# Secular trends in frailty: a comparative study of 75-year-olds born 1911-12 and 1930

Helena Hörder[1], Ingmar Skoog[1], Lena Johansson[1], Hanna Falk[1], Kerstin Frändin[1 2]

[1]Neuropsychiatric Epidemiology Unit, Institute of Neuroscience and Physiology, Sahlgrenska Academy at Göteborg University, Göteborg, Sweden.

[2] Division of Physical Therapy, Department of Neurobiology, Care Science and Society, Karolinska Institutet, Stockholm, Sweden.

Corresponding author:

Helena Hörder
Neuropsychiatric Epidemiology Unit
Neuropsykiatri SU/Mölndal
Wallinsgatan 6
SE 431 41 Mölndal
Telephone: +46 31 343 81 38
Fax: +46 31 776 04 03
E-mail: Helena.Horder@vgregion.se

## Abstract

**Background:** while there is a trend towards a compression of disability, secular trends in physiological frailty have not been investigated. The aim of this paper was to report physiological frailty in two cohorts of 75-year-olds examined in 1987 and 2005.

**Methods:** Repeated cross-sectional study**.** Two population-based birth cohorts of community-dwelling 75-year-olds from Gothenburg, Sweden born in 1911-12 (n=591) and 1930 (n=637) were examined with identical methods in 1987 and 2005. Measures were three frailty criteria from Fried´s frailty phenotype: low physical activity, slow gait speed and self-reported exhaustion.

**Results:** Seventy-five year olds examined in 2005 were less frail according to the criteria low physical activity compared to 75-year-olds examined in 1987 (3 % vs 18 %, $p<0.001$).This was seen both in women and men, and among those with basic and more than basic educational level. Further, men with basic education were less frail in 2005 compared to 1987 in slow gait speed (non-significant when adjusted for body height) and low self-rated fitness, while no cohort differences were seen in men with more than basic education. Women with more than basic education were less frail in 2005 compared to1987 in slow gait speed and self-rated fitness, while no cohort difference were seen in women with basic education.

**Conclusion:** Less 75-year-olds were physiologically frail in 2005 compared to 1987, with the exception of women with low educational level, suggesting that this is a disadvantaged group that needs to receive particular attention with regard to physiological frailty.

**Keywords:** physical function, compression morbidity, postponement disability, cohort differences, physical activity, socio-economy

# Introduction

Despite a remarkable gain in life expectancy during the last century [1], it is not clear whether this is reflected in a healthier and more active elderly population. Three main scenarios have been suggested. First, the compression of morbidity theory hypothesises that healthy years are added and morbidity is being squeezed into a shorter period of life [2]. Second, the expansion of morbidity theory hypothesises that years of poor health are added [3]. Third, the postponement theory hypothesises that the years that are added to life are mainly healthy, while the period with disabilities remains unchanged but postponed to a higher age [4].

Disability is commonly used as an adverse outcome among older persons. A yearly decrease of about 1 % in disability rates has been observed in the US from the 1970s to the 1990s [5]. In Sweden, improvements were observed during the 1970s and 1980s [6, 7], but this trend leveled off during the 1990s [8, 9]. It is unclear if the improvements seen in recent years have reached all groups in society, as socioeconomic disparities seem to have increased [10, 11].

Trends in disability rates are influenced by environmental change and technical developments. Therefore it is important also to analyse trends in measures that are sensitive to changes in the capacity of the individual.

Frailty is a clinical state that increases an individual's vulnerability for developing increased dependency and/or death when exposed to a stressor [12]. Slow gait speed, exhaustion, low physical activity, weakness and unintentional weight loss has been suggested to constitute a physiological frailty phenotype [13]. However, trends in physiological frailty have not been fully investigated. Thus, the aim of this paper was to compare trends in frailty according to Fried´s criteria in 75-year-olds using data from two birth cohorts examined in 1987 and 2005.

## Methods

## Samples

Two cohorts of 75-year-olds (born 1911-12 and 1930) were examined with identical methods, within the repeated cross-sectional Gerontological and Geriatric Population Studies in Gothenburg, Sweden (H70). These studies were initiated in 1971 with the aim to increase understanding of normal ageing. Samples were systematically obtained from the Swedish Population Register based on specific birth dates, and included persons living in Gothenburg. The details and procedure for the examination of the original sample has been described elsewhere [14]. This paper includes only non-institutionalised persons.

