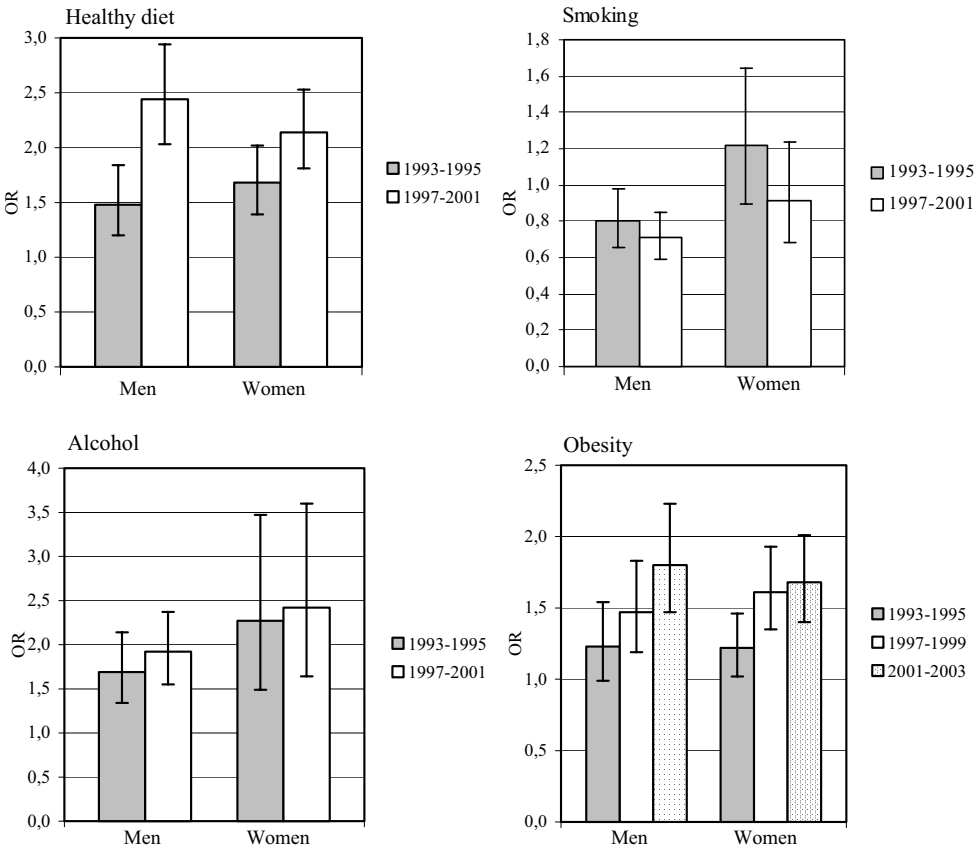


Figure 4. Healthy diet, smoking, alcohol consumption and obesity by time period. Odds ratios with 95 % confidence intervals, adjusted for age, previous occupation and marital status. In addition, obesity rates were adjusted for CVDs, MSDs and chronic bronchitis/emphysema. The reference group (OR=1.0) is 1985-1989 (II, III and IV).

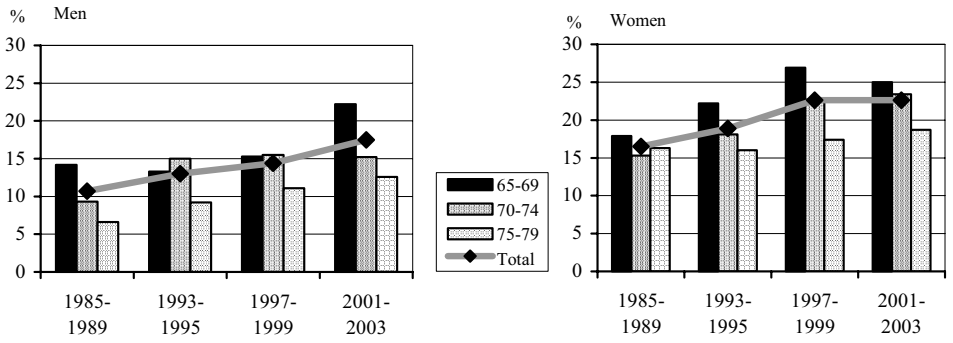


Figure 5. Obesity (BMI ≥ 30) by age groups and its age-adjusted total among men and women from the mid-1980s to the early 2000s (%) (IV).

A slight improvement in male smoking was also observed, and smoking among females remained at a low level throughout the monitoring period. There was about a twofold number of higher alcohol users in the early 2000s compared to the mid-1980s in both genders (III) (Figures 3 and 4). Even though alcohol use also increased among women, the proportion of higher users in the early 2000s was still only 5%. The number of obese elderly increased from the mid-1980s to the early 2000s (IV) (Figures 4 and 5). Women had a higher prevalence of obesity than men.

5.2.1. Age

The prevalence of healthy diet increased in all age groups in both genders from the mid-1980s to the early 2000s (II) (Table 6). Those aged 65-69 years had the highest prevalence of healthy diet (Table 6 and Figure 6). Throughout the monitoring period, smoking and higher level of alcohol use were most prevalent among aged 65-69 years of both genders (III) (Table 6 and Figure 6). The downward trend of smoking among men and upward trend of alcohol use in both genders took place in all age groups (Table 6). In the early 2000s, 21% of 65-69-year-olds, 12% of 70-74-year-olds and 9% of 75-79-year-old men were categorised as higher level alcohol users. The corresponding figures for women were 8%, 4% and 3% (Table 6).

Table 6. Trends of healthy diet, smoking and higher level of alcohol use by age groups of men and women, 1985-2001 (%) (II and III).

Age group	Healthy diet			Smoking			Higher level of alcohol use[a]		
	1985-1989	1993-1995	1997-2001	1985-1989	1993-1995	1997-2001	1985-1989	1993-1995	1997-2001
MEN									
65-69	13	15	26	19	21	16	11	16	21
70-74	11	16	22	19	13	14	6	11	12
75-79	8	14	24	14	10	10	5	7	9
Total[b]	**11**	**15**	**24**	**18**	**16**	**14**	**8**	**12**	**15**
WOMEN									
65-69	15	26	35	6	9	7	3	6	8
70-74	15	20	24	6	7	5	1	3	4
75-79	12	18	26	3	4	5	2	3	3
Total[b]	**14**	**22**	**29**	**5**	**7**	**6**	**2**	**4**	**5**

[a] At least 8 units per week for men and at least 5 units per week for women
[b] Age-adjusted

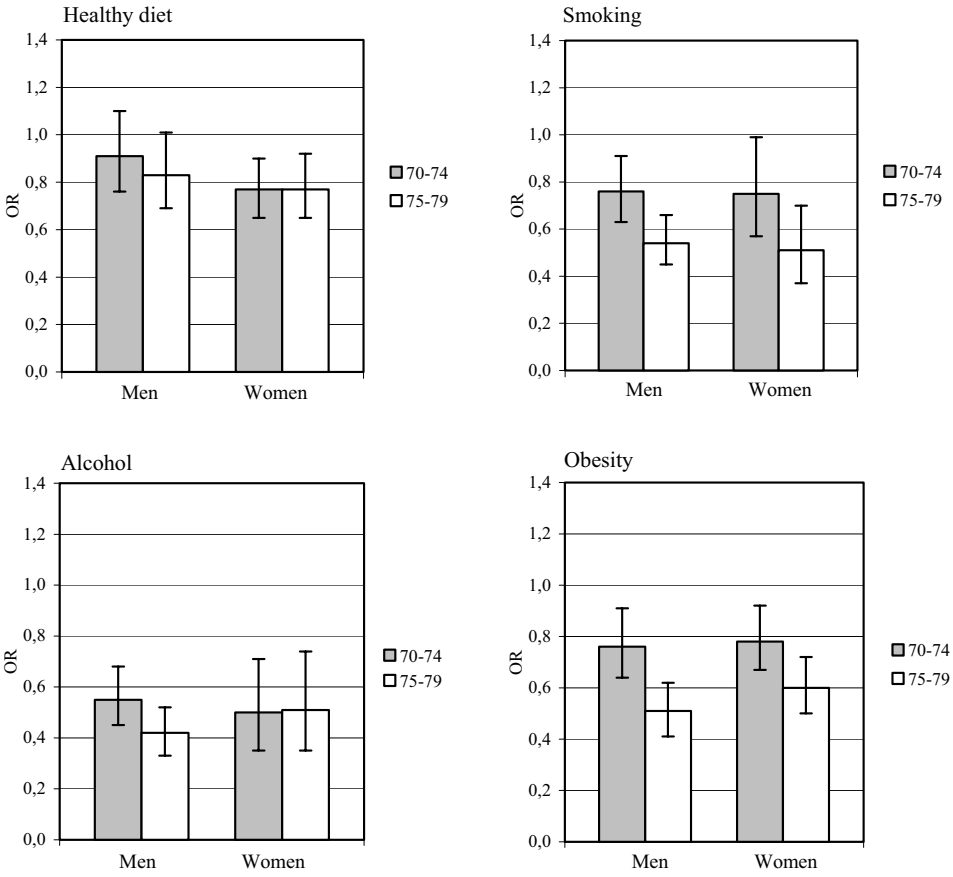


Figure 6. Healthy diet, smoking, alcohol consumption and obesity by age groups. Odds ratios with 95 % confidence intervals, adjusted by previous occupation, marital status and time period. In addition, CVDs, MSDs and chronic bronchitis/emphysema were adjusted for obesity. The reference group (OR=1.0) is 65-69-year-olds (II, III and IV).

In the 1980s, the prevalence of healthy diet among women was quite similar between age groups, but after that differences started to emerge so that in the early 2000s 65-69-year-olds followed a healthier diet than older people (II) (Table 6). The age-group difference in healthy diet remained statistically significant when controlling for occupation, marital status and time period (Figure 6), especially among women. Obesity increased in all age groups both in men and women (IV) (Figure 5). The youngest of the elderly were more often obese than older people (Figures 5 and 6).

5.2.2. Occupational group

On the basis of previous occupation, the prevalence of healthy diet increased in all occupational groups, but differences between groups persisted throughout the study period (II) (Table 7). From the mid-1980s onwards former office employees had the highest and farmers the lowest prevalence of healthy diet. In the mid-1980 there were as many ex-office employees following a healthy diet as there were ex-industrial employees in the early 2000s. Male retired office employees were smokers slightly less often than those from other occupations (III) (Table 7 and Figure 7). Female office and industrial employees were more often smokers than farmers and housewives (Table 7 and Figure 7). Higher alcohol consumption was most common among former office employees and very rare among farmers of either gender (III) (Table 7 and Figure 7).

Table 7. Age-adjusted trends for healthy diet, smoking and higher level of alcohol use by former occupation groups of men and women, 1985-2001 (%) (II and III).

	Healthy diet			Smoking			Higher level of alcohol use[a]		
Former occupation	1985-1989	1993-1995	1997-2001	1985-1989	1993-1995	1997-2001	1985-1989	1993-1995	1997-2001
MEN									
Office employee	22	28	33	16	12	12	12	21	21
Industrial employee	9	13	22	20	17	15	7	11	14
Farmer	4	6	13	18	18	15	6	8	8
WOMEN									
Office employee	21	30	34	10	11	7	3	7	6
Industrial employee	12	18	22	8	10	7	0	3	5
Farmer	7	15	19	1	1	3	0	1	2
Housewife	17	23	30	4	6	5	3	5	5

[a] At least 8 units per week for men and at least 5 units per week for women

Table 8. Age-adjusted trends of obesity (BMI $\geq$ 30) by former occupation groups of men and women, 1985-2003 (%) (IV).

	Men				Women			
	1985-1989	1993-1995	1997-1999	2001-2003	1985-1989	1993-1995	1997-1999	2001-2003
Former occupation								
Office employee	9	11	11	12	11	14	20	20
Industrial employee	12	13	15	19	19	19	20	26
Farmer	11	14	17	21	22	28	25	29
Housewife	-	-	-	-	14	17	29	20

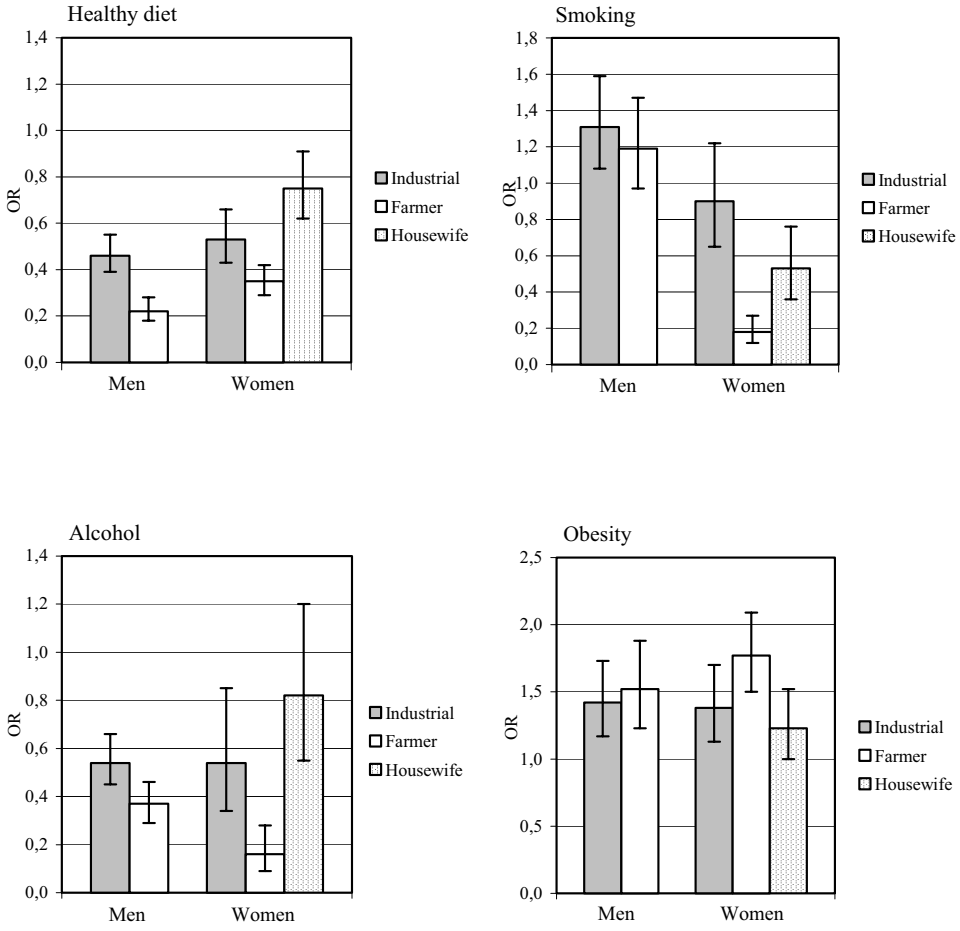


Figure 7. Healthy diet, smoking, alcohol consumption and obesity by former occupation. Odds ratios with 95 % confidence interval adjusted by age, marital status and time period. In addition, CVDs, MSDs and chronic bronchitis/emphysema were adjusted for obesity. The reference group (OR=1) is ex-office employees (II, III and IV).

