# Changes in fruit, vegetable, and fish consumption after statutory retirement: a prospective cohort study

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Running head: Food consumption after statutory retirement

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**Abstract**

Retirement is a major life transition affecting health and health behaviour, but evidence on how this transition contributes to changes in healthy food habits is scarce. We examined whether the consumption of fruit and vegetables as well as fish changes after transition into statutory retirement. The data were derived from the prospective Helsinki Health Study. At phase 1 in 2000–2002, all participants were 40–60-year-old employees of the City of Helsinki, Finland (*n* 8960, response rate 67%). Follow-up surveys were conducted in 2007, 2012, and 2017 (response rates 79-83%). Using the 4 phases, we formed 3 nested cohorts in which the participants either continued working or moved to statutory retirement. The final analytical sample consisted of 6887 participants (14 357 observations). Frequency of fruit, vegetable, and fish consumption were calculated from 22-item food frequency questionnaires. Analyses of repeated measures of food consumption before and after retirement transition were conducted with negative binomial mixed model, adjusting for age, marital status, limiting long-standing illness, and household income. During the follow-up, altogether 3526 participants retired. Transition to retirement was associated with a decrease in vegetable consumption among women and, contrarily, with an increase in fruit consumption among men ($P < 0.05$ for interaction between time and employment status). Fish consumption did not differ by the change in employment status. Statutory retirement can have mixed effects on healthy food habits, and these can differ between food groups and genders. Healthy food habits should be promoted among employees transitioning to retirement.

## Introduction

Due to growing number of retirees, it is essential to support healthy ageing, in which the promotion of healthy food habits is crucial.[1] There is a considerable amount of evidence showing that a diet rich in fruit, vegetables and fish is associated with a lower risk of chronic diseases[2–4], better quality of life[5] and longevity[6].

Fruit and vegetable consumption has been observed to be higher among older compared to younger adults in Western countries.[7] In Finland, recent nationwide findings have suggested that consumption of fruit increases and that of fresh vegetables decreases with age, although clear age group differences have not always been found.[8, 9] In both older and younger age groups fruit and vegetable consumption levels have decreased lately, as the previous general positive trend has reversed in Finland.[8,10,11] Fish consumption increased in Finland to some extent in 2007–2012 among men but decreased among women in an older age group,[10,12] and the latest nationwide survey in 2017 showed no age group differences.[9]

Transition to statutory retirement (retiring at the 'normal, age-based retirement age', i.e., not premature retirement, such as early retirement or disability retirement) is a major life event which can affect many aspects of retirees' lives including daily routines, availability of time, income and social relationships.[4,13,14] It is a critical time in life in terms of changes in health and health behaviours, and thus food habits might also be affected.[15] Only a few studies have focused on the associations between transition to retirement and food habits, and results have been inconsistent. The two most recent reviews that have been published on this topic concluded that food habits have been observed to either improve or deteriorate, or to remain unaffected.[4,16] In our own previous study, retired women had healthier food habits than continuously employed women.[17] Improvement has been explained to happen for example due to increased free-time that might promote healthier cooking at home.[18,19] Deterioration has been suggested to be caused by the decline in income associated with retirement, which might lead to a decreased consumption of fruit, vegetables, and fish that could cost more than some other food choices.[19,20] In Finland, where having lunch in staff canteen is common and associated with recommended food habits including higher vegetable and fish consumption, losing access to this facility could also be assumed to explain some of the decrease in healthy food habits.[21–23]

Overall, it is thus far largely unclear how such food habits are affected by the transition to retirement. To increase the understanding on the associations between retirement and healthy food habits, studies utilising a design that includes a within-individual follow-up with repeated measurements on food consumption before and after retirement are needed. In the present study, our aim was to examine the associations between transition into statutory retirement and fruit, vegetable and fish consumption, as indicators of recommended food habits.

## Methods

*Participants and the assessment of retirement*

This research is part of the Helsinki Health Study (HHS), a longitudinal cohort among ageing employees of the City of Helsinki, Finland.[24] The data were derived from postal surveys. In 2000–2002 baseline questionnaires were mailed to the employees who turned 40, 45, 50, 55 or 60 in one of those years (Phase 1, *n* 8960, response rate 67%). The first follow-up survey was collected in 2007 among the respondents to the baseline survey (Phase 2, *n* 7332, response rate 83%), the second follow-up in 2012 (Phase 3, *n* 6814, response rate 79%), and third follow-up in 2017 (Phase 4, *n* 6832, response rate 82%). Majority of the participants were women (80% at baseline), corresponding to the target population and the Finnish municipal sector in general. Further, according to non-response analyses, the baseline data reflect the target population decently, even though men, younger participants, manual workers, and those with poorer health as indicated by sickness absence were slightly underrepresented among the respondents.[24]

The four study phases consisted of three follow-up periods: Follow-up period 1 between Phases 1 and 2 (2002-2007); Follow-up period 2 between Phases 2 and 3 (2007-2012); and Follow-up period 3 between Phases 3 and 4 (2012-2017). Each follow-up period included participants who were employed for the entire period (later ‘employed’), and those entering statutory retirement during the period (later ‘retired’). We considered individuals as employed if they responded to be working full-time or part-time. Statutory retirement was defined as retiring at the ‘normal, age-based retirement age’ (, i.e., not premature retirement, such as early retirement or disability retirement), using questions regarding main type of activity, the date of retirement, and the retirement type. If the respondents had reported to be both retired and working they were classified as employed. Individuals who retired due to disability were excluded from analysis.

