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RESEARCH ARTICLE



# Changes in disability, self-rated health, comorbidities and psychological wellbeing in community-dwelling 75–95-year-old cohorts over two decades in Helsinki

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## ABSTRACT

**Objective:** To explore changes in self-reported disabilities, health, comorbidities and psychological wellbeing (PWB) in aged cohorts over two decades.

**Design, setting and subjects:** Cross-sectional cohort studies with postal surveys were conducted among community-dwelling people aged 75, 80, 85, 90 and 95 years in 1989 ( $n = 660$ ), 1999 ( $n = 2598$ ) and 2009 ( $n = 1637$ ) in Helsinki, Finland.

**Main outcome measures:** Self-reported items on disability, self-rated health (SRH), diagnoses and PWB were compared between cohorts of the same age. Standardized mortality ratios (SMRs) were calculated for each study year to explore the representativeness of the samples compared to general population of same age.

**Results:** A significantly lower proportion of the 75–85-year-olds of the later study years reported going outdoors daily, although this group had improvements in both SRH and PWB scores. The number of comorbidities increased over time among 75–85-year-olds. The only significant change that could be verified among 90- and 95-year-olds between 1999 and 2009, was the lower proportion of participants going outdoors daily. The trend of leveling-off in disabilities was not explained by the SMRs (0.90, 0.71 and 0.60 for 1989, 1999 and 2009).

**Conclusions:** The latest older people's cohorts showed an end to previously reported improvements in disabilities, despite having favorable trends in SRH and PWB. Primary care may be faced with increasing need of appropriate services for their senior members.

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Cohort comparison; physical functioning; self-rated health; psychological wellbeing; oldest-old; community-dwelling

## Introduction

A large proportion of general practitioners' (GP) patients are older people. This share will increase in the future. Researchers worldwide have investigated whether increasing life expectancies of populations entail additional years of morbidity or disability among older people, or could the period of morbidity and disability be compressed [1]. There are data supporting these theories in different European countries [2]. Researchers have mainly investigated functional limitations or disability trends in successive cohorts [3]. However, favorable trends in disability do not necessarily mean improved health and wellbeing of older

people: looking further into comorbidities, self-perceptions of health and psychological wellbeing (PWB) would increase knowledge of cohort trends, and their needs for health services. Older people's disabilities, comorbidities and wellbeing is a relevant topic when considering primary care resources.

A large number of studies have suggested that the later born cohorts of the oldest-old show less functional limitations [4,5] or less disabilities than the earlier born cohorts [4–7]. Studies have consistently suggested that the prevalence of disability in the older population decreased over two decades until early 2000 [4,6,8–10]. However, some studies have

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suggested that the prevalence of functional limitations and/or disability have remained stable thereafter or even increased in later born older cohorts [11–13], especially in the younger-aged cohorts [10,14,15]. Time trends in the oldest-old populations 85 years and older show mixed findings [7,9,12,14,16] among later cohorts compared with the earlier cohorts.

Self-rated health (SRH) measures the individual's own perceptions of her/his health status. It is significantly associated with objectively measured health, and it has prognostic value [3,9]. The few studies that reported time trends in SRH have shown mixed results especially from 1980 to 2003 [3,9]. The few studies that reported trends up to 2009 have suggested either stable or worsening SRH [17]. The prevalence of diseases seems to be increasing in the later born cohorts [8–11,17,18].

Time trends in some aspects of PWB have been studied in general adult populations. The later born 65–69-year old cohorts of the Finnish Evergreen project in 2004 found life more meaningful than their counterparts in 1996 or 1988 [19]. However, there is a scarcity of studies that explore time trends in PWB of older people and the oldest old, and we are not aware of any recent published studies.

The studies that have investigated health trends between cohorts of the same age range seldom report PWB, health and disability in the same paper. We reported in our previous study in 2001 that the aged samples taken in 1999 showed improved physical functioning and PWB, compared with the samples of same age that were studied 10 years earlier [20]. We have extended our research in the present study to compare previous study year (1989, 1999) samples of the same age groups to samples of the corresponding ages that were obtained in 2009. The aim of this present study was to investigate the changes in self-reported disability, SRH, comorbidities and PWB in community-dwelling cohorts of people aged 75–95 years over two decades.