The cohort born in 1911-12 comprised a sample of 1245 persons, living in Gothenburg, selected at the age of 70 and still alive in 1987 (n=844). Among those, 649 accepted to take part (response rate 77 %) and 591 (327 women and 264 men) attended a research clinic for tests of their fitness. Of these, 182 had been part of a 2-year medical-social intervention in Gothenburg [15]. Those who took part in the intervention and those who only took part in health examinations did not differ in fitness, and only to a small extent in physical activity, at the age of 75[16].

The cohort born in 1930 was invited to take part in health examinations in 2005-06 (n=1250). Ten died before they could be examined, two had emigrated outside Sweden, 32 could not speak Swedish and 18 could not be traced, leaving an effective sample of 1188 individuals. Among these, 758 accepted to take part (response rate 64 %), and 637 (383 women and 254 men) took part in examinations dealing with fitness.

Responders and non-responders in both samples were similar regarding gender and number of hospitalisations during a 4-year-period preceding the examinations. In both cohorts, non-responders, compared to responders, more often died before age 78 years (women 1911-12 cohort 42 % vs 24 %; women1930 cohort 27 % vs 17 %; men 1911-12 cohort 61 % vs 42 %;

men 1930 cohort 44 % vs 29 %, p<0.001) and were less often married (men) (1911-12 cohort 61 % vs 72 %, p<0.05; 1930 cohort: 55 % vs 72 %, p<0.001).

The study was approved by the Regional Ethical Review Board. Written informed consent was obtained from the participants after they had received a complete description of the study.

## Measures

Three out of five criteria according to Fried´s frailty phenotype were available:

- *Physical activity* was assessed according to a 6-grade scale ranging from hardly any physical activity to hard exercise regularly and several times a week [17]. Low physical activity was defined as level 1-2 (mostly sitting).
- *Self-selected gait speed* was examined for 20 meters indoors with a standing start. The type of walking aids was recorded [18]. The walking test has good intra- and interrater reliability [19]. A slow gait speed was defined as <1 meter/sec [20].
- *Exhaustion* was assessed by "How would you judge your current physical fitness?". Response alternatives ranged from very poor to very good on a 5-point Likert scale [17]. Exhaustion was defined as level 1-2.

*Background characteristics*: education was used as a proxy for socioeconomic status and divided into basic and more than basic education (1911-12 cohort basic ≤6 years; 1930 cohort basic ≤7 years, due to decision in Sweden in 1937 to increase elementary school by one year), marital status, height, weight, body mass index (BMI) and smoking habits.

## Statistical Analyses

Cohort differences, stratified by gender and educational level, were tested with Fisher´s exact test. Gender differences and differences between educational levels (basic versus higher) within cohorts were tested with logistic regression. To test interaction effects, logistic regression models with the interaction term gender*cohort and education*cohort (stratified by gender) were used for each frailty indicator. Adjustments for age (in months) were made in all analyses. This did not have any impact on the results and only unadjusted results are therefore presented. Analyses concerning gait speed were adjusted for body height. Tests were carried out using SPSS (Statistical Package for Social Sciences, Chicago IL for Windows, version 18). P-values were two-tailed and considered significant at $p \leq 0.05$. Non-significant p-values are not reported except for tests of interaction where p-values $\leq 0.10$ could be considered relevant due to the lower statistical power of interaction analyses.

# Results

Seventy-five year-olds examined in 2005 had higher educational level, height, weight and BMI compared to those examined in 1987. Men examined in 2005 had lower 3-year-mortality rate and were less often smokers compared to men examined in 1987. Among women, those examined in 2005 were more often smokers compared to those examined in 1987 (Table 1).

## Cohort differences in relation to gender

Among women, a lower proportion was physically inactive in 2005 compared to 1987, while no cohort difference was seen for slow gait speed or low self-rated fitness.

Among men, a lower proportion were physically inactive, had a slow gait speed (not significant when adjusted for body height) and a low self-rated fitness in 2005 compared to 1987.