Obesity became more common in all occupational groups in both genders (IV) (Table 8). This trend occurred rather evenly across different occupational groups of women. Among former male office employees the prevalence of obesity increased only slightly, whereas the proportion of obese ex-farmers doubled. Obesity was more common among former farmers and industrial employees compared to office employees (Table 8 and Figure 7).

5.2.3. Marital status

Both unhealthy diet and smoking were more common among the non-married (II and III) (Table 9 and Figure 8), even though there were positive improvements in diet for men and women and in smoking for men over time among both the married and non-married. Differences in diet by marital status were greater among women than men. In fact, the slight difference observed in 1985-1989 persisted among men and widened among women over time. In the early 2000s among men, 22% of the non-married were smokers compared to 11% of the married. Among women the corresponding figures were 8% and 4% (Table 9). Differences in daily smoking by marital status were statistically significant after adjusting for age, occupation and time period (Figure 8). Differences in alcohol consumption by marital status were minor (Figure 8).

Table 9. Age-adjusted trends in healthy diet, smoking and higher level of alcohol use by marital status of men and women, 1985-2001 (%) (II, III and IV).

	Healthy diet			Smoking			Higher level of alcohol use[a]		
Marital status	1985-1989	1993-1995	1997-2001	1985-1989	1993-1995	1997-2001	1985-1989	1993-1995	1997-2001
MEN									
Married	12	16	25	16	15	11	7	12	16
Non-married	6	11	22	27	22	22	9	13	13
WOMEN									
Married	16	22	33	4	4	4	2	5	5
Non-married	13	20	25	6	9	8	2	4	4

[a] At least 8 units per week for men and at least 5 units per week for women

Table 10. Age-adjusted trends of obesity (BMI ≥ 30) by marital status of men and women, 1985-2003 (%) (IV).

	Men				Women			
	1985-1989	1993-1995	1997-1999	2001-2003	1985-1989	1993-1995	1997-1999	2001-2003
Marital status								
Married	11	13	15	17	17	19	23	20
Single	13	13	15	20	13	15	21	17
Divorced	7	12	13	22	10	19	23	23
Widowed	13	12	8	17	19	20	24	27

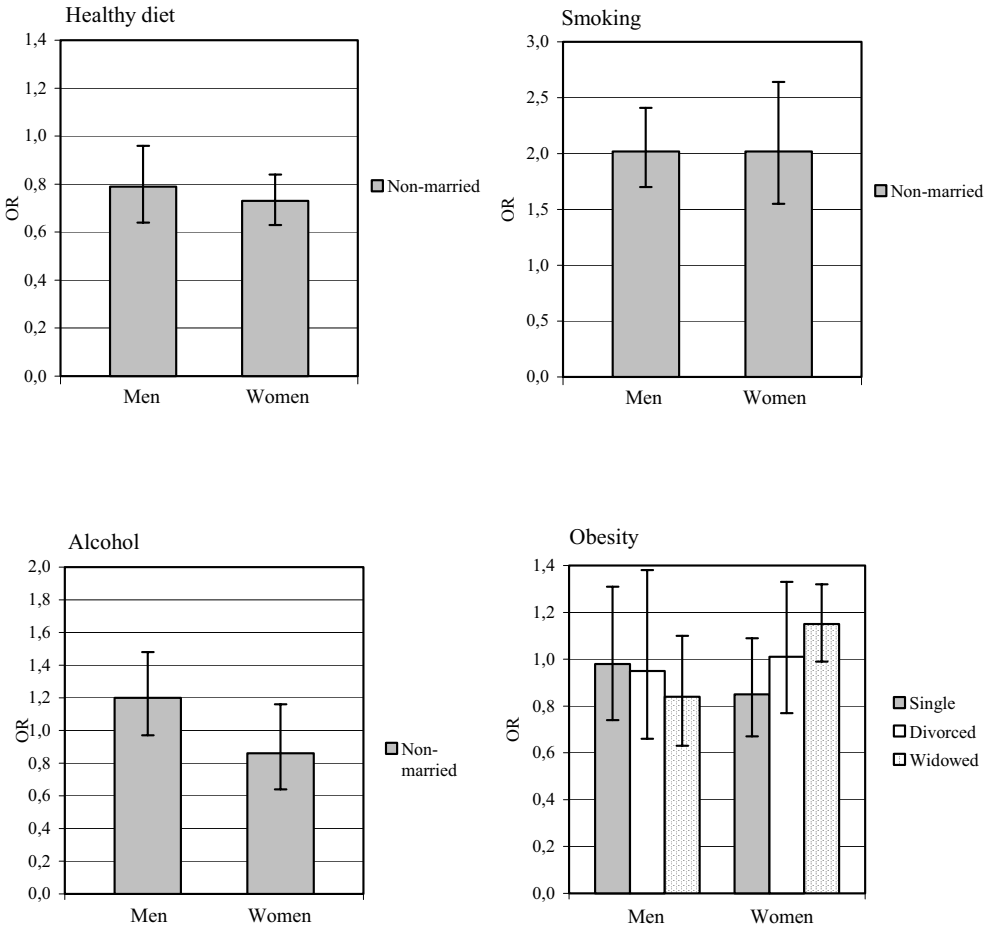
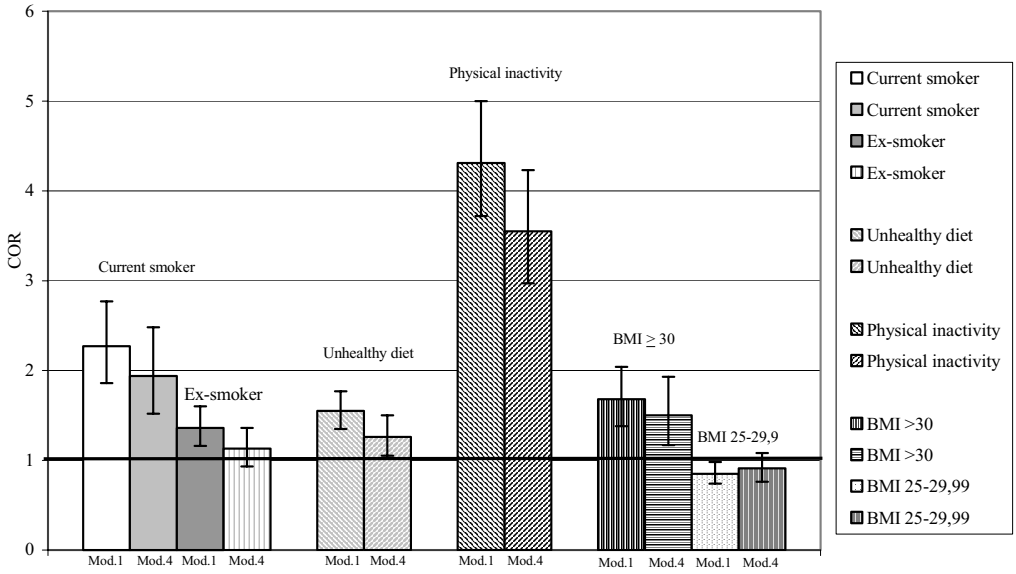


Figure 8. Healthy diet, smoking, alcohol consumption and obesity by marital status. Odds ratios with 95 % confidence interval adjusted by age, former occupation and time period. In addition, CVDs, MSDs and chronic bronchitis/emphysema were adjusted for obesity. Reference group (OR=1.0) is married (II, III and IV).

Obesity showed an upward trend in all marital status groups (IV) (Table 10). Obesity was quite evenly distributed by marital status among men, but widowed women had a slightly higher prevalence of obesity than married women (Figure 8), especially in 2001-2003 (Table 10).

5.3. Associations of functional ability with health behaviours

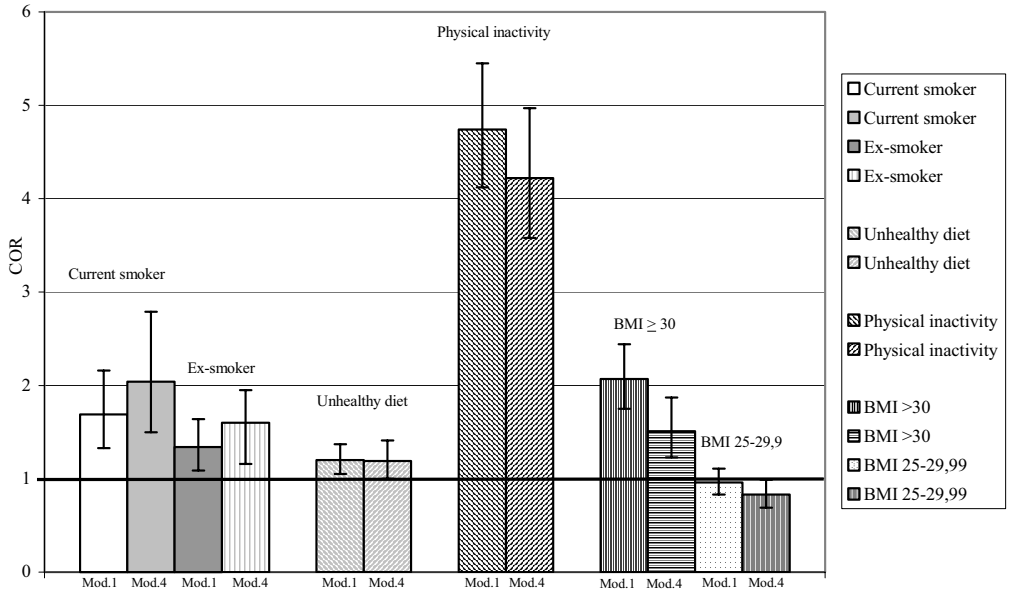
Age-adjusted cumulative odds ratios (COR) with their 95% confidence intervals (CI) of functional ability with smoking, unhealthy diet, physical inactivity and BMI are shown in Figures 9 (men) and 10 (women) (V). Reference groups for independent variables were never smokers, healthy diet, physical activity and normal weight (BMI < 25 kg/m^2). In age-adjusted figures (Model 1) never smokers had better functional ability than current and ex-smokers in both genders. Those following a healthy diet had slightly better functional ability than those with an unhealthy diet. Physically inactive elderly people had clearly worse functional ability than active ones. Obese (BMI ≥ 30 kg/m^2) elderly people of both sexes had inferior functional ability than others, but overweight (BMI 25 to < 30 kg/m^2) men had slightly better functional ability than those with normal weight.



Model 1. Age-adjusted.
Model 4. Adjusted by all background, health behaviour and chronic disease variables.

Figure 9. Association between health behaviours and difficulties in functional ability among men. Cumulative odds ratios and their 95% confidence intervals. Reference groups are indicated by COR=1 (V).

After adjusting for chronic diseases in addition to health behaviours and sociodemographic factors (model 4), current smokers showed poorer functional ability than never smokers. However, although ex-smoking in men was no longer attached to poorer functioning compared to never smokers, among women the association persisted. A slight association between poorer functional ability and unhealthy diet remained after controlling for the chronic diseases. After these adjustments physical inactivity was most strongly associated with difficulties in functional ability, even though this association was attenuated slightly among men and women. With the adjustments, the association between obesity and poorer functional ability weakened but remained. The statistically significant difference in functional ability between overweight and normal weight men observed in model 1 vanished in model 4. However, overweight women had slightly better functional ability compared to those with normal weight (model 4).



Model 1. Age-adjusted.
Model 4. Adjusted for all background, health behaviour and chronic disease variables.

Figure 10. Association between health behaviours and difficulties in functional ability among women. Cumulative odds ratios and their 95% confidence intervals. Reference groups are indicated by COR=1 (V).

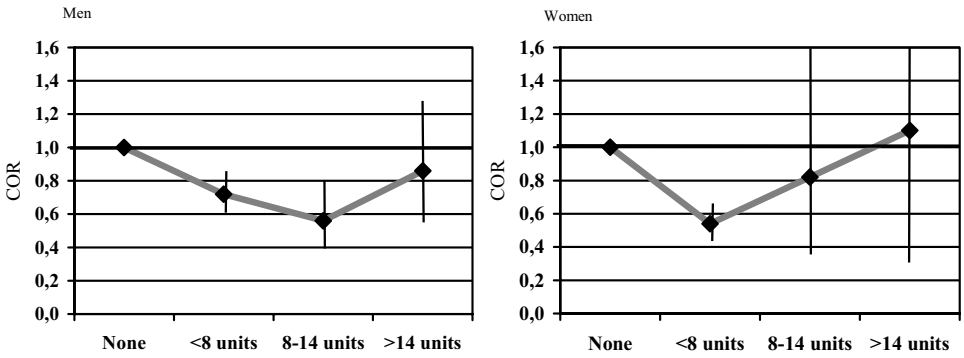


Figure 11. Cumulative odds ratios and their 95% confidence intervals for functional disability by alcohol consumption in men and women. Adjusted for smoking, diet, physical activity, BMI, chronic diseases and sociodemographic factors. Reference group (COR=1.0) is non-drinkers (V).

Alcohol consumption showed a U-shaped relation to functional disabilities in all models among men and women (V). However the only statistically significant association among women was found between non-drinkers and those using less than eight units of alcohol per week (Figure 11). Women who drank less than eight units per week had better functional ability even after adjusting for multiple factors. Among men, non- and heavy drinkers had poorer functional ability than those who drank one to eight or eight to 14 units per week (Figure 11).

Table 11. Differences in difficulties in functional ability[a] by former occupation and marital status. Cumulative odds ratios and their 95 % confidence intervals (V).