## Materials and methods

This study is based on Helsinki Ageing Study [20] and combines data of three population-based, cross-sectional studies with census data, which were obtained in 1989, 1999 and 2009. Random samples of community-dwelling people in Helsinki, Finland, were retrieved from the population register in 1989 ( $N = 898$ ; 300 each of 75- and 80-year-olds groups and 298 of the 85-year-olds group), in 1999 [ $N = 3921$ ; 1000 each of 75, 80 and 85-year-olds groups in addition to all 90 (734) and also all 95-year-olds (187)],

and in 2009 [ $N = 2633$ ; 600 each of the four groups from 75 to 90, and also all 95-year-olds (233)]. A questionnaire with identical items was mailed to eligible people in Helsinki, Finland, and re-sent once to those not responding at each time point. We excluded persons with unknown address, the deceased and those who were permanently institutionalized. The response rates for 1989, 1999 and 2009 were 93% ( $n = 660$ ), 80% ( $n = 2598$ ) and 73% ( $n = 1637$ ), respectively.

The survey questionnaire *inter alia* inquired about demographic items (education, marital status). Our cross-sectional surveys given in all three time-points 1989, 1999 and 2009 included identical items on self-reported disability (i.e. difficulties in performing some daily activities). The subjects were invited to respond to the following: whether they go outdoors daily (yes/no), they need another person's help daily (yes/no) and they need another person's help to get out of bed (yes/no).

Respondents were invited to evaluate their SRH, which was categorized as good (healthy/quite healthy) and poor (quite unhealthy/unhealthy). Participants were invited to report the occurrence of their diagnosed major diseases (yes/no), and the Charlson comorbidity index was calculated accordingly [21].

The questionnaire evaluated PWB according to responses to six questions [22,23]. These six questions have shown good test–retest reliability [24] and significant prognostic validity for mortality [23]. The questions inquire about (1) life satisfaction (yes/no), (2) feeling useful (yes/no), (3) having plans for the future (yes/no), (4) having zest for life (yes/no), (5) feeling depressed (seldom or never/sometimes/often or always) and (6) suffering from loneliness (seldom or never/sometimes/often or always) [23]. Responses 'no' to questions 1–4 and 'often or always' to questions 5 or 6 contribute 0 raw points to the aggregated score. Responses 'sometimes' to questions 5 or 6 contribute to the total with  $\frac{1}{2}$  raw points. The responses 'yes' to questions 1–4 and 'seldom or never' to questions 5 or 6 contribute 1 raw point each to the total score. We created a total PWB score from the responses to these six questions. The PWB score for each study participant was then calculated by dividing the sum total of raw points by the number of questions the participant had answered. A score of 1 represented the best possible PWB score and 0 the poorest PWB score [25].

The mortality data were retrieved from the central registers during a four-year follow-up for each cross-sectional cohort. The standardized mortality ratios (SMRs) were calculated so that we could compare the mortality of each study sample with the whole Finnish population of respective age at each time point. This

enables us to assess the representativeness of each sample. The expected number of deaths was calculated on the basis of sex-, age- and calendar-period-specific mortality rates of the Finnish population. The SMRs were calculated as the ratio of observed and expected number of deaths according to Statistics Finland. The corresponding 95% confidence intervals (CIs) were defined assuming a Poisson distribution of the observed number of deaths.

In the figures, we describe raw data for each age cohort. In our analyses, we compared 75–85-year-olds and 90–95-year-olds separately, because these age groups have shown somewhat different trends in disability in previous studies [7,9,12,14]. Generalized linear mixed-models were used to determine the adjusted relationships between the samples of each age groups over the study years. These basic models included the main effects (year and age) and their interaction. All these analyses performed were adjusted for gender, education and widowhood. A significant cohort trend between the study years is indicated by  $p < .05$  for linearity for the study year effect, or for the study year effect. The age effect  $p < .05$  remarks the obvious situation where disability/SRH/comorbidities or PWB changes with higher age in the group. These results have more power, if  $p$  for the interactions is higher than .05 indicating no other interactions. The normality of each variable was tested by using the Shapiro–Wilk  $W$  test. All analyses were performed using STATA software (version 13.1), StataCorp, LP, College Station, TX.