Gender differences were seen in 2005 in that fewer men than women had a slow gait speed. No significant gender differences were found in any other frailty criteria, or in 1987, and no interaction effects gender*cohort (Table 2).

## Cohort differences in relation to educational level

Among women with more than basic education, a lower proportion had slow gait speed (interaction education* cohort p=0.057) and low self-rated fitness (interaction education*cohort p=0.10) in 2005 compared to 1987, while no cohort differences were seen in these indicators in women with basic education. There were no significant differences between educational levels in any of the frailty criteria in women in 1987. However, in 2005, women with more than basic education less often had slow gait speed and low self-rated fitness compared to those with basic education, indicating no effect of education in 1987 but an effect in 2005 among women.

Among men with more than basic education, there were no cohort differences, while men with basic education less often had a slow gait speed (interaction education* cohort p=0.18) and low self-rated fitness (interaction education*cohort p<0.001) in 2005 compared to in 1987. Men with more than basic education less often had slow gait speed in 1987, while no significant differences were seen between educational levels in 2005, indicating an effect of education in 1987, but not in 2005 among men (Figure 1).

## Discussion

A lower proportion of 75-year-olds examined in 2005 were frail according to the criteria low physical activity compared to 75-year-olds examined in 1987. This was seen in both women and men and in both educational levels (basic and more than basic). Further, lower rates of slow gait speed and low self-rated fitness were seen in 2005, compared to 1987, in men with basic education and in women with more than basic education. Thus, inequalities due to educational level increased among women and decreased among men.

Less frailty among 75-year-olds in 2005 compared to 1987 is in line with previous research on disability rates in older persons in developed countries [1, 21]. A previous report from our group showed that the 1911-12 cohort had better physical functioning (women) than a cohort born 1901-02 at age 70 years [6], indicating that improvements in physical functioning occurred already between 1971 and 1981. Our results suggest that improvements have continued until 2005. In contrast to these findings, others have reported that both self-reported and performance-based physical functioning deteriorated among Swedes aged 77+ between 1992 and 2002, especially among persons aged above 80 years [8]. This indicates that improvements in physical functioning might have leveled off or even reversed after 1992, or that the positive health trend is less evident amongst the oldest-old.

Improvements in frailty were more pronounced in men than in women. This is in contrast to results on secular trends in disability where women have improved more [22, 23]. In addition, the lower rates of frailty in 2005 in slow gait speed and low self-rated fitness were seen in men with basic education and women with more than basic education. This could be seen in light of the finding that life expectancy differs considerably by educational level. In Sweden, this difference increased in both women and men from 1987 to 2007, but women with low education gained less in life expectancy than any other group [24]. Increased disparities

between educational levels have been reported among older persons in the US between 1982 and 2002 [10], while they seem to be persistent in older persons from 1968 to 1991 in Sweden [11]. The group we describe as low educated in the later born cohort is a substantial smaller group compared to in the earlier born cohort. A low educational level might therefore be a more negative selecting factor in societies with higher educational levels. Our results indicate that older women with a low educational level need special attention in relation to physiological frailty.

Physical activity was the frailty indicator with largest improvement between cohorts. This was seen in both genders and both educational levels. Interestingly, this was seen in spite of the fact that 31 % of those examined in 1987 had been part of a physical activity intervention at age 70 years. Increased levels of physical activity in older persons during a similar time period have also been reported by others [25-27]. Previous reports from the H70 -studies demonstrated that the 1911-12 cohort was less physically active than the 1930 cohort also at age 70, while no difference was seen between the 1911-12 cohort and a cohort born 1901-02 [28, 29]. Thus, increases in physical activity seem to have taken place in both 70 and 75-year-olds during the 1990s.

Several limitations need to be mentioned. Firstly, the response rate declined from 77 % in 1987 to 63 % in 2005. The three-year-mortality rate was higher in non-responders than in responders in both samples, which indicates a healthy-population bias in both cohorts. This bias may thus have a larger influence in the 1930 cohort, due to its higher refusal rate. Secondly, 31 % of the participants in the 1911-12 cohort had been part of a health-promoting intervention at age 70. This might have led to better results for this sample as compared to other persons born that year, with a risk of underestimating real health improvements between cohorts. However, comparisons between those who took part in the intervention and those

who only took part in health examinations revealed no significant differences in any frailty criteria, which also a previous paper has shown [16]. Rather, we found a non-significant trend towards higher rates of frailty in the intervention group among men.