	MEN			***WOMEN***		
Former Occupation	Model 1[b]	Model 2[c]	Model 3[d]	Model 1[b]	Model 2[c]	Model 3[d]
Office	1.00	1.00	1.00	1.00	1.00	1.00
Farmer	1.66 (1.40-1.98)***	1.52 (1.23-1.89)***	1.41 (1.13-1.75)**	1.54 (1.32-1.80)***	1.30 (1.07-1.60)**	1.18 (0.96-1.45)
Industrial	1.37 (1.15-1.62)***	1.23 (1.01-1.51)*	1.13 (0.92-1.39)	1.23 (1.00-1.52)*	1.15 (0.89-1.47)	1.12 (0.86-1.44)
Housewife	-	-	-	1.34 (1.11-1.62)**	1.29 (1.02-1.63)*	1.32 (1.04-1.67)*
Marital status						
Married	1.00	1.00	1.00	1.00	1.00	1.00
Widowed	1.35 (1.10-1.64)**	1.39 (1.09-1.76)**	1.42 (1.12-1.81)**	1.26 (1.10-1.45)**	1.31 (1.10-1.56)**	1.30 (1.09-1.55)*
Divorced	1.61 (1.19-2.17)**	1.38 (0.88-2.05)	1.33 (0.89-1.99)	1.39 (1.08-1.79)*	1.41 (1.03-1.94)*	1.30 (0.94-1.80)
Single	1.32 (1.03-1.70)*	1.05 (0.77-1.44)	1.11 (0.81-1.53)	0.93 (0.74-1.17)	1.19 (0.89-1.57)	1.24 (0.93-1.66)

[a]Six-point sum scale
[b]Variables were studied individually, adjusting for age.
[c]Adjusted for smoking, alcohol use, diet, physical activity, BMI, time period, and simultaneously adjusted for occupation and marital status.
[d]In addition to the variables in model 2, CVDs, MSDs and chronic bronchitis/emphysema were adjusted for.
***p<.001; **p<.01; *p<.05

Former office employees had better functional ability than those retired from other occupations (Model 1 in Table 11). According to marital status, widow(er)s and divorced elderly had poorer functional ability than married persons (Model 1 in Table 11). Occupational disparities in functional ability largely vanished after controlling for health behaviors, time period, marital status and diseases. Only farmers among men and housewives among women had poorer functional ability than office employees (Model 3 in Table 11). Also, marital status disparities in functional ability narrowed when adjusted for health behaviours (Model 2), and largely vanished when disease variables were included in the adjustment model (Model 3 in Table 11). After this adjustment widowed men and women differed in functional ability compared to married persons.

6. DISCUSSION

6.1. Main findings

1. Functional ability among Finnish elderly aged 65-79 years improved from the mid 1980s to the early 2000s. This progress was most obvious among 65-69-year-olds, especially men. On the basis of former occupation, farmers of both sexes had the poorest functional ability. Occupational disparities slightly decreased over time among men but not women. Widowed and divorced elderly had slightly poorer functional ability than married individuals.

2. Smoking among men decreased slightly over the study period and stayed at a low level among women. Definite upward trends in both healthy diet and alcohol consumption were observed in all age, occupational and marital status groups, although inter-group disparities persisted. The youngest respondents and retired office employees had the highest prevalence of healthy diet and alcohol consumption. Former farmers of both sexes had the lowest level of healthy diet and alcohol consumption throughout the monitoring period. Furthermore, smoking among female farmers remained an extremely rare habit over time. Smoking was more prevalent among the younger members of the elderly. Non-married elderly had a lower prevalence of healthy diet and a higher smoking prevalence than married people.

3. Today's elderly Finnish people have a higher prevalence of obesity than their same-age counterparts a couple of decades ago. This upward trend has taken place in all age, occupational and marital status groups. The lowest prevalence of obesity was observed among the oldest respondents and former office employees. Widowed compared to married women had a slightly higher prevalence of obesity.

4. Functional ability associated with health behaviours. Current and ex-smoking, both heavy and non-alcohol use, unhealthy diet, physical inactivity and obesity were all associated with difficulties in ADLs, even when adjusting for chronic diseases. Alcohol consumption among men showed a statistically significant U-shaped relation to functional disability.

5. Differences in functional ability by occupation and marital status became milder after adjustment for health behaviours and chronic diseases.

6.2. Discussion of the findings

Functional ability

The improvement observed in functional ability among Finnish elderly accords with findings of earlier studies indicating declining disability figures over recent years in Finland and elsewhere (e.g. Jylhä et al. 1992; Spiers et al. 1996; Pohjolainen et al. 1997; Laukkanen et al. 1999; Ostir et al. 1999; Ahacic et al. 2000; Pitkälä et al. 2001; Freedman et al. 2002; Malmberg et al. 2002; Martelin et al. 2002; Crimmins 2004; Kattainen et al. 2004b; Spillman 2004). This positive development in functional ability may be partly explained by the improving overall health status of the overall population. Advances in technical aids and improvements in living conditions may also be partly responsible.

Difficulties in ADLs increased with age, and the clearest improvement in functional ability was seen among those aged 65-69-years, especially men. A recent Finnish study indicated similar developments (Martelin et al. 2002). In the present study functional ability among those aged 75-79-years remained more or less similar over the study period in terms of single ADLs. According to other studies from Finland disability figures among those aged 75 and over did not differ markedly from 1979 to 1989 (Winblad 1993) and from 1989 to 1999 (Winblad et al. 2001). The present findings reveal that the prevalence of people suffering from declining functional ability as they enter retirement is lower than a couple of decades ago, suggesting that deteriorating functioning has been somewhat postponed.

Based on former occupation, farmers had a higher prevalence of functional disabilities than office employees. As farmers have clearly less education than office employees our results accord with previous studies that have found those with lower education or with poor socio-economic status to have inferior functional ability (Guralnik et al. 1993a,b; Thorslund and Lundberg 1994; Mendes de Leon et al. 1995; Mendes de

Leon et al. 1997; Rahkonen and Takala 1997; Melzer et al. 2001; Martelin et al. 2002). Poorer functional ability among farmers suggests a detrimental effect of the demanding work on their physical health, which later affects their functional status. It could also be that differences in material wealth among these occupational categories may influence these results. Nevertheless, a slight reduction in functional ability disparities between occupational groups over time was observed among men.

Married persons enjoyed slightly better functional status than widow(er)s or divorced individuals. This is in accordance with earlier studies (Duffy and MacDonald 1990; Goldman et al. 1995; Rahkonen and Takala 1997; Martelin et al. 2002). As social relations and participation have been found to be predictors of maintained functional ability among the elderly (Avlund et al. 2004b), the results of the present study may reflect the better social networks among married people.

Health behaviours

A positive trend appears to have occurred in the prevalence of healthy diet over the past two decades. Moreover, daily smoking among men decreased slightly and female smoking remained at remarkably low levels. Alcohol consumption, on the other hand, showed an upward trend in both genders. A couple of studies outside Finland have also indicated positive changes in food behaviour in recent years (Popkin et al. 1992; Rothenberg et al. 1994; Eiben et al. 2004; Mokdah et al. 2004). A few regional studies from Finland have indicated similar results for male smoking (Nissinen et al. 1993; Pohjolainen et al. 1997), and for alcohol consumption in both genders (Pohjolainen et al. 1997). Healthy diet, smoking and alcohol consumption were less prevalent among the oldest of the respondents, which accords with studies from other countries (Adams et al. 1990; Cooper et al. 1999; Moore et al. 1999; Arday et al. 2002). These changes can be partly explained by a cohort effect: younger cohorts entering retirement age have slightly different health behaviours than older cohorts. However, this does not explain all of the changes, as people's health behaviour can also change during their retirement years (Sulander et al. 2004)

It can be assumed that the proportion of smokers attenuates with age, as smoking is a habit strongly related to mortality. It is suggested that the low level of smoking and alcohol consumption among older generations of women may result from low prevalence of these habits when they were young (Cooper et al. 1999). This seems to be true also in Finland. Smoking rates among Finnish men have also been very strongly aligned with the age classes included in the present study. The societal factors that have most probably influenced drinking habits among older generations of Finns are prohibition (1919-1932) and the era of strict sales controls on alcoholic drinks (1932-1968). Aside from these societal factors, it is also suggested that declining alcohol consumption with age is more of an age-related than cohort effect (Adams et al. 1990).

Despite findings that low to moderate levels of drinking are associated with some healthy outcomes, people should not be indiscriminately encouraged to drink, even abstainers (Klatsky 2003). The relationship between alcohol and health is multidimensional, and perhaps the only clear message that can be stated is that heavy drinkers should reduce their use or abstain (Klatsky 2003). For older members of society this issue becomes even more complicated. For example, there is evidence that alcohol interferes with the metabolism of many medications (Adams 1995; Fraser 1997). Because elderly people have a higher prevalence of chronic diseases and use of medication compared to the general population, general guidelines for safe drinking among the elderly are difficult to formulate.

Healthy diet and alcohol use increased in all occupational groups over the study period. These trends were most prevalent among former office employees. Farmers of both genders had the poorest diet and clearly the lowest level of alcohol use. These results correspond with other studies indicating healthier diet and higher consumption of alcohol among elderly people to be associated with higher socioeconomic status (Rothenberg et al. 1994; Poikolainen 1995; Pohjolainen et al. 1997; Moore et al. 1999; Ganry et al. 2001). One explanation for poorer diet among farmers might be that they still use milk products from the farm that have higher fat content than dairy products in general. Even though diet has improved in all occupational groups, disparities between occupations have tended to persist. This does not accord with findings concerning working aged Finns (Prättälä et al. 1992).

Smoking among the working age population is more common among those with low compared to high socioeconomic status (e.g. Lahelma et al. 1997b). Among elderly people, socioeconomic disparities in unhealthy habits have not been studied extensively. According to our findings, variations in smoking between occupational groups of men were not great, which somewhat supports the notion that socioeconomic disparities in smoking are minor in those aged 65 and over (Wister 1996). However, this is a multiform issue as some other studies have produced inconsistent results concerning socioeconomic differences in smoking among the elderly (Cooper et al. 1999; Cavelaars et al. 2000; Osler et al. 2001). Among elderly women, retired farmers were clearly the least likely to smoke. As farmers have less education than office employees, this result is somewhat contrary to those found in the working age population. It is likely that socioeconomic disparities in smoking even out when people retire, as some smokers do not reach retirement age. In fact there is some evidence from Finland that among smoking men aged 30-64, blue collar workers or farmers have higher mortality rates than white collar workers (Pekkanen et al. 1995).

Male farmers had a less healthy diet and were smokers almost as often as those in other former occupations. This indicates an accumulation of CVD risk factors among former farmers, who also had a higher prevalence of functional limitations than others. This is an important finding, as still a fifth of today's elderly are former farmers.

Heavy drinking has been suggested to be more common among divorced and widowed men in comparison to married men (Cooper et al. 1999). The present study found no statistically significant support for this. Perhaps the limit for higher alcohol use was too low to differentiate the marital status groups. However, the higher prevalence of smoking found among non-married individuals accords with previous studies (Cooper et al. 1999).

Obesity

The results of the present study are congruent with reports from other countries showing an upward trend of obesity among the elderly (Dey et al. 2001; Rodriguez-Artalejo et al. 2002; Sundquist et al. 2003). There is evidence indicating that the increasing prevalence of obesity is related to a falling prevalence of leisure time physical activity (e.g. Lindstrom et al. 2003). Results from Finland (Sulander et al. 2004) indicate no clear changes in physical activity among the elderly. It is probable that there are also other explanations underlying the upward trend of obesity. It might be that nowadays less physical effort to fulfil the demands of everyday life is needed compared to a couple of decades ago, leading to an attenuation of daily energy expenditure. Also, the energy intake of Finnish elderly people might have increased. Alcohol consumption has risen, and its high caloric value could also be contributing to the increasing obesity figures.

As farmers in Finland have clearly a lower level of education than those in other occupational groups, the results accord partly with previous studies indicating higher BMI among the lower educated (Rissanen et al. 1991; Lahti-Koski et al. 2000; Kaplan et al. 2003; Sundquist et al. 2003). A plausible explanation for the higher obesity figures among farmers is that after retirement from their physically demanding occupation their energy expenditure declines but they continue with the same food habits.

Despite evidence that obesity does not vary greatly by marital status (Himes 2000), non-married women may be slightly more susceptible to obesity (Kaplan et al. 2003). The present study tends to support this, as obesity was slightly more prevalent among widowed than married women. As single women had the lowest prevalence of obesity it can be argued that if the reference group in regression analyses had been single women the disparity between single and widowed women would have been greater than that between married and widowed.

Associations of functional ability with health behaviours

The findings of this nationally representative study indicate clear associations of functional ability with health behaviours. Current smokers had poorer functional ability than ex- and non-smokers, and ex-smokers had poorer ability than non-smokers. This is in accordance with earlier findings (Stuck et al. 1999; Ostbye et al. 2002; Arday et al. 2003). When disease variables were controlled for, male ex-smokers no longer differed statistically significantly from never smokers in terms of their functional ability. Perhaps some of the ex-smokers had quit smoking due to a chronic disease. Such diseases could thus be stronger causes of inferior functional ability than a history of smoking.

In study V alcohol consumption was divided into four categories, enabling us to investigate the possibility of a U-shaped relation between alcohol use and functional disability. This pattern was actually found. To our knowledge, this topic has not been studied previously. Nevertheless our result is in accordance with previous studies showing that heavy compared to moderate drinking is associated with poorer functional ability. It is also suggested that those drinking small to moderate amounts of alcohol are more likely to maintain mobility than non-drinkers (LaCroix et al. 1993). There is established evidence that one to seven units of alcohol per week have some beneficial effects on health (Oslin 2000; Klatsky 2000). In the present study this seemed to be true both in men and women. However, men who used eight to 14 units of alcohol per week had the best functional ability even when controlling for other health behaviours, sociodemographic factors and chronic diseases. This result was not observed among women, and indicates a slightly higher risk drinking limit for men. It could also be that there are other health related factors (e.g. positive mental and social determinants) among elderly men which contribute to this finding.

There is some support (Rothenberg et al. 1994) for the present finding indicating slightly poorer functional ability among those following an unhealthy compared to a healthy diet. The slight attenuation of this association among men, when controlling for the sociodemographic variables and other health behaviours, may be due to differences in functional ability and diet between occupational groups. As there is also a suggestion that functional ability and nutrition may not be associated (Sonn et al.