## Results

In these cross-sectional cohorts of older community-dwelling people (1989, 1999 and 2009), the proportion of males among the 80- and 85-year-old participants increased significantly from 1989 to 2009. Widowhood among 75-, 80- and 85-year-olds decreased significantly from 1989 to 2009. Furthermore, the educational status improved significantly in all aged cohorts except among the 95-year-olds (Table 1).

The SMR was 0.90 (95% CI 0.78–1.03) for the 1989 sample, whereas the corresponding ratios for the 1999 and 2009 samples were 0.71 (95% CI 0.64–0.76) and 0.60 (95% CI 0.54–0.66). This indicates that the respondents represented fitter sample of population of the same age each decade.

Results concerning the research question show changes in self-reported disabilities, health, comorbidities and PWB between the independent cross-sectional cohorts over decades. Figure 1 illustrates

**Table 1.** Characteristics of participants in study years 1989, 1999 and 2009.

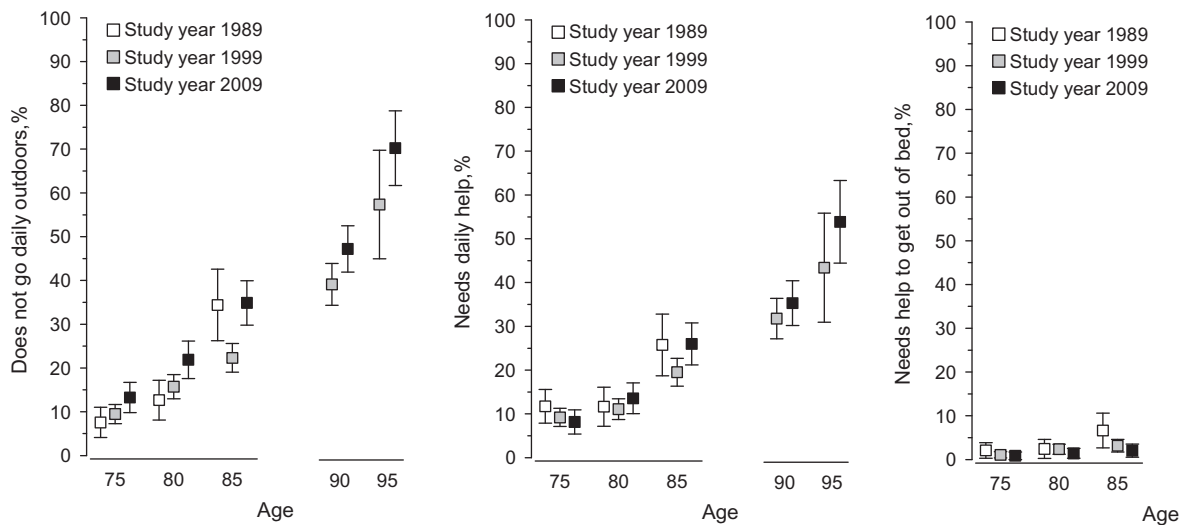
Characteristics	1989 <i>n</i> = 660	1999 <i>n</i> = 2598	2009 <i>n</i> = 1637	<i>p</i> Value <sup>a</sup>
<b>Males, <i>n</i> (%)</b>				
75 years	70 (28.6)	263 (35.8)	143 (35.8)	.096
80 years	60 (27.3)	218 (30.4)	146 (37.2)	.007
85 years	46 (23.6)	148 (23.0)	109 (30.5)	.029
90 years		101 (23.1)	89 (24.0)	.974
95 years		17 (25.8)	24 (20.3)	.40
<b>Widowed, <i>n</i> (%)</b>				
75 years	85 (35.0)	212 (29.4)	84 (21.0)	<.001
80 years	102 (46.4)	308 (44.3)	120 (30.8)	<.001
85 years	104 (57.8)	351 (56.0)	171 (48.4)	.019
90 years		266 (63.2)	227 (61.5)	.63
95 years		42 (66.7)	79 (67.5)	.91
<b>Education &lt;8 years, <i>n</i> (%)</b>				
75 years	159 (71.9)	370 (51.6)	141 (35.8)	<.001
80 years	135 (70.3)	339 (49.8)	147 (38.1)	<.001
85 years	133 (81.1)	363 (58.4)	115 (32.7)	<.001
90 years		230 (55.4)	142 (39.0)	<.001
95 years		35 (56.4)	58 (49.6)	.38