Further, the mean age for "75-year-olds" at the examination in 2005 was 75.7 (range 75.0-76.9) years compared to 76.1 (range 75.2-77.9) years in 1987, making the 1911-12 cohort chronologically slightly older and at a higher risk for functional decline. However, adjustment for age in months did not change the results. Thirdly, we did not have comparable data for all frailty indicators as suggested by Fried [13]. For example, data on unintentional weight loss was not recorded and grip strength was measured with different instruments in 1987 and 2005. Further, critical aspects in repeated cross-sectional and longitudinal studies are the reliability and validity of outcome measures over time and longitudinal response-shifts, i.e. a change in the meaning of a respondent's self-evaluation as a result of changes in the internal standards, values in society, conceptualization of the construct, and also social desirability, which have to be considered for self-rated health indicators. Fourthly, some of the subgroups (e.g. education stratified by gender) might have been too small to yield statistical power. This might have led to some false negative results. The stratifications might also have led to false positive results as the number of tests increased. Fifthly, all studies of older persons include a survival bias. We can thus not make any conclusions about cohort difference at younger ages. Finally, we only examined 75-years-olds and therefore cannot generalize findings to other ages.

In conclusion, 75-year-olds were less frail in 2005, compared to 1987, suggesting that there is a postponement of morbidity. This might have large implications due to the increasing number of older persons. However, women with low educational level did not improve, suggesting that this is a disadvantaged group that needs to receive particular attention with regard to physiological frailty.

## Keypoints

- Less 75-year-olds were physiologically frail in 2005 compared to 1987
- Low physical activity was the indicator with largest improvement
- When stratified by gender and educational level, women with low educational level did not have the same positive trend

## Funding

This work was supported by the Forte-centre Aging and health: Centre for capability in ageing (AGECAP), the Swedish Research Council for Health, Working Life and Wellfare (2004-0145, 2006-0596, 2008-1111, 2010-0870, Epilife 2006-1506, AGECAP 2013-2300, 2013-2496), the Swedish Research Council (no. 11267, 2005-8460, 825-2007-7462, 825-2012-5041, 2013-8717), the Bank of Sweden Tercentary Foundation, Swedish Brain Power, Stiftelsen Gamla Tjänarinnor, Hjalmar Svenssons Forskningsfond, Research and development council of the county Södra Älvsborg, Systrarna Greta Johansson and Brita Anderssons minnesfond, Axel Linders stiftelse, Stiftelsen Sigurd and Elsa Goljes Minne,, Stohnes stiftelse, Lundgrenska stiftelserna

## Conflict of interests

None declared

## Acknowledgements

We are very grateful to the persons who consented to participate in this study and to Valter Sundh for statistical support.

## References

1. Christensen K, Doblhammer G, Rau R, Vaupel JW. Ageing populations: the challenges ahead. Lancet. 2009;374(9696):1196-208.

2. Fries JF, Bruce B, Chakravarty E. Compression of morbidity 1980-2011: a focused review of paradigms and progress. J Aging Res. 2011;2011:261702.

3. Olshansky SJ. Trading off longer life for worsening health. The expansion of morbidity hypothesis. J of Aging and Health. 1991;3:194-216.

4. Manton K, XiLiang G. Changes in the prevalence of chronic disability in the United States black and non-black population above age 65 from 1982 to 1999. ProcNatl Acad Sci. 2001;11:6354–9.

5. Murabito JM, Pencina MJ, Zhu L, Kelly-Hayes M, Shrader P, D'Agostino RB Sr. Temporal trends in self-reported functional limitations and physical disability among the community-dwelling elderly population: the Framingham heart study. Am J Public Health. 2008;98(7):1256-62.

6. Wilhelmson K, Allebeck P, Steen B. Improved health among 70-year olds: comparison of health indicators in three different birth cohorts. Aging Clin Exp Res. 2002;14(5):361-70.