1998; Haveman-Nies et al. 2003), further studies are needed to examine this issue more thoroughly.

Poorer functional ability was clearly associated with physical inactivity, even when controlling for other health behaviours, sociodemographic factors and chronic diseases. This accords with earlier findings indicating physical activity to be a clear predictor of better functional ability (LaCroix et al. 1993; Young et al. 1995; Wang et al. 2002). For older members of society it is not the type but the regularity of physical activity that is essential for maintaining mobility (LaCroix et al. 1993). Thus walking, for instance, is a recommendable form of exercise as it is easier to link with everyday actions, and the risk of joint problems and falls is lower than with most forms of more vigorous activity.

There is some evidence that slight overweight among older people does not have a harmful effect on health or could even be somewhat beneficial, at least when examined in relation to cardiovascular diseases and all cause mortality (Dey et al. 2002; Heiat 2003). In fact, after controlling for other health behaviours and chronic diseases in the present study, overweight elderly seemed to have slightly better functional ability than those with normal weight, especially among women. It could be that slightly overweight elderly reach a balanced state whereby they become 'resistant' to the adverse effect of excess fat (Inelmen et al. 2003). Perhaps slight overweight could also protect from fractures resulting from falls. Nevertheless, obesity in the present study was associated with inferior functional ability, which supports earlier findings (Stuck et al. 1999)

Previous studies have shown inferior functional ability among those with lower socioeconomic status (Guralnik et al. 1993; Thorslund and Lundberg 1994; Mendes de Leon et al. 1997; Rahkonen and Takala 1997; McGee et al. 1998; Grundy and Holt 2000; Melzer et al. 2001; Rautio et al. 2001; Martelin et al. 2002; Avlund et al. 2004a). The present study showed that health inequalities according to former occupation among elderly people were partly explained by health behaviour, marital status and various diseases. The observed association between marital status and functional ability confirmed earlier reports (Duffy and MacDonald 1990; Goldman et al.1995; Martelin et al. 2002), but also weakened after adjustment of all variables so

that divorcees no longer had poorer functional ability than married people. Nevertheless, the functional ability of widowed men and women was poorer than that of married people. Thus it can be argued that health behaviours and chronic diseases partly mediate disparities in functional ability by former occupation and marital status. A recent study from Finland showed that CVDs were important determinants of disability among elderly aged 65-74 years (Kattainen et al. 2004a).

6.3. Methodological considerations

The high response rate among the participants indicates good external validity for this biennially collected nationwide cross-sectional follow-up data. This study supplements the information from the limited number of nationally representative studies on functional ability and health behaviours.

Self-reporting based on postal surveys might produce a rather general picture of the issues studied. Further bias may arise from inaccurate and incomplete reporting. It is known that institutionalised elderly are underrepresented in the data, suggesting slightly more positive results than in the whole population of Finnish elderly. However, the number of 65-79-year-old institutionalised people in Finland is rather low.

Whether other non-respondents differ in their health behaviours and level of functional ability is unexplored. However, there is some indication from other countries that non-respondents among working age people are more often smokers and physically inactive, although they have a lower prevalence of heavy drinking than respondents (Hill et al. 1997). Whether this is true among elderly people has largely been neglected in previous research. However, it may be that if the number of non-respondents is high, it may bias results concerning functional ability and other health outcomes (Hoyemans et al. 1998). In the present study the prevalence of non-respondents was low (12% - 25%), so if there are some differences in functional ability and health behaviours between respondents and non-respondents among elderly people in Finland, we can assume that it has not greatly biased these results.

Even though rather general self-reported ADL measures and an index composed of these were used in the present study, these measures have been found to associate with more objective performance tests (Kivinen et al. 1998; Van den Brink et al. 2003). Therefore at least a general picture of changes and associations in functional ability at the national level was produced. It could be argued that the items used can be considered essential as far as independent functioning is concerned. However, light housework, which was used in study I, may not be an ideal indicator for studying changes in functional ability as it might be affected by traditional gender roles. Thus it may not measure actual functional ability but more willingness or capability to perform housework. Traditionally, women have been responsible for household chores.

In the present study a diet index was constructed from the reported information on dietary fat and use of vegetables – two prominent indicators in the Finnish diet of important disease hazards. Due to data restrictions it was not possible to investigate diet more thoroughly, e.g. in terms of energy and nutrient levels. Nevertheless, this general level of monitoring of diet among elderly people was able to detect new and relevant information about dietary changes at the national level.

The prevalence of smoking among Finnish elderly people found in the present study can be considered relatively reliable, as self-reported smoking has been found to be a valid (Vartiainen et al. 2002) and accurate measure in most studies (Patrick et al. 1994). As the information about quantity of alcohol consumption in the present study was based on self-reports, use of alcohol is likely to be underestimated (Uchalik 1979; Poikolainen 1985; Simpura et al. 1997). It is suggested that under reporting might occur due to memory impairment or possible shame experiences in relation to drinking, especially among women (Liberto et al. 1992; Simpson et al. 1994). However, notwithstanding the problem of measuring actual alcohol consumption based on questionnaires, our high response rate and time period analysis provide useful information on general trends in alcohol consumption among the elderly.

It is likely that self-reporting biases the prevalence figures of obesity slightly downward, as height tends to decrease along with advancing age and people therefore over report it (Rowland 1990; Kuczmarski et al. 2001). It is suggested that people

aged 70 and older tend to overestimate their height by approximately three to four centimeters (Kuczmarski et al. 2001). Preliminary results from the Health 2000 study (Aromaa and Koskinen 2002) in Finland (including statistics from BMI based on physical examination) indicate this might be the case with our results, too. However, even if the prevalence figures for obesity in our study are slightly downward biased, the trend observed is likely to be valid, since there are no reasons to assume that the bias would have changed over time.

The cross-sectional study design made it impossible to determine whether health-related behaviours are causes or consequences of the level of functional ability. However, simultaneous adjustment of health behaviours, sociodemographic factors and medical diagnoses gives important information on whether the association between functional ability and a certain variable is influenced by other factors.

Even though the ADL scale used in sub-study V did not include all those items suggested in Katz's index, for instance, the items were in hierarchical order. In fact the hierarchy accords partly with the study by Dunlop and colleagues (1997). Their hierarchy of disabilities was based on longitudinal data and the order they found was as follows: walking, bathing, transfer, dressing, toileting, feeding. As study populations, participation rates and methods in general vary between studies it is probable that different hierarchical structures of ADL occur in different studies.

In study V the numbers of respondents in the two highest alcohol consumption categories were extremely low, especially among women. Therefore, the U-shaped relation between drinking and functional ability could only be studied among men. Although it is likely that self-reported units of alcohol consumed are underestimates, we can assume that those in the highest drinking category in the present study were truly heavy drinkers.

We also included a measure of physical activity in our analyses. It could be argued that there is overlapping between functional ability and physical activity. However, no major changes were found in the cumulative odds ratios for other determinants when omitting physical activity from the analyses. It could thus be assumed that physical activity did not bias the results.

The data excluded the possibility of examining health behaviours and functional ability based on education or income. Occupation before retirement age was therefore used to infer socioeconomic status. This is not a traditional indicator of socioeconomic status. Moreover, when examining socioeconomic status it would also be appropriate to include social class based on education and income. Presumably, however, as higher educated persons and white collar workers tend to be employed in offices, office work may be taken as an indicator of higher socioeconomic status.

Social class among elderly people might be difficult to measure, as most have left the labour market many years earlier (Cooper et al. 1999). Education, moreover, may not allow sufficient differentiation, as older generations do not have the range of educational experience of younger people (Grundy and Holt 2001). The number of higher educated elderly people in Finland has been rather small, especially in the 1980s and 1990s. At the turn of the millennium the number of higher educated elderly people has started to increase as younger cohorts have reached retirement age. Therefore, studies examining educational disparities in health issues among elderly people should become more meaningful.

Social class based on main occupation before retirement age has been shown to reveal clear class gradients in health (Rahkonen and Takala 1998; Arber and Cooper 1999). Former occupation is an important indicator among Finnish elderly as there are still large numbers of farmers whose diet may be largely based on products from their own farm. Furthermore, occupational grouping corresponds closely to education as stated in the methods section. A large number of current elderly in Finland are retired farmers living in the countryside, far from municipal services. In this sense this study has crucially identified a sub-group with poorer functional ability and somewhat inferior health behaviours. Therefore, health studies involving the urban-rural dimension among elderly people could also be of great importance. Despite the scarcity of studies examining this issue, Kumar et al. (2001) have reported that rural elderly in developed countries have more functional impairments and risk factors like sedentarism and smoking than urban dwellers.

6.4. Tomorrow's elderly - will they be healthier?

The future health of the elderly is a major issue in public health. Their well-being is especially important in the policy context, because it is likely that increased allocations in health and social services will not keep pace with the growing number of elderly people. Although it is known that the use of services will increase rapidly, there are somewhat contradictory opinions about the future state of health among older members of the society.

The classical compression of morbidity theory introduced by Fries (1980, 1989) suggests that if the onset of chronic diseases could be postponed, and if this postponement could be greater than increases in life expectancy, people would have more healthy years in old age and their disabilities and diseases would largely manifest at the end of the life span. The opposing theory suggests that the increase in life expectancy is caused by a reduction in the fatality rate of chronic diseases due to medical progress, so that more years are lived with nonfatal diseases (Gruenberg 1977). Among the Finnish elderly functional ability and some health behaviours have improved along with positive developments in morbidity and mortality figures. While technological advances have undoubtedly contributed during recent decades, positive health behaviour changes have certainly taken place at the individual level, too. Individual changes that affect health are therefore difficult to separate from societal changes, including medical advances.

There are indications that disability rates have declined more rapidly than mortality rates in the past few decades (Fries 2003). This and other studies have found support for the compression of morbidity theory (e.g. Vita et al. 1998; Simons et al. 2000; Doblhammer and Kytir 2001). There is no universal explanation for deteriorating disability figures. Health behaviours may explain part of this development (Hubert et al. 2002) but there are some contradictions: at the same time that diet has been improving and male smoking has slightly declined, obesity has increased. This suggests that other factors have also contributed to this development. Medication, for instance for cardiovascular risk factors such as high blood pressure and high cholesterol level, has improved and the use of medication has increased. This has most probably had an impact on disability figures. There are also sociodemographic

explanations. Higher education is associated with better health and today's elderly people have more education than their age counterparts a couple of decades ago. So this, too, is likely to have exerted an influence on improving health among the elderly.

All in all, the present study sheds light on active ageing. Other reports indicate that assessments of subjective health have improved among elderly Finns (Sulander et al., 2004). However, active ageing cannot be described or assessed merely by the level of functional or health status, or by developments in health behaviour. Among other things, active ageing requires that societal changes promote health, so as long as policy remains dominated by economic principles such promotion is likely to remain unbalanced and under-fulfilled, especially if there is a continuous reduction of vital services for older members of society.

The findings of the present and previous studies suggest that the relative use of future health and social services by the elderly people in Finland and other developed nations will decrease. However, the absolute use of these services by this population sector will most probably increase, which poses a tough challenge for public health. Nevertheless, we need to move forward from a perception of older people as merely a burden on society, to embracing them as active participants in both the formal and informal work sectors and in voluntary activities.

6.5. Future prospects

This study is the first in Finland to reveal trends in health behaviours among elderly people at the national level. One purpose of this study was to provide material for further analyses. In fact, various forms of register based information will be linked to the data in the near future to enable more thorough analysis of these issues.

Improving functional ability among elderly people has been well established in many studies from different countries. More research is needed of functional ability in a broader context. Although positive results have been achieved using home-based intervention programmes for preventing functional decline (Gill et al. 2002), the functioning of the environment should also be a priority. It has been found that elderly

people living in neighborhoods with poor access to public transportation, poor lighting at night, heavy traffic, high crime rates etc. had a higher risk of losing physical function than those living in better areas (Balfour and Kaplan 2002). Some arrangements for living and the environment could be adjusted so that those with mild to moderate functional impairment could live an independent life. In housing developments this could involve, for example, installing ramps and elevators instead of stairs.

This study has made progress in abolishing the conception that elderly people are set in their previous habits, especially in terms of diet. It is likely that positive changes in health behaviours have contributed to improving functional ability. Thus this study suggests that modifiable health behaviours, along with chronic diseases, are a key factor in the functional status of the elderly.

Even though smoking figures among Finnish elderly are not particularly high, this is an issue of great importance. This study showed that non-married elderly have a clearly higher prevalence of smoking than married people, which should be a priority concern in future studies and for interventions among the elderly. In Finland, elderly women who are now reaching retirement age have a higher prevalence of daily smoking than previous generations. For men the pattern is opposite (Martelin 1984; Helakorpi et al. 2004). This suggests increasing smoking prevalence among women and declining figures among men. Further studies and monitoring of this issue are therefore important. As quitting smoking during retirement age has a positive affect on active life expectancy and mortality (Sunyer et al. 1998; Ferrucci et al. 1999), interventions for smoking cessation should focus more attention on older members of society.

The upward trend of obesity among the elderly is congruent with the trend among the Finnish working age population (Lahti-Koski et al. 2000). Obesity is thus a health burden that touches the entire adult population of Finland. Prevention programmes should therefore also be a priority among the elderly.

As there are somewhat similar changes in health behaviours among working age and elderly people, it would be interesting to study the possible accumulation of unhealthy

habits. This has not been studied among the elderly. However, a recent study among working aged Finns suggests smoking to be the habit most strongly attached to other unhealthy behaviours (Laaksonen et al. 2001)

This study revealed inferior functional ability and diet among former farmers. As most of them live in sparsely populated areas, it would be important to study area disparities in health-related factors among the elderly, for instance using the urban-rural dimension. Such information is essential for planning and implementing health policy actions.

Health care has traditionally dealt with health-related issues at the stage when health problems in the population have already emerged. The unprecedented expansion of the ageing population and the challenge of maintaining access to health services requires that preventive approaches to functional ability and health in general receive more urgent priority than ever before.

Although healthy ageing rests largely on a lifetime's accumulation, health behaviour changes in old age itself can also exert a marked impact on health. In an ageing society people are expected to remain living at home ever longer. But living independently in familiar surroundings is not merely a challenge for health and social policy but also for other sectors of society. The development of living environments plays an important role here. Being able to live in familiar surroundings has a profound impact on a person's quality of life. It is therefore essential to study people's social networks, home services and local environments. These factors, together with functional ability and health behaviour, exert a profound influence on active ageing. The future challenges to society from the increasing number of older people thus call for a wealth of studies from numerous angles to investigate these central issues for public health policy.