<sup>a</sup> $p$  for linearity between the study years.

changes in individual items of self-reported disability at different ages in 1989, 1999 and 2009.

A significantly lower proportion of 75-, 80- and 85-year-olds reported going outdoors daily in the later study years ( $p < .001$  for linearity for the study year effect,  $p < .001$  for the age effect,  $p = .043$  for the interactions; adjusted for gender, education and widowhood). Also a significantly lower proportion of 90- and 95-year-olds reported going outdoors daily ( $p = .030$  for the study year effect,  $p < .001$  for the age effect,  $p = .57$  for the interactions; adjusted for gender, education and widowhood). Furthermore, there was only an age effect between the 75-, 80- and 85-year-olds concerning the need of another person's daily help ( $p = .84$  for linearity for the study year effect,  $p < .001$  for the age effect,  $p = .30$  for the interactions; adjusted for gender, education and widowhood), and similarly among 90- and 95-year-olds ( $p = .14$  for the study year effect,  $p < .001$  for the age effect,  $p = .56$  for interactions; adjusted for gender, education and widowhood). There was a difference between 75- and 85-year-olds in needing help to get out of bed between the study years ( $p = .022$  for linearity for the study year effect,  $p = .0012$  for the age effect,  $p = .82$  for the interactions; adjusted for gender, education and widowhood), but among 90- and 95-year-olds there was only an age effect ( $p = .18$  for the study year effect,  $p = .019$  for the age effect,  $p = .56$  for the interactions; adjusted for gender, education and widowhood).

SRH was good in most participants at all ages at each time point. A significantly higher proportion of 75-, 80- and 85-year-olds reported good SRH in the later study years ( $p = .028$  for linearity for the study year effect,  $p < .001$  for the age effect,  $p = .32$  for the



**Figure 1.** Self-reported physical functioning among community-dwelling older people in Helsinki, Finland according to their age for the study years 1989, 1999 and 2009. Proportions reporting difficulties or need of help with 95% confidence intervals.

interactions; adjusted for gender, education and widowhood). There were no significant differences in SRH for the 90- and 95-year-olds between the study years ( $p = .057$  for linearity for the study year effect,  $p = .59$  for the age effect,  $p = .63$  for the interactions; adjusted for gender, education and widowhood). There was a significant increase in the Charlson comorbidity index among 75–85-year-olds in the later study years compared to 1989 ( $p < .001$  for linearity for study year effect,  $p < .001$  for the age effect,  $p = .13$  for the interactions; adjusted for gender, education and widowhood). No significant differences were observed among 90- and 95-year-olds over the study years ( $p = .55$  for the study year effect,  $p = .25$  for the age effect,  $p = .15$  for the interactions; adjusted for gender, education and widowhood). **Figure 2** illustrates the trends in SRH and comorbidities in individual age groups in 1989, 1999 and 2009.

**Figure 2** illustrates also the trends in PWB at different ages for 1989, 1999 and 2009. In addition, in 75-, 80- and 85-year-olds the PWB score improved significantly from 1989 to 2009 ( $p = .0055$  for linearity of the study year effect,  $p < .001$  for the age effect,  $p = .39$  for the interactions; adjusted for gender, education and widowhood). Among 90- and 95-year-olds, there was no significant difference in PWB between the study years ( $p = .49$  for the study year effect,  $p = .040$  for the age effect,  $p = .50$  for the interactions; adjusted for gender, education and widowhood).