7. Persson GB, G B, p A, L A. Elderly peoples health - 65 and after. Scand J Public Health. 2001.

8. Parker MG, Ahacic K, Thorslund M. Health changes among Swedish oldest old: prevalence rates from 1992 and 2002 show increasing health problems. J Gerontol A Biol Sci Med Sci. 2005;60(10):1351-5.

9. Parker MG, Thorslund M. Health trends in the elderly population: getting better and getting worse. Gerontologist. 2007;47(2):150-8.

10. Schoeni RF, Martin LG, Andreski PM, Freedman VA. Persistent and growing socioeconomic disparities in disability among the elderly: 1982-2002. Am J Public Health. 2005;95(11):2065-70.

11. 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(3):190-8.

12. Morley JE, Vellas B, van Kan GA, Anker SD, Bauer JM, Bernabei R, et al. Frailty consensus: a call to action. J Am Med Dir Assoc. 2013;14(6):392-7.

13. Fried LP, Tangen CM, Walston J, Newman AB, Hirsch C, Gottdiener J, *et al*. Frailty in older adults: evidence for a phenotype. J Gerontol A Biol Sci Med Sci. 2001;56(3):M146-56.

14. Rinder L, Roupe S, Steen B, Svanborg A. Seventy-year-old people in Gothenburg. A population study in an industrialized Swedish city. Acta Med Scand. 1975;198(5):397-407.

15. Eriksson BG, Mellstrom D, Svanborg A. Medical-social intervention in a 70-year-old Swedish population. A general presentation of methodological experience. Compr Gerontol C. 1987;1:49-56.

16. Frändin K, Johannesson K, Grimby G. Physical activity as part of an intervention program for elderly persons in Göteborg. Scand J Med Sci Sports. 1992;2(4):218-24.

17. Frändin K, Grimby G, Mellstrom D, Svanborg A. Walking habits and health-related factors in a 70-year-old population. Gerontology. 1991;37(5):281-8.

18. Frändin K, Grimby G. Assessment of physical activity, fitness and performance in 76-year-olds. Scand J Med Sci Sports. 1994;4:41-6.

19. Connelly D, Stevenson T, Vandervoort A. Between- and within-rater reliability of walking tests in a frail elderly population. Physiother Can. 1996(58):47-51.

20. Studenski S, Perera S, Wallace D, Chandler JM, Duncan PW, Rooney E, *et al*. Physical performance measures in the clinical setting. J Am Geriatr Soc. 2003;51(3):314-22.

21. Christensen K, Thinggaard M, Oksuzyan A, Steenstrup T, Andersen-Ranberg K, Jeune B, *et al.* Physical and cognitive functioning of people older than 90 years: a comparison of two Danish cohorts born 10 years apart. Lancet. 20132;382(9903):1507-13.

22. Engberg H, Christensen K, Andersen-Ranberg K, Vaupel JW, Jeune B. Improving activities of daily living in danish centenarians--but only in women: a comparative study of two birth cohorts born in 1895 and 1905. J Gerontol A Biol Sci Med Sci. 2008;63(11):1186-92.

23. Falk H, Johansson L, Ostling S, Thogersen Agerholm K, Staun M, Host Dorfinger L, *et al.* Functional disability and ability 75-year-olds: a comparison of two Swedish cohorts born 30 years apart. Age Ageing. 2014 Mar 3.

24. Statistics Sweden. Livslängden i Sverige 2001-2010 : livslängdstabeller för riket och länen : [Life expectancy in Sweden 2001-2010 : life tables for the country and by county]. Stockholm: Statistiska Centralbyrån 2011.

25. Lennartsson C, Heimersson I. Äldres hälsa. Folkhälsorapport 2009. Västerås: Socialstyrelsen; 2009.

26. Heikkinen E, Kauppinen M, Rantanen T, Leinonen R, Lyyra TM, Suutama T, *et al.* Cohort differences in health, functioning and physical activity in the young-old Finnish population. Aging Clin Exp Res. 2011;23(2):126-34.

27. Palacios-Cena D, Alonso-Blanco C, Jimenez-Garcia R, Hernandez-Barrera V, Carrasco-Garrido P, Pileno-Martinez E, *et al*. Time trends in leisure time physical activity and physical fitness in elderly people: 20 year follow-up of the Spanish population national health survey (1987-2006). BMC Public Health. 2011;11:799.