REFERENCES

Adams WL, Garry PJ, Rhyne R, Hunt WC, Goodwin JS. Alcohol intake in the healthy elderly. Changes with age in a cross-sectional and longitudinal study. Journal of the American Geriatrics Society 1990;38:211-216.

Adams WL. Interactions between alcohol and other drugs. International Journal of Addiction 1995;30:1903-1923.

Aguero-Torres H, Thomas VS, Winblad B, Fratiglioni L. The impact of somatic and cognitive disorders on the functional status of the elderly. Journal of Clinical Epidemiology 2002;55:1007-1012.

Ahacic K, Parker MG, Thorslund M. Mobility limitations in the Swedish population from 1968 to 1992: age, gender and social class differences. Aging (Milano) 2000;12:190-198.

Ahacic K, Parker MG, Thorslund M. Mobility limitations 1974-1991: period changes explaining improvement in the population. Social Science and Medicine 2003;57:2411-2422.

Aliyu MH, Adediran AS, Obisesan TO. Predictors of hospital admissions in the elderly: analysis of data from the Longitudinal Study on Aging. Journal of the National Medical Association 2003;95:1158-1167.

Allaire SH, LaValley MP, Evans SR, O'Connor GT, Kelly-Hayes M, Meenan RF, Levy D, Felson DT. Evidence for decline in disability and improved health among persons aged 55 to 70 years: the Framingham Heart Study. American Journal of Public Health 1999;89:1678-1683.

American Geriatrics Society. Clinical Guidelines: Alcohol Use Disorders in Older Adults. New York: American Geriatrics Society, 1997.

Anderson R. The development of the concept of health behaviour and its application in recent research. In: Anderson R, Davis J, Kickbush I, McQueen DV, Turner J, (eds.). Health behaviour research and health promotion. Oxford: Oxford University Press, 1988, pp. 22-35.

Anttila S. Functional capacity in two elderly populations aged 75 or over: comparisons at 10 years' interval. Journal of Clinical Epidemiology 1991;44:1181-1186.

Arber S. Gender, marital status, and ageing: Linking material, health, and social resources. Journal of Aging Studies 2004;18:91-108.

Arber S, Cooper H. Gender differences in health in later life: the new paradox? Social Science and Medicine 1999;48:61-76.

Arber S, Ginn J. Gender and later life: A sociological analysis of resources and constraints. London: Sage; 1991.

Arber S, Ginn J. Gender and inequalities in health in later life. Social Science and Medicine 1993;36:33-46.

Arday DR, Lapin P, Chin J, Preston JA. Smoking patterns among seniors and the medicare stop smoking program. Journal of the American Geriatrics Society 2002;50:1689-1697.

Arday DR, Milton MH, Husten CG, Haffer SC, Wheeless SC, Jones SM, Johnson RE. Smoking and functional status among Medicare managed care enrollees. American Journal of Preventive Medicine 2003;24:234-241.

Arnett DK, McGovern PG, Jacobs DR Jr, Shahar E, Duval S, Blackburn H, Luepker RV. Fifteen-year trends in cardiovascular risk factors (1980-1982 through 1995-1997): the Minnesota Heart Survey. American Journal of Epidemiology 2002;156:929-935.

Aromaa A, Heliövaara M, Impivaara O, Knekt P, Maatela J, Joukamaa M, Klaukka T, Lehtinen V, Melkas T, Mälkiä E, Nyman K, Paunio I, Reunanen A, Sievers K, Kalimo E, Kallio V. Terveys, toimintakyky ja hoidontarve Suomessa. Mini-Suomi-terveystutkimuksen perustulokset (Health, functional limitations and need for care in Finland, Basic results from the Mini-Finland Health Survey; in Finnish with English summary). Kansaneläkelaitoksen julkaisuja/Publications of the Social Insurance Institution AL:32. Helsinki and Turku, 1989.

Aromaa A, Koskinen S. (eds). Health and functional capacity in Finland. Baseline results of the Health 2000 health examination survey (in Finnish with English abstract). Publications of the National Public Health Institute B3/2002. Helsinki 2002.

Avlund K, Damsgaard MT, Osler M. Social position and functional decline among non-disabled old men and women. European Journal of Public Health 2004a;14:212-216.

Avlund K, Davidsen M, Schultz-Larsen K. Changes in functional ability from ages 70 to 75. A Danish longitudinal study. Journal of Aging and Health 1995;7:254-282.

Avlund K, Lund R, Holstein BE, Due P. Social relations as determinant of onset of disability in aging. Archives of Gerontology and Geriatrics 2004b;38:85-99.

Avlund K, Lund R, Holstein BE, Due P, Sakari-Rantala R, Heikkinen RL. The impact of structural and functional characteristics of social relations as determinants of functional decline. The Journals of Gerontology. Series B, Psychological Sciences and Social Sciences 2004c;59:S44-S51.

Balfour JL, Kaplan GA. Neighborhood environment and loss of physical function in older adults: evidence from the Alameda County Study. American Journal of Epidemiology 2002;155:507-515.

Becker PM, Cohen HJ. The functional approach to the care of the elderly: a conceptual framework. Journal of the American Geriatrics Society 1984;32:923-929.

Beckett LA, Brock DB, Lemke JH, Mendes de Leon CF, Guralnik JM, Fillenbaum GG, Branch LG, Wetle TT, Evans DA. Analysis of change in self-reported physical function among older persons in four population studies. American Journal of Epidemiology 1996;143:766-778.

Berg M-A. Ravitsemussuosituksiin liittyvien ruokatottumusten alue-erot ja niiden muutokset Suomessa. Väitöskirja. Kansanterveyslaitoksen julkaisuja A1/2000. Helsinki 2000.

Bernard SL, Kincade JE, Konrad TR, Arcury TA, Rabiner DJ, Woomert A, DeFriese GH, Ory MG. Predicting mortality from community surveys of older adults: the importance of self-rated functional ability. The Journals of Gerontology. Series B, Psychological Sciences and Social Sciences 1997;52B:S155-S163.

Black SA, Rush RD. Cognitive and functional decline in adults aged 75 and older. Journal of the American Geriatrics Society 2002;50:1978-1986.

Boffetta P, Garfinkel L. Alcohol drinking and mortality among men enrolled in an American Cancer Society prospective study. Epidemiology 1990;1:342-348.

Branch JS, FitzGerald S, Newman AB, Kelsey S, Kuller L, VanSwearingen JM, Kriska AM. Physical activity and functional status in community-dwelling older women. Archives of Internal Medicine 2003;163:2565-2571.

Branch LG, Jette AM. The Farmingham Disability Study: I. Social disability among the aging. American Journal of Public Health 1981;71:1202-1210.

Brayne C, Matthews FE, McGee MA, Jagger C. Health and ill-health in the older population in England and Wales. The Medical Research Council Cognitive Function and Ageing Study (MRC CFAS). Age and Ageing 2001;30:53-62.

Breeze E, Fletcher AE, Leon DA, Marmot MG, Clarke RJ, Shipley MJ. Do socioeconomic disadvantages persist into old age? Self-reported morbidity in a 29-year follow-up of the Whitehall study. American Journal of Public Health 2001;91:277-283.

Burke GL, Arnold AM, Bild DE, Cushman M, Fried L, Newman A, Nunn C, Robbins J. Factors associated with healthy aging: the cardiovascular health study. Journal of the American Geriatrics Society 2001;49:254-262.

Cavelaars AE, Kunst AE, Geurts JJ, Crialesi R, Grotvedt L, Helmert U, Lahelma E, Lundberg O, Matheson J, Mielck A, Rasmussen NK, Regidor E, do Rosario-Giraldes M, Spuhler T, Mackenbach JP. Educational differences in smoking: international comparison. British Medical Journal 2000;320:1102-1107.

Clark DO. The effect of walking on lower body disability among older blacks and whites. American Journal of Public Health 1996;86:57-61.

Clark DO, Mungai SM, Stump TE, Wolinsky FD. Prevalence and impact of risk factors for lower body difficulty among Mexican Americans, African Americans, and whites. The journals of gerontology. Series A, Biological Sciences and Medical Sciences 1997;52:M97-M105.

Cooper H, Ginn J, Arber S. Health-related behaviour and attitudes of older people: a secondary analysis of national datasets. London: Health Education Authority; 1999.

Crimmins EM. Trends in the health of the elderly. Annual Review of Public Health 2004;25:79-98.

Crimmins EM, Saito Y. Change in the prevalence of diseases among older Americans:1984-1994. Demographic Research 2000;9:1-20.

Crimmins EM, Saito Y. Trends in healthy life expectancy in the United States, 1970-1990: gender, racial and educational differences. Social Science and Medicine 2001;52:1629-1641.

Crimmins EM, Saito Y, Reynolds SL. Further evidence on recent trends in the prevalence and incidence of disability among older Americans from two sources: the LSOA and the NHIS. The Journals of Gerontology. Series B, Psychological Sciences and Social Sciences 1997;52:S59-S71.

Dey DK, Rothenberg E, Sundh V, Bosaeus I, Steen B. Body mass index, weight change and mortality in the elderly. A 15 y longitudinal population study of 70 y olds. European Journal of Clinical Nutrition 2001a;55:482-492.

Dey DK, Rothenberg E, Sundh V, Bosaeus I, Steen B. Height and body weight in elderly adults: a 21-year population study on secular trends and related factors in 70-year-olds. The Journals of Gerontology. Series A, Biological Sciences and Medical Sciences 2001b;56:M780-M784.

Doblhammer G, Kytir J. Compression or expansion of morbidity? Trends in healthy-life expectancy in the elderly Austrian population between 1978 and 1998. Social Science and Medicine 2001;52:385-391.

Doll R. One for the heart. British Medical Journal 1997;315:1664-1668.

Duffy ME, MacDonald E. Determinants of functional health of older persons. Gerontologist 1990;30:503-509.

Dunlop DD, Hughes SL, Manheim LM. Disability in activities of daily living: patterns of change and a hierarchy of disability. American Journal of Public Health 1997;87:378-383.

Eiben G, Andersson CS, Rothenberg E, Sundh V, Steen B, Lissner L. Secular trends in diet among elderly Swedes – cohort comparison over three decades. Public Health Nutrition 2004;7:637-644.

Ensrud KE, Nevitt MC, Yunis C, Cauley JA, Seeley DG, Fox KM, Cummings SR. Correlates of impaired functioning in older women. Journal of the American Geriatrics Society 1994;42:481-489.

Era P, Rantanen T. Changes in physical capacity and sensory/psychomotor functions from 75 to 80 years of age and from 80 to 85 years of age – a longitudinal study. In: Heikkinen E, Heikkinen R-L, Ruoppila I, eds. Functional capacity and health of elderly people – the Evergreen project. Scandinavian Journal of Social Medicine 1997;Suppl.53:25-43.

Ferraro KF, Booth TL. Age, body mass index, and functional illness. The Journals of Gerontology. Series B, Psychological Sciences and Social Sciences 1999;54:S339-S348.

Ferrucci L, Guralnik JM, Pahor M, Corti MC, Havlik RJ. Hospital diagnoses, Medicare charges, and nursing home admissions in the year when older persons become severely disabled. JAMA: the Journal of the American Medical Association 1997;277:728-734.

Ferrucci L, Izmirlian G, Leveille S, Phillips CL, Corti MC, Brock DB, Guralnik JM. Smoking, physical activity, and active life expectancy. American Journal of Epidemiology 1999;149:645-653.

Foley DJ, Ostfeld AM, Branch LG, Wallace RB, McGloin J, Cornoni-Huntley JC. The risk of nursing home admission in three communities. Journal of Aging and Health 1992;4:155-173.

Fraser AG. Pharmacokinetic interactions between alcohol and other drugs. Clinical Pharmacokinetics 1997;33:79-90.

Freedman VA, Martin LG. Understanding trends in functional limitations among older Americans. American Journal of Public Health. 1998;88:1457-1462.

Freedman VA, Martin LG. The role of education in explaining and forecasting trends in functional limitations among older Americans. Demography 1999;36:461-473.

Freedman VA, Martin LG, Schoeni RF. Recent trends in disability and functioning among older adults in the United States: a systematic review. JAMA: the Journal of the American Medical Association 2002;288:3137-3146.

Fried LP, Bush TL. Morbidity as a focus of preventive health care in the elderly. Epidemiologic Reviews 1988;10:48-64.

Fries JF. Aging, natural death and the compression of morbidity. New England Journal of Medicine 1980;303:130-135.

Fries JF. The compression of morbidity: near or far? The Milbank Quarterly 1989;67:208-232.

Fries JF. Measuring and monitoring success in compressing morbidity. Annals of Internal Medicine 2003;139:455-459.

Ganry O, Baudoin C, Fardellone P, Dubreuil A; EPIDOS Group. Alcohol consumption by non-institutionalised elderly women: the EPIDOS Study. Public Health 2001;115:186-191.

Gill TM, Baker DI, Gottschalk M, Peduzzi PN, Allore H, Byers A. A program to prevent functional decline in physically frail, elderly persons who live at home. New England Journal of Medicine 2002;347:1068-1074.

Goldman N, Korenman S, Weinstein R. Marital status and health among the elderly. Social Science and Medicine 1995;40:1717-1730.

Gove WR. Sex, marital status and mortality. American Journal of Sociology 1973;79:45-67.

Greiner PA, Snowdon DA, Greiner LH. The relationship of self-rated function and self-rated health to concurrent functional ability, functional decline, and mortality: findings from the Nun study. The Journals of Gerontology. Series B, Psychological Sciences and Social Sciences 1996;51:S234-S241.

Gronbaek M, Deis A, Becker U, Hein HO, Schnohr P, Jensen G, Borch-Johnsen K, Sorensen TI. Alcohol and mortality: is there a U-shaped relation in elderly people? Age and Ageing 1998;27:739-744.

Groth MV, Fagt S, Brondsted L. Social determinants of dietary habits in Denmark. European Journal of Clinical Nutrition 2001;55:959-966.

Gruenberg EM. The failures of success. The Milbank Memorial Fund Quarterly. Health and Society 1977;55:3-24.

Grundy E, Holt E. Adult life experiences and health in early old age in Great Britain. Social Science and Medicine 2000;51:1061-1074.