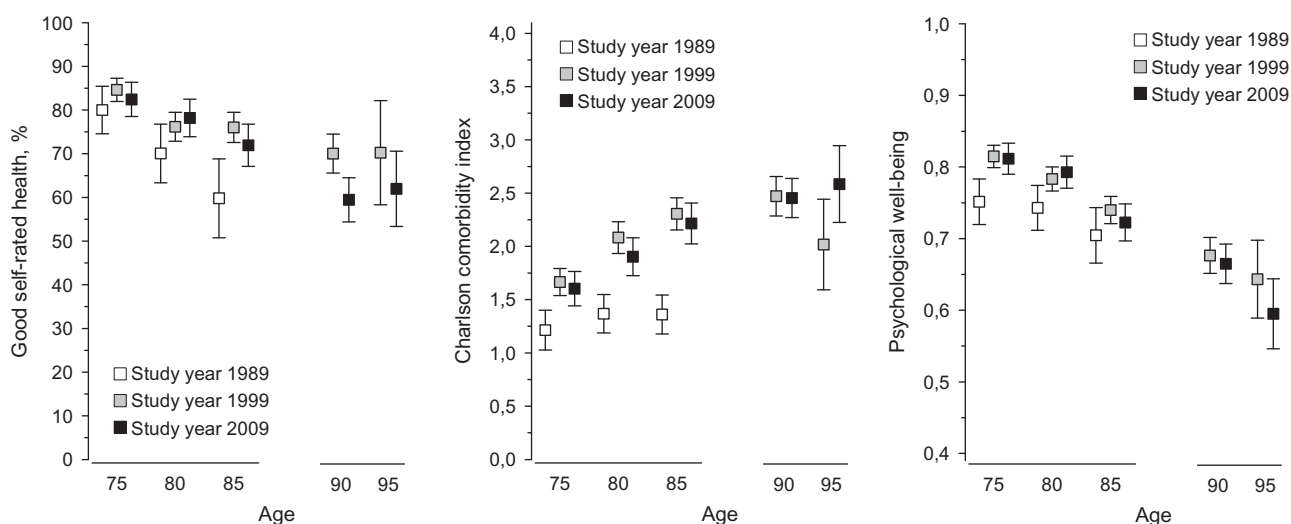
## Discussion

This study addresses disabilities, health, diseases and PWB, thus the domains indicating need for primary care services for community-dwelling older people.

Old community-dwelling people in Finland generally feel well. However, improvements in self-reported disability in our community-dwelling cohorts could not be seen from 1989 through 1999 to 2009. A lower proportion of 75–95-year-olds go outdoors daily. Comorbidities increased from 1989 to 1999 but a further increase was not observed in 2009. The SRH and PWB data suggested improvements in 75–85-year-olds over the study years.

The strength of our study lies in it being a representative sample of community-dwelling older people in Finland. Response rates were very good, although these decreased for each study time point over the two decades, which is a common phenomenon [5]. Another strength of our study is that we used identical questions at each time point.

A limitation of this study is the small number of participants particularly in the first study sample (1989). This limited the statistical power of the study to detect small differences between the three study years. Additionally, the 90- and 95-year-olds were missing in 1989, leading to exploring cohort trends among 90- and 95-year-olds in only one decade, 1999–2009. Furthermore, we had a fairly small number of items related to disability. The response rate was significantly lower in the later study years. The proportion of 75+ population institutionalized in Helsinki was 16.0%, 13.7% and 6.0% in 1989, 1999 and 2009, respectively. Most people who would have resided in nursing homes in 1989 or 1999 would now live in home-like assisted living facilities. These facilities are not, however, considered to be institutional care in today's terminology. This change in terminology may explain



**Figure 2.** Self-rated health, the Charlson comorbidity index [21] and psychological well-being [25] among community-dwelling older people in Helsinki, Finland according to their age in study years 1989, 1999 and 2009. Proportions reporting good self-rated health with 95% confidence intervals, and the mean Charlson comorbidity index and mean psychological well-being with 95% confidence intervals.

why the response rate for community-dwelling older people apparently decreased in our study.