28. 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. J Gerontol A Biol Sci Med Sci. 2001;56(12):M780-4.

29. Eiben G, Dey DK, Rothenberg E, Steen B, Bjorkelund C, Bengtsson C, *et al.* Obesity in 70-year-old Swedes: secular changes over 30 years. Int J Obes (Lond). 2005;29(7):810-7.

# Tables and figures

**Table 1**. Characteristics of 75-year-olds examined in 1987 and 2005, by gender

| | Women | | Men | |
|---|---|---|---|---|
| | Examined in 1987 (n=327) | Examined in 2005 (n=383) | Examined in 1987 (n=264) | Examined in 2005 (n=254) |
| Three-year-mortality, % | 9 | 6 | 20 | 9*** |
| More than basic education, % | 21 | 43*** | 29 | 46*** |
| Living alone, % | 61 | 54 | 28 | 24 |
| Current or former smoker, % | 25 | 38*** | 72 | 65*** |
| Height, cm, mean, (sd) | 159.6 (5.7) | 161.5 (6.1)** | 172.4 (6.5) | 175.2 (6.5)** |
| Weight, kg, mean, (sd) | 65.6 (12.1) | 69.0 (12.1)*** | 76.4 (11.0) | 82.6 (12.6)*** |
| BMI, kg/m², mean (sd) | 25.8 (4.6) | 26.6 (4.6)*** | 25.7 (3.4) | 26.8 (3.6)*** |

*p<0.05, **p<0.01, *** p<0.001: cohort 1911 versus 1930

Basic education: 1911-12 cohort ≤6 years; 1930 cohort ≤7 years

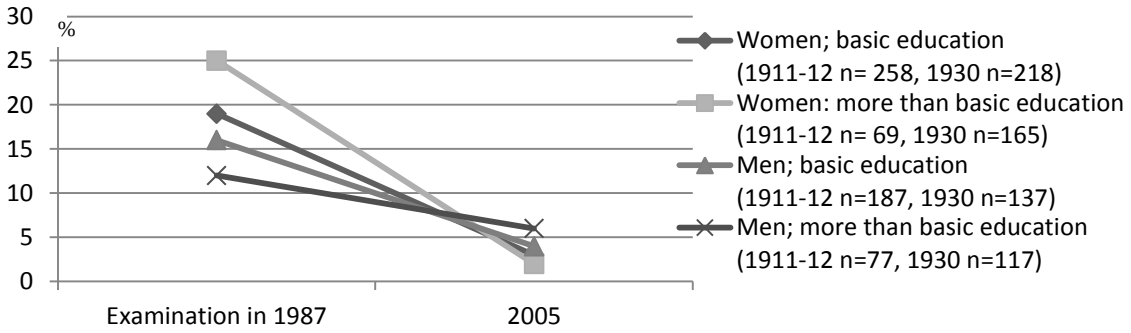
**Table 2**. Prevalence of frailty in 75-year-olds examined in 1987 and 2005

| | Examined in 1987 | Examined in 2005 |
|---|---|---|
| Low physical activity, % | | |
| *All* | *18 (n=106)* | *3 (n=19)**** |
| *Women* | 21 (n=69) | 2 (n=8)*** |
| *Men* | 15 (n=40) | 5 (n=13)*** |
| Slow gait speed, % | | |
| *All* | *19 (n=112)* | *16 (n=102)* |
| *Women* | 22 (n=72) | 21 (n=80) |
| *Men* | 17 (n=45) | 10 (n=25)* |
| Low self-rated fitness, % | | |
| *All* | 19 (n=112) | 16 (n=102) |
| *Women* | 18 (n=59) | 17 (n=65) |
| *Men* | 20 (n=53) | 14 (n=36)* |