Grundy E, Glaser K. Socio-demographic differences in the onset and progression of disability in early old age: a longitudinal study. Age and Ageing 2000;29:149-157.

Grundy E, Holt G. The socioeconomic status of older adults: how should we measure it in studies of health inequalities? Journal of Epidemiology and Community Health 2001;55:895-904.

Guralnik JM, Branch LG, Cummings SR, Curb JD. Physical performance measures in aging research. Journal of Gerontology 1989;44:M141-146.

Guralnik JM, LaCroix AZ, Abbott RD, Berkman LF, Satterfield S, Evans DA, Wallace RB. Maintaining mobility in late life. I. Demographic characteristics and chronic conditions. American Journal of Epidemiology 1993a;137:845-857.

Guralnik JM, Land KC, Blazer D, Fillenbaum GG, Branch LG. Educational status and active life expectancy among older blacks and whites. New England Journal of Medicine 1993b;329:110-116.

Guralnik JM, Ferrucci L, Simonsick EM, Salive ME, Wallace RB. Lower-extremity function in persons over the age of 70 years as a predictor of subsequent disability. New England Journal of Medicine 1995;332:556-561.

Guralnik JM, Simonsick EM. Physical disability in older Americans. Journal of Gerontology 1993;48 Spec No:3-10.

Hanlon P, Walsh D, Whyte BW, Scott SN, Lightbody P, Gilhooly ML. Hospital use by an ageing cohort: an investigation into the association between biological, behavioural and social risk markers and subsequent hospital utilization. Journal of Public Health Medicine 1998;20:467-476.

Harris DM, Guten S. Health-protective behavior: an exploratory study. Journal of Health & Social Behavior 1979;20:17-29.

Harris T, Kovar MG, Suzman R, Kleinman JC, Feldman JJ. Longitudinal study of physical ability in the oldest-old. American Journal of Public Health 1989;79:698-702.

Haveman-Nies A, De Groot LC, Van Staveren WA; Survey in Europe on Nutrition and the Elderly: a Concerted Action Study. Relation of dietary quality, physical activity, and smoking habits to 10-year changes in health status in older Europeans in the SENECA study. American Journal of Public Health 2003;93:318-323.

Heiat A. Impact of age on definition of standards for ideal weight. Preventive Cardiology 2003;6:104-107.

Heikkinen E, Arajärvi RL, Era P, Jylhä M, Kinnunen V, Leskinen AL, Leskinen E, Mässeli E, Pohjolainen P and Rahkila P. Functional capacity of men born in 1906-10, 1926-30 and 1946-50. A basic report. Scandinavian Journal of Social Medicine Suppl. 1984;33:97p.

Heikkinen E, Heikkinen R-L, Kauppinen M, Laukkanen P, Ruoppila I and Suutama T. Iäkkäiden henkilöiden toimintakyky. Ikivihreät-projekti. Osa I (Functional capacity in the elderly. Evergreen-project. Part I; in Finnish with English summary). Sosiaali- ja terveysministeriön suunnitteluosasto 1990:1. Helsinki, 1990.

Heikkinen R-L and Suutama T, eds. Iäkkäiden henkilöiden toimintakyvyn ja terveyden arviointi. Ikivihreät-projekti. Osa II (Evaluating the functional capacity and health of the elderly; in Finnish with English summary). Sosiaali- ja terveysministeriön kehittämisosaston julkaisuja 1991:10. Helsinki, 1992.

Helakorpi S, Martelin T, Torppa J, Patja K, Vartiainen A, Uutela A. Did Finland's tobacco control act of 1976 have an impact in ever smoking? An examination based on male and female cohort trends. Journal of Epidemiology and Community Health 2004;58:649-654.

Helakorpi S, Patja K, Prättälä R, Aro AR, Uutela A. Suomalaisen aikuisväestön terveyskäyttäytyminen ja terveys, kevät 2003 (Health behaviour and health among Finnish adult population, Spring 2003; in Finnish with English summary). Kansanterveyslaitoksen julkaisuja/Publications of the National Public Health Institute, B17/2003. Helsinki, 2003.

Hill A, Roberts J, Ewings P, Gunnell D. Non-response bias in a lifestyle survey. Journal of Public Health Medicine 1997;19:203-207.

Himes CL. Obesity, disease and functional limitation in later life. Demography 2000;37:73-82.

Hodgson TA. Cigarette smoking and lifetime medical expenditures. The Milbank Quarterly 1992;70:81-125.

Hoyemans H, Feskens EJ, Van Den Bos GA, Kromhout D. Non-response bias in a study of cardiovascular diseases, functional status and self-rated health among elderly men. Age and Ageing 1998;27:35-40.

Hu Y, Goldman N. Mortality differentials by marital status: an international comparison. Demography 1990;27,223.

Hubert HB, Bloch DA, Oehlert JW, Fries JF. Lifestyle habits and compression of morbidity. The journals of gerontology. Series A, Biological Sciences and Medical Sciences 2002;57:M338-M342.

Huijbregts P, Feskens E, Räsänen L, Fidanza F, Nissinen A, Menotti A, Kromhout D. Dietary pattern and 20 year mortality in elderly men in Finland, Italy, and the Netherlands: longitudinal cohort study. British Medical Journal 1997;315:13-17.

Husten CG, Shelton DM, Chrismon JH, Lin YC, Mowery P, Powell FA. Cigarette smoking and smoking cessation among older adults: United States, 1965-94. Tobacco Control 1997;3:175-180.

Inelmen EM, Sergi G, Coin A, Miotto F, Peruzza S, Enzi G. Can obesity be a risk factor in elderly people? Obesity Review 2003;4:147-155.

Jacobs DR Jr, Adachi H, Mulder I, Kromhout D, Menotti A, Nissinen A. Blackburn H. Cigarette smoking and mortality risk: twenty-five-year follow-up of the Seven Countries Study. Archives of Internal Medicine 1999;159:733-740.

Jagger C, Clarke M, Clarke SJ. Getting older-feeling younger: the changing health profile of the elderly. International Journal of Epidemiology 1991;20:234-238.

Jensen G, Nyboe J, Appleyard M, Schnohr P. Risk factors for acute myocardial infarction in Copenhagen II: Smoking, alcohol intake, physical activity, obesity, oral conception, diabetes, lipids and blood pressure. European Heart Journal 1991;12:298-308.

Jette AM, Branch LG. The Framingham Disability Study: II. Physical disability among the aging. American Journal of Public Health 1981;71:1211-1216.

Jette AM, Branch LG, Berlin J. Musculoskeletal impairments and physical disablement among the aged. Journal of Gerontology: Medical Science 1990;45:M203-M208.

Jylhä M, Jokela J, Tolvanen E, Heikkinen E, Heikkinen R-L, Koskinen S, Leskinen E, Lyyra AL, Pohjolainen P. The Tampere longitudinal study on ageing. Scandinavian Journal of Social Medicine Suppl. 1992:47:1-58.

Kalache A, Kickbusch I. "A global strategy for healthy ageing." World Health 1997;4:4-5.

Kaplan MS, Huguet N, Newsom JT, McFarland BH, Lindsay J. Prevalence and correlates of overweight and obesity among older adults: findings from the Canadian National Population Health Survey. The Journals of Gerontology. Series A, Biological Sciences and Medical Sciences 2003;58:1018-30.

Karisto A, Nummela O, Konttinen R, Haapola I, Valve R, Uutela A, Heikkilä K. Ikääntyvä Päijät-Häme. Kuntien hyvinvointiraportti. Helsingin yliopiston Tutkimus- ja koulutuskeskus Palmenia. Raportteja ja selvityksiä 41/2003. Lahti 2003.

Kasl S, Cobb S. Health behaviour, illness behaviour and sick-role behaviour. Archives of Environmental Health 1966;12:246-266, 531-541.

Kattainen A, Koskinen S, Reunanen A, Martelin T, Knekt P, Aromaa A. Impact of cardiovascular diseases on activity limitations and need for help among older persons. Journal of Clinical Epidemiology 2004a;57:82-88.

Kattainen A, Reunanen A, Koskinen S, Martelin T, Knekt P, Sainio P, Härkänen T, Aromaa A. Secular changes in disability among middle-aged and elderly Finns with and without coronary heart disease from 1978-1980 to 2000-2001. Annals of Epidemiology 2004b;14:479-485.

Katz S, Ford AB, Moskowitz RW, Jackson BA, Jaffe MW. Studies of illness in the aged. The index of ADL: a standardized measure of biological and psychosocial function. JAMA: the Journal of the American Medical Association 1963;185:914-919.

Kivelä S-L, Piha T, Niemensivu H, Eronen A. Eläkeikäisen väestön terveyskäyttäytyminen kevät 1985. Kansanterveyslaitoksen julkaisuja, B2/1986. Helsinki, 1986.

Kivinen P, Sulkava R, Halonen P, Nissinen A. Self-reported and performance-based functional status and associated factors among elderly men: the Finnish cohorts of the Seven Countries Study. Journal of Clinical Epidemiology 1998;51:1243-52.

Klatsky AL. Drink to your health? Scientific America 2003; 288: 62-69.

Kuczmarski MF, Kuczmarski RJ, Najjar M. Effects of age on validity of self-reported height, weight, and body mass index: findings from the Third National Health and Nutrition Examination Survey, 1988-1994. Journal of the American Dietetic Association 2001;101:28-34;quiz 35-6.

Kumar V, Acanfora M, Hennessy CH, Kalache A. Health status of the rural elderly. Journal of Rural Health 2001;328-331.

Laaksonen M, Prättälä R, Karisto A. Patterns of unhealthy behaviour in Finland. European Journal of Public Health 2001;11:294-300.

Laatikainen T, Tapanainen H, Alfthan G, Salminen I, Sundvall J, Leiviskä J, Harald K, Jousilahti P, Salomaa V, Vartiainen E. FINRISKI 2002. Kansanterveyslaitoksen julkaisuja/Publications of the National Public Health Institute B7/2003. Helsinki, 2003.

LaCroix AZ, Guralnik JM, Berkman LF, Wallace RB, Satterfield S. Maintaining mobility in late life. II. Smoking, alcohol consumption, physical activity, and body mass index. American Journal of Epidemiology 1993;137:858-69.

Lahelma E, Rahkonen O, eds. Health inequalities in modern societies and beyond [special issue]. Social Science and Medicine 1997a;44:721-910.

Lahelma E, Rahkonen O, Berg MA, Helakorpi S, Prattala R, Puska P, Uutela A. Changes in health status and health behavior among Finnish adults 1978-1993. Scandinavian Journal of Work, Environment and Health 1997b;23 Suppl. 3:85-90.

Lahti-Koski M, Vartiainen E, Mannisto S, Pietinen P. Age, education and occupation as determinants of trends in body mass index in Finland from 1982 to 1997. International Journal of Obesity and Related Metabolic Disorders: Journal of the International Association for the Study of Obesity 2000;24:1669-1676.

Lammi U-K, Kivelä S-L, Nissinen A, Pekkanen J, Punsar S. Functional capacity and associated factors in elderly Finnish men. Scandinavian Journal of Social Medicine 1989a;17:67-75.

Lammi U-K, Kivelä S-L, Nissinen A, Punsar S, Puska P, Karvonen M. Predictors of disability in elderly Finnish men – a longitudinal study. Journal of Clinical Epidemiology 1989b;42:1215-1225.

Laukkanen P, Leinonen R, Sakari-Rantala R, Heikkinen E. Health status and performance in the activities of daily living among 65-69-year-old residents of Jyväskylä in 1988 and 1996 (In Finnish with an English summary). In: Heikkinen E, Lampinen P, Suutama T, eds. Cohort Differences in the Functional Capacity, Health and Leisure Activities of 65-69-year-old Persons. Observations from the Cohort Comparisons of the Evergreen Project in 1988 and 1996. Helsinki: The Social Insurance Institution, Finland, Studies in Social Security and Health 47, 1999:47-66.

Launer LJ, Harris T, Rumpel C, Madans J. Body mass index, weight change, and risk of mobility disability in middle-aged and older women. The epidemiologic follow-up study of NHANES I. JAMA: the Journal of the American Medical Association 1994;271:1093-1098.

Lawrence RH, Jette AM. Disentangling the disablement process. 1996. The Journals of Gerontology. Series B, Psychological Sciences and Social Sciences 1996;51:S173-S182.

Lawton MP, Brody EM. Assessment of older people: self-maintaining and instrumental activities of daily living. Gerontologist 1969;9:179-186.

Lazardis EN, Rudberg MA, Furner SE, Cassel CK. Do activities of daily living have a hierarchical structure? An analysis using the Longitudinal Study of Aging. Journal of Gerontology: Medical Sciences 1994;49:M47-M51.

Lehtonen A, Tilvis R. Turun vanhustutkimus. Turkulaisten 70-vuotiaiden terveydentila, toimintakyky ja terveyspalvelujen tarve. Turun kaupungin terveydenhuollon julkaisuja 10. Turku, 1994.

Leveille SG, Penninx BWJH, Melzer D, Izmirlian G, Guralnik JM. Sex differences in the prevalence of mobility disability in old age: the dynamics of incidence, recovery, and mortality. The Journals of Gerontology. Series B, Psychological Sciences and Social Sciences 2000;55B:S41-S50.

Liao Y, McGee DL, Cao G, Cooper RS. Recent changes in the health status of the older U.S. population: findings from the 1984 and 1994 supplement on aging. Journal of the American Geriatrics Society 2001;49:443-9.

Liberto JG, Oslin DW, Ruskin PE. Alcoholism in older persons: a review of the literature. Hospital and Community Psychiatry 1992;43:975-84.

Lindström M, Isacsson SO, Merlo J. Increasing prevalence of overweight, obesity and physical inactivity: two population-based studies 1986 and 1994. European Journal of Public Health 2003;13:306-312.

Longnecker MP, MacMahon B. Associations between alcoholic beverage consumption and hospitalization, 1983 National Health Interview Survey. American Journal of Public Health 1988;78:153-156.

Luchsinger JA, Lee WN, Carrasquillo O, Rabinowitz D, Shea S. Body mass index and hospitalization in the elderly. Journal of the American Geriatrics Society 2003;51:1615-1620.

Luoto R, Poikolainen K, Uutela A. Unemployment, sociodemographic background and consumption of alcohol before and during the economic recession of the 1990s in Finland. International Journal of Epidemiology 1998a;27:623-629.