The findings of unfavorable trends in disability in our study are in line with some previous studies [9,10,14,15]. The leveling-off in self-reported functioning in 2009 amongst our community-dwelling participants cannot be explained by the lower proportion being institutionalized as suggested earlier [5,20], because the SMRs of our participants decreased every decade. The SMRs of our cross-sectional samples mean that survival during a four-year follow-up among our respondents in 1989 was approximately 10% higher than survival among Finnish population of respective ages (background population) in 1989. Survival of our cohorts in 1999 was 29%, and in 2009 40% higher than survival of all Finnish older people of the same ages, respectively. This indicates that the participants in our later study years survived longer than their respective background population and, thus, they represent the fitter proportion of their background population compared to the respondents of earlier study years. Seasonal weather conditions in Finland neither explain the disability trends. The questionnaires were mailed during late autumn in 1989, in slippery mid-winter in 1999, but the 2009 questionnaires were mailed in summer. Interestingly, the largest proportion of respondents not going outdoors on a daily basis was found in the summer 2009 sample. Therefore, the proportion of those presenting disability in the latest study year could plausibly be an underestimation.

Possible mechanisms for any leveling-off in functioning could be the increasing prevalence of diabetes

and obesity and sedentary lifestyle, which effectively predispose subjects to frailty and mobility limitations [13,26–28]. These increasing trends have been reported all over the world. Our results suggest that health care services, especially primary care should be prepared for the future with increasing number of older people with more disabilities. GPs are the key persons to plan preventive services and procedures for these patients. Our results suggest that about 5% more of those aged 85 and 90, and 10% more of those aged 95 need daily help in the 2009 cohort than in the respective cohort of 1999. This means a significantly increasing burden for primary health care.

The Charlson comorbidity index measurements suggested an increase in comorbidities from 1989 to 1999, but it leveled-off thereafter. The increasing number of diseases has been reported earlier from 1980 to 1990 [8,9,11,13,17,18]. This may partly be explained by an increase in diagnostic activity among the oldest-old especially in primary health care after 1989. For example, failing-memory complaints or osteoporosis were diagnosed with a relatively low frequency, until dementia and osteoporosis drugs became available. However, diseases such as cancer, arthritis and diabetes show increasing trends in older later born cohorts [8,10,13].

SRH demonstrated improvements from 1989 to 2009. There are few published studies that investigated trends in SRH. Some studies that investigated time periods from 1978 to 2003 show similar findings to ours [3,29] although there are also contradictory findings [9]. The SRH in our samples may reflect improved social wellbeing and also improved PWB.

In contrast to the worrisome trend in disability, the PWB reflected improving wellbeing from 1989 until 2009. Higher education and lower proportions of widowed responders probably contribute to this positive finding. Several previous cohort studies have reported higher educational levels [28,30]. However, this is the first study to explore time trends in PWB also among the oldest-olds, as far as we are aware. Health care professionals need to understand the difference between older people and younger adults in history taking: a multimorbid older person with several relevant issues to discuss may rate SRH or PWB higher than a younger person would possibly do.

In conclusion, our study used sufficiently large samples to investigate some domains of disability, health and PWB among community-dwelling older people in Helsinki. The findings suggest a leveling-off after decades of improvements in disability, and increase in comorbidities, despite favorable trends in mortality, SRH and PWB. This may truly indicate increasing needs for appropriate, accessible and preventive primary care services in future years.

### Disclosure statement

No potential conflict of interest was reported by the author(s).

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**Jaakko Valvanne**, PhD, is a Professor of Geriatrics at the University of Tampere. He is responsible for 1989 cohort data.

**Käthe Yoder**, MD in Helsinki. She participated in the design of the study.

**Timo E. Strandberg**, PhD, is a Professor of Geriatrics at the University of Helsinki, and responsible for conception of the design, gathering data and conducting the study.

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