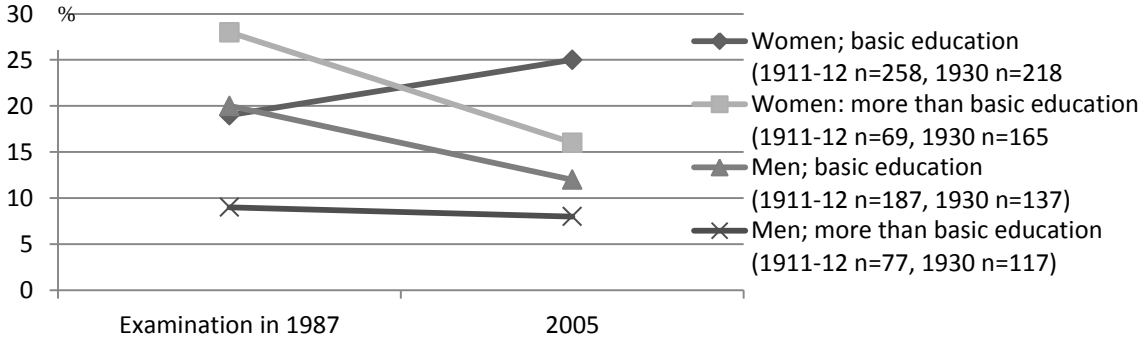
*p<0.05, **p<0.01, *** p<0.001: cohort 1911-12 versus 1930.
When adjusted for body height, differences in gait speed were non-significant.

Low physical activity: level 1-2 (mostly sitting) on a 6-grade scale winter, slow gait speed: < 1 m/sec, low self-rated fitness: level 1-2 on a 5-grade scale,
Gender differences within cohorts (non-significant not reported)
1987: non
2005: slow gait speed <0.01

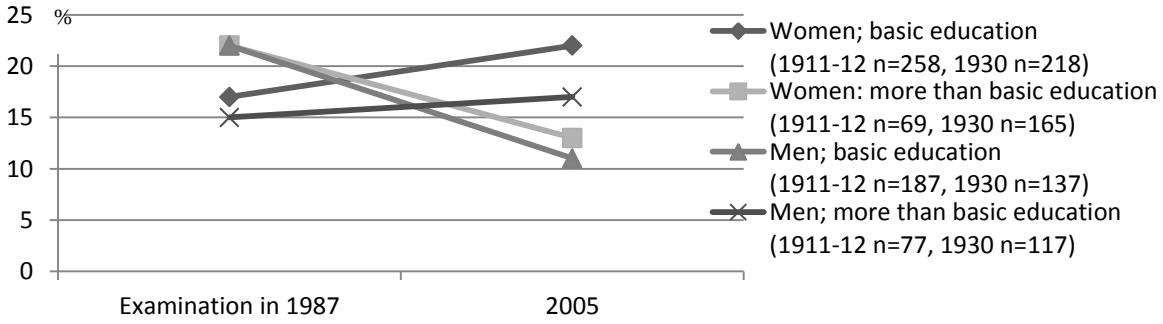
Tests of interaction effect gender* cohort: no significant interactions




**Low physical activity** (level 1-2 on 6-grade activity scale)
Cohort differences by educational levels: women basic p<0.001; women more than basic p<0.001; men basic p<0.001; men more than basic p<0.01
Differences according to educational level within cohorts: women 1987 p>0.20; women 2005 p>0.20; men 1987 p>0.20; men 2005 p>0.20
Interaction.education*cohort: women p=0.44; men p=0.80




**Slow gait speed (< 1 m/sec)**
Cohort differences by educational levels: women basic p=ns; women more than basic p<0.05; men basic p<0.05; men more than basic p<ns
Differences according to educational level within cohorts: women 1987 p=0.12; women 2005 p=0.05; men 1987 p=0.05; men 2005 p>0.20
Interaction.education*cohort: women: p=0.057; men. p=0.18




**Low self-rated fitness (**level 1-2 on a 5-grade scale)
Cohort differences by educational level: women basic p=ns; women more than basic p<0.05, men basic p<0.05; men more than basic p<ns
Differences according to educational level within cohorts: women 1987 p<0.20; women 2005 p<=0.05; men 1987 p>0.20; men 2005 p=0.15
Interaction education*cohort: women p=0.10; men p<0.001

**Figure 1.** Prevalence of frailty (low physical activity, slow gait speed and low self-rated fitness) among 75-year-olds examined in 1987 and 2005, by gender and educational level