Luoto R, Prättälä R, Uutela A, Puska P. Impact of unhealthy behaviors on cardiovascular mortality in Finland, 1978-1993. Preventive Medicine 1998b;27:93-100.

Mahoney FI, Barthel DW. Functional evaluation: The Barthel Index. Maryland State Medical Journal 1965;14:61-65.

Malmberg JJ, Miilunpalo SI, Vuori IM, Pasanen ME, Oja P, Haapanen-Niemi NA. Improved functional status in 16 years of follow up of middle aged and elderly men and women in north eastern Finland. Journal of Epidemiology and Community Health 2002;56:905-912.

Manton KG. A longitudinal study of functional change and mortality in the United States. Journal of Gerontology 1988;43:S153-S161.

Manton KG, Corder L, Stallard E. Chronic disability trends in elderly United States populations: 1982-1994. Proceedings of the National Academy of Sciences of the United States of America 1997;94:2593-2598.

Manton KG, Gu X. Changes in the prevalence of chronic disability in the United States black and nonblack population above age 65 from 1982 to 1999. Proceedings of the National Academy of Sciences of the United States of America 2001;98:6354-6359.

Martelin T. The development of smoking habits according the Survey Data in Finland (in Finnish with English summary). Helsinki, 1984.

Martelin T, Koskinen S, Kattainen A, Sainio P, Reunanen A, Aromaa A. Changes and differentials in the prevalence of activity limitations among Finns aged 65–74: comparison of the Mini-Finland Health Examination Survey (1978–80) and the FINRISK-97 Senior Survey (1997). Yearbook of Population Research in Finland. 2002:38:55-75.

McGee MA, Johnson AL, Kay DW. The description of activities of daily living in five centers in England and Wales. Medical Research Council Cognitive Function and Ageing Study. Age and Ageing 1998;27:605-613.

Mehta KM, Yaffe K, Covinsky KE. Cognitive impairment, depressive symptoms, and functional decline in older people. Journal of the American Geriatrics Society 2002;50:1045-1050.

Melzer D, Izmirlian G, Leveille SG, Guralnik JM. Educational differences in the prevalence of mobility disability in old age: the dynamics of incidence, mortality, and recovery. The Journals of Gerontology. Series B, Psychological Sciences and Social Sciences 2001;56B:S294–S301.

Mendes de Leon CF, Fillenbaum GG, Williams CS, Brock DB, Beckett LA, Berkman LF. Functional disability among elderly blacks and whites in two diverse areas: the New Haven and North Carolina EPESE. Established Populations for the Epidemiologic Studies of the Elderly. American Journal of Public Health 1995;85:994-998.

Mendes de Leon CF, Beckett LA, Fillenbaum GG, Brock DB, Branch LG, Evans DA, Berkman LF. Black-white differences in risk of becoming disabled and recovering from disability in old age: a longitudinal analysis of two EPESE populations. American Journal of Epidemiology 1997;145:488-497.

Mendes de Leon CF, Glass TA, Beckett LA, Seeman TE, Evans DA, Berkman LF. Social networks and disability transitions across eight intervals of yearly data in the New Haven EPESE. The Journals of Gerontology. Series B, Psychological Sciences and Social Sciences 1999;54:S162-S172.

Ministry of Social Affairs and Health. Government Resolution on the Health 2015 public health programme. Publications of the Ministry of Social Affairs and Health 2001:6, Helsinki 2001.

Mokdad AH, Giles WH, Bowman BA, Mensah GA, Ford ES, Smith SM, Marks JS. Changes in health behaviors among older Americans, 1990 to 2000. Public Health Reports 2004;119:326-361.

Moore AA, Endo JO, Carter MK. Is there a relationship between excessive drinking and functional impairment in older persons? Journal of the American Geriatrics Society 2003;51:44-49.

Moore AA, Hays RD, Greendale GA, Damesyn M, Reuben DB. Drinking habits among older persons: findings from the NHANES I Epidemiologic Followup Study (1982-84). National Health and Nutrition Examination Survey. Journal of the American Geriatrics Society 1999;47:412-416.

Mor V, Murphy J, Masterson-Allen S, Willey C, Razmpour A, Jackson ME, Greer D, Katz S. Risk of functional decline among well elders. Journal of Clinical Epidemiology 1989;42:895-904.

Mor V, Wilcox V, William R, Hiris J. Functional transitions among the elderly: patterns, predictors, and related hospital use. American Journal of Public Health 1994;84:1274-1280.

Nagi SZ. An epidemiology of disability among adults in the United States. The Milbank Memorial Fund Quarterly. Health and Society 1976;54:439-467.

Nagi SZ. Disability concept revisited: implications for prevention. In Pope AM, Tarlov AR, eds. Disability in America: Toward a National Agenda for Prevention. Washington, DC: National Academy Press. 1991: 309 – 327.

National Institute on Alcohol Abuse and Alcoholism. The Physicians' Guide to Helping Patients with Alcohol Problems (NIH Publication no. 95-3769). Bethesda, MD: National Institute of Alcohol Abuse and Alcoholism, 1995.

Nelson HD, Nevitt MC, Scott JC, Stone KL, Cummings SR. Smoking, alcohol, and neuromuscular and physical function of older women. Study of Osteoporotic Fractures Research Group. JAMA: the Journal of the American Medical Association 1994;272:1825-1831.

Niinistö L, Verkkoniemi A and Sulkava R. Vantaan vanhimmat. Tutkimus Vantaan kaupungin yli 85-vuotiaiden toimintakyvystä, palveluiden tarpeesta ja sairauksista. Vantaan kaupunki, sosiaali- ja terveysviraston julkaisusarja C:4. 1996.

Nissinen A, Tervahauta M, Pekkanen J, Kivinen P, Stengard J, Kaarsalo E, Kivela SL, Vaisanen S, Salonen JT, Tuomilehto J. Prevalence and change of cardiovascular risk factors among men born 1900-19: the Finnish cohorts of the Seven Countries Study. Age and Ageing 1993;22:365-376.

Norton R, Batey R, Dwyer T, MacMahon S. Alcohol consumption and the risk of alcohol related cirrhosis in women. British Medical Journal 1987;295:80-82.

O'Loughlin JL, Robitaille Y, Boivin JF, Suissa S. Incidence of and risk factors for falls and injurious falls among the community-dwelling elderly. American Journal of Epidemiology 1993;137:342-354.

Osler M, Holstein B, Avlund K, Damsgaard MT, Rasmussen NK, Socioeconomic position and smoking behaviour in Danish adults. Scandinavian Journal of Public Health 2001;29:32-39.

Oslin DW. Alcohol use in late life: disability and comorbidity. Journal of Geriatric Psychiatry and Neurology 2000;13:134-140.

Ostbye T, Taylor DH, Jung S-H. A longitudinal study of the effects of tobacco smoking and other modifiable risk factors on ill health in middle-aged and old Americans: results from the Health and Retirement Study and Asset and Health Dynamics among the Oldest Old Survey. Preventive Medicine 2002;34:334-345.

Ostir GV, Carlson JE, Black SA, Rudkin L, Goodwin JS, Markides KS. Disability in older adults 1: prevalences, causes, and cosequences. Behavioral Medicine 1999;24:147-156.

Parker MG, Thorslund M, Lundberg O. Physical function and social class among Swedish oldest old. Journals of Gerontology 1994;49:S196-S201.

Patrick DL, Cheadle A, Thompson DC, Diehr P, Koepsell T, Kinne S. The validity of self-reported smoking: a review and meta-analysis. American Journal of Public Health 1994;84:1086-1093.

Pekkanen J, Tuomilehto J, Uutela A, Vartiainen E, Nissinen A. Social class, health behaviour, and mortality among men and women in eastern Finland. British Medical Journal 1995;311:589-593.

Peto R, Lopez AD, Boreham J, Thun M, Heath C. Mortality from smoking in developed countries 1950-2000. Oxford University Press Inc., New York 1994.

Pietinen P, Lahti-Koski M, Vartiainen E, Puska P. Nutrition and cardiovascular disease in Finland since the early 1970s: a success story. The Journal of Nutrition, Health and Aging 2001;5:150-154.

Pietinen P, Vartiainen E, Seppänen R, Aro A, Puska P. Changes in diet in Finland from 1972 to 1992: impact on coronary heart disease risk. Preventive Medicine 1996;25:243-250.

Pitkälä KH, Valvanne J, Kulp S, Strandberg TE and Tilvis RS. Secular trends in self-reported functioning, need for assistance and attitudes towards life: 10-year differences of three older cohorts. Journal of the American Geriatrics Society 2001;49:596-600.

Pi-Sunyer FX. Health implications of obesity. American Journal of Clinical Nutrition Suppl. 1991;53:1595S-1603S.

Pohjolainen P. Suoritustestit ja itsearviointi ikääntyneiden toimintakyvyn mittaamisessa. Gerontologia 1999;13:209-217.

Pohjolainen P. Ikääntyneiden fyysisen toimintakyvyn arviointi. Esitutkimus mittausmenetelmistä. Kuntokallio, vanhustyön koulutus- ja tutkimuskeskus. ORAITA 1/2002. Helsinki, 2002.

Pohjolainen P, Heikkinen E, Lyyra A-L, Helin S, Tyrkkö K. Socio-economic status, health and life-style in two elderly cohorts in Jyväskylä. Scandinavian Journal of Social Medicine Suppl. 1997;52:1-65.

Poikolainen K. Underestimation of recalled alcohol intake in relation to actual consumption. British Journal of Addiction 1985;80:215-6.

Poikolainen K. Alcohol and mortality: a review. Journal of Clinical Epidemiology 1995;48:455-465.

Popkin BM, Haines PS, Patterson RE. Dietary changes in older Americans, 1977-1987. American Journal of Clinical Nutrition 1992;55:823-830.

Prättälä R, Berg M-A, Puska P. Diminishing or increasing contrasts? Social class variation in Finnish food consumption patterns, 1979-1990. European Journal of Clinical Nutrition 1992;46:279-287.

Puska P. Nutrition and mortality: the Finnish experience. Acta Cardiologica 2000;55:213-220.

Puska P, Tuomilehto J, Nissinen A, Vartiainen E, eds. The North Karelia Project: 20-year results and experiences. Helsinki University Printing House. Helsinki, 1995.

Rahkonen O, Takala P. Social class differences in health and functional disability among older men and women. International Journal of Health Services: Planning, Administration, Evaluation 1998;28:511-524.

Rautio N, Heikkinen E, Heikkinen RL. The association of socio-economic factors with physical and mental capacity in elderly men and women. Archives of Gerontology and Geriatrics 2001;33:163-178.

Reuben DB, Siu AL. An objective measure of physical function of elderly outpatients. The Physical Performance Test. Journal of the American Geriatrics Society 1990;38:1105-1112.

Revicki DA, Israel RG. Relationship between body mass indices and measures of body adiposity. American Journal of Public Health 1986;76:992-994.

Rimm EB, Giovannucci EL, Willett WC, Colditz GA, Ascherio A, Rosner B, Stampfer MJ. Prospective study of alcohol consumption and risk of coronary disease in men. Lancet 1991;338:464-468.

Rissanen AM, Heliövaara M, Knekt P, Reunanen A, Aromaa A. Determinants of weight gain and overweight in adult Finns. European Journal of Clinical Nutrition. 1991;45:419-430.

Rissanen TH, Voutilainen S, Virtanen J, Venho B, Vanharanta M, Mursu J, Salonen JT. Low intake of fruits, berries and vegetables is associated with excess mortality in men; the Kuopio Ischaemic Heart Disease Risk Factor (KIHD) Study. The Journal of Nutrition 2003;133:199-204.

Rodriguez-Artalejo F, Lopez Garcia E, Gutierrez-Fisac JL, Banegas Banegas JR, Lafuente Urdinguio PJ, Dominguez Rojas V. Changes in the prevalence of overweight and obesity and their risk factors in Spain, 1987-1997. Preventive Medicine 2002;34:72-81.

Rothenberg E, Bosaeus I, Steen B. Food habits, food beliefs and socio-economic factors in an elderly population. Scandinavian Journal of Nutrition 1994;38:159-165.

Rowland ML. Self-reported weight and height. American Journal of Clinical Nutrition 1990;52:1125-1133.

Rudberg MA, Parzen MI, Leonard LA, Cassel CK. Functional limitation pathways and transitions in community-dwelling older persons. Gerontologist 1996;36:430-440.

Räty S, Aromaa A, Koponen P. Measurement of physical functioning in comprehensive national health surveys - ICF as a framework. In Aromaa A, Koponen P, Tafforeau J, Vermeire C, Primatesta P, Marmot M, Kurth B, Gargiulo L, Lehto-Järnstedt U-S, Räty S, eds. Health surveys: evaluation and recommendations Subproject reports of Phase 2 of the project Health Surveys in the EU: HIS and HIS/HES Evaluations and Models. Publications of the National Public Health Institute, B16/2003. Helsinki, 2003.

Rönnemaa T, Karppi S-L (eds.). Changes in health and functional capacity in initially healthy 65 years old men and women followed up to the age of 80 years (in Finnish, English summary). The Social Insurance Institution, Finland, Social security and health reports 23; 1997.

Sairanen S, Niinistö L and Tilvis R. Vantaalaisten 65-vuotiaiden terveydentila ja toimintakyky. Vantaan kaupungin sosiaali- ja terveysviraston julkaisuja C:3. 1993.

Sakari-Rantala R, Era P, Heikkinen E, Heikkinen R-L, Laukkanen P, Ruoppila I, Suominen H and Suutama T. Iäkkäiden toimintakyky- ja terveystutkimus. Kahden keskisuomalaisen 75-vuotiaan väestöryhmän vertailu (Evaluating functional capacity and health of elderly people in two populations; in Finnish with English summary). Kansaneläkelaitos, Sosiaali- ja terveysturvan tutkimuksia 2. Helsinki, 1995.

Sakari-Rantala, Laukkanen P, Heikkinen E. Iäkkäiden jyväskyläläisten itsearvioitu toimintakyky kahdeksan vuoden seuruututkimuksessa (Self-assessed functional capacity of Finnih elderly people in an eight-year follow-up; in Finnish with English summary). In Suutama T, Ruoppila I, Laukkanen P, eds. Iäkkäiden henkilöiden toimintakyvyn muutokset. Havaintoja Ikivihreät-projektin 8-vuotisesta seuruututkimuksesta (Changes in functional abilities among elderly people. Findings from an eight-year follow-up study by the Evergreen project). Helsinki: The Social Insurance Institution, Finland, Studies in Social Security and Health 42, 1999:171-197.

Salive ME, Collins KS, Foley DJ, George LK. Predictors of nursing home admission in a biracial population. American Journal of Public Health 1993;83:1765-1767.

Schoeni RF, Freedman VA, Wallace RB. Persistent, consistent, widespread, and robust? Another look at recent trends in old-age disability. The Journals of Gerontology. Series B, Psychological Sciences and Social Sciences 2001;56:S206-S218.

Schroll K, Carbajal A, Decarli B, Martins I, Grunenberger F, Blauw YH, de Groot CP. Food patterns of elderly Europeans. SENECA Investigators. European Journal of Clinical Nutrition 1996;50 Suppl 2:S86-100.

Schroll M. Physical activity in an ageing population. Scandinavian Journal of Medicine and Science in Sports 2003;13:63-69.

Scott WK, Macera CA, Cornman CB, Sharpe PA. Functional health status as a predictor of mortality in men and women over 65. Journal of Clinical Epidemiology 1997;50:291-296.

Seeman TE, Berkman LF, Charpentier PA, Blazer DG, Albert MS, Tinetti ME. Behavioral and psychosocial predictors of physical performance: MacArthur studies of successful aging. The Journals of Gerontology. Series A, Biological Sciences and Medical Sciences 1995;50:M177-M183.

Seeman T, Chen X. Risk and protective factors for physical functioning in older adults with and without chronic conditions. Journals of Gerontology Series B: Psychological Sciences and Social Sciences 2002;57:S135-S144.

Simons LA, McCallum J, Friedlander Y, Ortiz M, Simons J. Moderate alcohol intake is associated with survival in the elderly: the Dubbo Study. The Medical Journal of Australia 2000a;173:121-124.

Simons LA, McCallum J, Friedlander Y, Simons J. Healthy ageing is associated with reduced and delayed disability. Age and Ageing 2000b;29:143-148.

Simpson M, Williams B, Kendrick A. Alcohol and elderly people: an overview of the literature for social work. Ageing and Society 1994;14:575-587.

Simpura J, Leppänen K, Metso L, Mustonen H, Österberg E. Paljonko Suomi juo? Alkoholin kokonaiskulutustason selvittäminen vaikeutunut. Alkoholipolitiikka 1997;62:101-112.

Sletvold O, Tilvis R, Jonsson A, Schroll M, Snaedal J, Engedal K, Schultz-Larsen K, Gustafson Y. Geriatric work-up in the Nordic countries. Danish Medical Bulletin 1996;43:350-359.

Solfrizzi V, Panza F, Capurso A. The role of diet in cognitive decline. Journal of Neural Transmission 2003;110:95-110.

Sonn U, Rothenberg E, Steen B. Dietary intake and functional ability between 70 and 76 years of age. Aging (Milano) 1998;10:324-331.

Spector WD, Katz S, Murphy JB, Fulton JP. The hierarchical relationship between activities of daily living and instrumental activities of daily living. Journal of Chronic Diseases 1987;40:481-489.

Spiers N, Jagger C, Clarke M. Physical function and perceived health: cohort differences and interrelationships in older people. The Journals of Gerontology. Series B, Psychological Sciences and Social Sciences 1996;51B:S226-S233.

Spillman BC. Changes in elderly disability rates and the implications for health care utilization and cost. The Milbank Quarterly 2004;82:157-194.

SPSS Inc. Spss Regression Models 10.0. USA: SPSS Inc., 1999.

Steen B, Rothenberg E. Aspects on nutrition of the elderly at home – a review. The Journal of Nutrition, Health and Aging 1998;2:28-33.

Steinmetz KA, Potter JD. Vegetables, fruits and cancer prevention: a review. Journal of the American Dietetic Association 1996;96:1027-1039.

Stuck AE, Walthert JM, Nikolaus T, Bula CJ, Hohmann C, Beck JC. Risk factors for functional status decline in community-living elderly people: a systematic literature review. Social Science and Medicine 1999;48:445-469.

Sulander T, Helakorpi S, Nissinen A, Uutela A. Eläkeikäisen väestön terveyskäyttäytyminen ja terveys keväällä 2003 ja niiden muutokset 1993-2003. (Health behaviour among Finnish elderly, spring 2003 with trends 1993-2003; in Finnish with English summary). Kansanterveyslaitoksen julkaisuja/Publications of the National Public Health Institute, B6/2004. Helsinki, 2004.

Sundquist K, Qvist J, Johansson SE, Sundquist J. Increasing trends of obesity in Sweden between 1996/97 and 2000/01. International Journal of Obesity and Related Metabolic Disorders: Journal of the International Association for the Study of Obesity 2004;28:254-261.

Sunyer J, Lamarca R, Alonso J. Smoking after age 65 years and mortality in Barcelona, Spain. American Journal of Epidemiology 1998;148:575-580.

Thorslund M, Lundberg O. Health and inequalities among the oldest old. Journal of Aging and Health 1994;6:51-69.

Thun MJ, Peto R, Lopez AD, Monaco JH, Henley SJ, Heath CW Jr, Doll R. Alcohol consumption and mortality among middle-aged and elderly U.S. adults. New England Journal of Medicine 1997;337:1705-1714.

Townsend P, Davidson N. Inequalities in health: the Black Report. Hammondsworth: Penguin Books; 1988.

Trichopoulou A, Kouris-Blazos A, Wahlqvist ML, Gnardellis C, Lagiou P, Polychronopoulos E, Vassilakou T, Lipworth L, Trichopoulos D. Diet and overall survival in elderly people. British Medical Journal 1995;311:1457-1460.

Tsuji I, Takahashi K, Nishino Y, Ohkubo T, Kuriyama S, Watanabe Y, Anzai Y, Tsubono Y, Hisamichi S. Impact of walking upon medical care expenditure in Japan: the Ohsaki Cohort Study. International Journal of Epidemiology 2003;32:809-814.

Tyrkkö A. Elinolot numeroina 1994. Tilastokeskus, julkaisusarja Elinolot 1996:1. Helsinki, 1996.

Uchalik DC. A comparison of questionnaire and self-monitored reports of alcohol intake in a nonalcoholic population. Addictive Behaviors 1979;4:409-413.

Unger JB, McAvay G, Bruce ML, Berkman L, Seeman T. Variation in the impact of social network characteristics on physical functioning in elderly persons: MacArthur Studies of Successful Aging. The Journals of Gerontology. Series B, Psychological Sciences and Social Sciences 1999;54:S245-S251.

Valkonen T, Martikainen P, Jalovaara M, Koskinen S, Martelin T, Mäkelä P. Changes in socioeconomic inequalties in mortality during an economic boom and recession among middle-aged men and women in Finland. European Journal of Public Health 2000;10:274-280.

Valvanne J, Erkinjuntti T, Tilvis R. Helsingin vanhustutkimus. Helsinkiläisten 75-, 80- ja 85-vuotiaiden terveydentila, toimintakyky ja terveyspalvelujen tarve vuonna 1989. Helsingin kaupungin terveysviraston raportteja, sarja A, raportti 71. Helsinki, 1992.

Van den Brink CL, Tijhuis M, Kalmijn S, Klazinga NS, Nissinen A, Giampaoli S, Kivinen P, Kromhout D, van den Bos GA. Self-reported disability and its association with performance-based limitation in elderly men: a comparison of three European countries. Journal of the American Geriatrics Society 2003;51:782-788.

Vartiainen E, Seppälä T, Lillsunde P, Puska P. Validation of self reported smoking by serum cotinine measurement in a community-based study. Journal of Epidemiology and Community Health 2002;56:167-170.

Verbrugge LM, Jette AM. The disablement process. Social Science and Medicine 1994;38:1-14.

Vita AJ, Terry RB, Hubert HB, Fries JF. Aging, health risks and cumulative disability. New England Journal of Medicine 1998;338:1035-1041.

Wachtel TJ, Fulton JP, Goldfarb J. Early prediction of discharge disposition after hospitalization. Gerontologist 1987;27:98-103.

Wahlqvist ML, Saviage GS. Interventions aimed at dietary and lifestyle changes to promote healthy aging. European Journal of Clinical Nutrition 2000;54, Suppl 3:S148-S156.

Waidmann TA, Liu K. Disability trends among elderly persons and implications for the future. The Journals of Gerontology. Series B, Psychological Sciences and Social Sciences 2000;55B:S298-S307.

Wang L, van Belle G, Kukull WB, Larson EB. Predictors of functional change: a longitudinal study of nondemented people aged 65 and older. Journal of the American Geriatrics Society 2002;50:1525-1534.

Wannamethee GS, Shaper GA, Whincup PH, Walker M. Overweight and obesity and the burden of disease and disability in elderly men. International Journal of Obesity 2004;11:1374-1382.

Winblad I. Comparison of the prevalence of disability in two birth cohorts at the age of 75 years and over. Journal of Clinical Epidemiology 1993;46:303-308.

Winblad I, Jääskeläinen M, Kivelä S-L, Hiltunen P, Laippala P. Prevalence of disability in three birth cohorts at old age over time spans of 10 and 20 years. Journal of Clinical Epidemiology 2001;54:1019-1024.

Winogard CH, Gerety MB, Chung M, Goldstein MK, Dominguez F Jr, Vallone R. Screening for frailty: criteria and predictors of outcomes. Journal of the American Geriatrics Society 1991;39:778-784.

Wister AV. The effects of socioeconomic status on exercise and smoking: age-related differences. Journal of Aging and Health 1996;8:467-488.

World Health Organization (1993). International Classification of Impairments, Disabilities, and Handicaps. Reprint. Geneva: World Health Organization.

World Health Organization (2000). Obesity: Preventing and managing the global epidemic. WHO Technical Report Series 894. Geneva: World Health Organization.

World Health Organization (2001). International Classification of Functioning, Disability and Health: ICF. Geneva: World Health Organization.

World Health Organization (2002). Active ageing: a policy framework. Geneva: World Health Organization.

Zhou H, Deng J, Li J, Wang Y, Zhang M, He H. Study of the relationship between cigarette smoking, alcohol drinking and cognitive impairment among elderly people in China. Age and Ageing 2003;32:205-210.

Zimmer Z, House J. Education, income, and functional limitation transitions among American adults: contrasting onset and progression. International Journal of Epidemiology 2003;32:1089-1097.

Young DR, Masaki KH, Curb JD. Associations of physical activity with performance-based and self-reported physical functioning in older men: the Honolulu Heart Program. Journal of the American Geriatrics Society 1995;43:845-854.

Appendix 1.

QUESTIONNAIRE 2003 (EVTK2003)

Gender

1 men
2 women

In what year were you born?

_____

What is your present marital status?

1 married or cohabiting
2 single
3 separated or divorced
4 widowed

What kind of work have you done most of your life?

1 farming, cattle minding, forestry, Farmer's wife
2 factory, mining, construction or similar work
3 office work, intellectual work, service profession
4 housewife, homemaker
5 other, please specify: _____

In the past year (12 months), have you been diagnosed with or treated for the following illnesses by a doctor?

	yes
high blood pressure, hypertension	1
diabetes	1
myocardial infarction	1
coronary disease, angina pectoris	1
heart failure	1
rheumatoid arthritis	1
other arthritic illness	1
degenerative disk disease/other back illness	1
chronic bronchitis/emphysema	1

How tall are you?

_____ cm

How much do you weight in light clothes?

_____ kg

What kind of spread do you usually use on bread?

1 nothing
2 low-fat spread with fat content under 65% (e.g. Vähärasvaisempi Flora, Becel, Kevyt Becel, Keiju 60, Kevyt Keiju, Kultarypsi, Lätta, Mini Lätta)
3 plant stanol margarine (e.g. Benecol, Kevyt Benecol)
4 plant sterol margarine (Becel pro.activ)
5 margarine or vegetable spread with 70 – 80% fat content (e.g. Flora, Keiju)
6 mixture of butter and vegetable oil (e.g. Voimariini, Enilett)
7 butter

If you drink milk do you usually use

1 unprocessed cow milk
2 whole milk
3 semi-skimmed milk (1,5% fat)
4 low-fat milk (1% fat)
5 skimmed milk
6 I do not drink milk

In the past week (7 days) **how often have you eaten vegetables or root crops** (excluding potato) **as such, grated or in salad?**

1 not once
2 on 1-2 days
3 on 3-5 days
4 on 6-7 days

In the past week (7 days) **how often have you eaten fresh or frozen berries or fruits?**

1 not once
2 on 1-2 days
3 on 3-5 days
4 on 6-7 days

In the past week (7 days) **how many glasses** (normal restaurant servings) **or bottles have you drunk of the following:** (If you have not drunk any, mark 0)

beer _____ bottle(s)
spirits _____ restaurant serving(s)
wine or similar beverage _____glasse(s)
cider or low-alcohol wine (alcohol content about 5 %) _____ glasses

Have you ever smoked?

1 No
2 Yes

Have you ever smoked daily for at least one year? For how many years in all?

1 I have never smoked daily
2 I have smoked daily for a total of _____ years

Do you smoke at the present time (cigarettes, cigars or pipes)**?**

1 yes, daily
2 occasionally
3 not at all

When have you smoked last? If you smoke continuously, mark alternative 1.

1 yesterday or today
2 2 days-1 month ago
3 1 month-half a year ago
4 half a year-one year ago
5 1-5 years ago
6 5-10 years ago
7 over 10 years ago

How often do you walk outdoors for at least half an hour?

1 daily
2 4-6 times a week
3 2-3 times a week
4 once a week
5 2-3 times a week
6 a few times a year or less
7 I can not walk at all due to an illness or injury

How often do you perform other physical activities than walking for at least half an hour (e.g. skiing, bicycling, swimming, gymnastics, games, dance)**?**

1 daily
2 4-6 times a week
3 2-3 times a week
4 once a week
5 2-3 times a month
6 a few times a year or less
7 I can not walk at all due to an illness or injury

Older people sometimes have difficulty performing the following functions. Can you perform them? Can you perform them alone or do you need another person's help?

	I can't do this even with assistance	yes, if someone assists me	yes, alone but it is difficult	yes, alone without difficulty
use of stairs	1	2	3	4
walk outside	1	2	3	4
eat	1	2	3	4
bath	1	2	3	4
dress and undress	1	2	3	4
to do light housework	1	2	3	4