For each follow-up period, participants were part of the period if they were employed and working at the beginning of the period. For instance, to be included in the follow-up period 2 a participant had to be employed in 2007. Participants were no longer part of the sequential follow-up period after transitioning to statutory retirement or moving out of working life. For example, a participant who was included in the follow-up period 1 and 2, but retired or stopped working for other reasons during the second period was no longer included in the follow-up period 3. All the follow-up periods were pooled in the analysis. The final data for the analysis consisted of 6887 participants (81% women) with a total of 14 357 follow-up periods across the four study phases. During the follow-up there were 3526 transitions to statutory retirement.

The ethics committees of the Department of Public Health, University of Helsinki and the health authorities of the City of Helsinki, Finland approved the study protocol.

*Fruit, vegetable, and fish consumption*

Participants' food consumption was assessed using a 22-item food frequency questionnaire (FFQ). The same questionnaire was used at each phase. We selected fruits, fresh vegetables, and fish because their sufficient consumption is one of the main dietary challenge in Finland at population level. Berry consumption was enquired with in the same item with fruit consumption. The questions for fruit and berry consumption as well as fish consumption did not specify for the type or cooking methods used. Thus, other than fresh fruits and berries and fish cooked with various methods may have been reported in these items. Participants were asked to estimate how often they had eaten the food items during the past 4 weeks, using alternatives as follows: not during the past 4 weeks, 1–3 times a month, once a week, 2–4 times a week, 5–6 times a week, once a day and two times or more daily. From these options, the frequency of food consumption during four weeks (28 days) was calculated by using the following frequencies: 0, 2, 4, 12, 22, 28, and 56. Thus, a participant who reported to consume fruit 2–4 times a week, consumed fruit 12 times during four weeks.

*Covariates*

Covariates included age, marital status, limiting long-standing illness, and household income. Covariates were all self-reported taken from baseline questionnaire and from each follow-up year's questionnaire, and modelled as time-variant variables. Age and household income were used as continuous variables. Marital status was categorized as married or cohabiting and single, divorced or widowed. Limiting long-standing illness was a binary variable: In the questionnaire, the participants were asked whether they have a longstanding illness, and if so, whether the illness

limits working or other daily tasks. The participants who reported that they have a longstanding illness that limits their daily tasks were categorised as those with limiting long-standing illness, and the others were considered as being without limiting long-standing illness. Socioeconomic variables such as education, occupational class and household income are mostly telling the same story, thus we could have included any of these into our analyses. However, considering our main exposure, transitioning to statutory retirement, household income is likely to affect it the most by decreasing it. Decreased household income has also a major negative impact on individuals' capability to buy expensive foods, such as fresh fruits, vegetables and fish. Although also education and occupational class are associated with dietary intake, they do not have strong association with statutory retirement. Further, diet is likely affected by income the most as income can be higher or lower inside the same occupational and educational groups. Lastly, education and occupation do not vary over time as much as household income may vary which also supported our decision to use it in our analyses.

*Statistical analyses*

Associations between change in employment status and fruit, vegetable, and fish consumption was analysed using negative binomial mixed model. This association was explored by placing an interaction term between the variable indicating employment status and follow-up time. To account for repeated measures within individuals, a subject specific random intercept was included in the models. We calculated marginal effect at mean holding age as constant in all models. Consumption frequencies of the average fruit, vegetable, and fish consumption during four weeks and their 95% confidence intervals (CI) were reported at the beginning and at the end of the pooled follow-up period by the employment status. All the analyses were carried out separately for women and men since there were statistically significant interactions between change in employment status and gender when analysing fruit, vegetable, and fish consumption frequencies ($P < 0.05$ for all interactions).

To control for confounding, analyses were first adjusted for age. The second model was additionally adjusted for marital status; the third model further for limiting long-standing illness; and the fourth model also for household income. Due to missing information in some of the variables the amount of excluded observations varied from 169 (0.7%) to 1546 (6.5%) in women and 36 (0.7%) to 276 (5.4%) in men depending on the model.

Data were analysed using IBM SPSS statistics version 24. The GENLINMIXED procedure in SPSS takes into account the correlation between observations that appear in designs with repeated measures.[25]

## Results

Descriptive data with means and standard deviations are presented in table 1. Retired participants tended to be older than those who were employed, even though we did not conduct any statistical test for these descriptive data (Table 1). Moreover, retired participants also reported having a limiting long-standing illness more often. Household income was lower among retired women compared to employed women. In contrast, household income was higher among retired men compared to employed men. Similar difference between women and men was found in marital status as retired women were less often and retired men were more often married or cohabiting compared to those who were employed.

*Fruit consumption* patterns differed among women and men (Table 2). In women, the changes in fruit consumption did not differ by change in employment status, even though those who retired decreased the consumption more. Looking at cross-sectional differences, fruit consumption frequencies were fairly similar at the beginning and at the end of the follow-up period between retired and employed women.

In men, the changes in fruit consumption between retired and employed were different. During the follow-up, fruit consumption increased among the retired, whereas it decreased among the employed. When comparing fruit consumption cross-sectionally at the beginning of the follow-up it did not differ between retired and employed men. At the end of the follow-up, however, the differences were significant, retired men having higher consumption.

In women, the change in *vegetable consumption* differed by change in employment status between those who retired and those who were employed when age, marital status and limiting long-standing illnesses were adjusted for ($P < 0.05$ for interaction, data not shown) but the association attenuated after adjusting for household income ($P = 0.062$, Table 2). Vegetable consumption remained unchanged among employed women and decreased among retired women. When comparing vegetable consumption cross-sectionally at the beginning of the follow-up period, there was no statistically significant difference between employed and retired women. However, vegetable

consumption was higher in the employed women compared to the retired at the end of the follow-up period.

In men, the change in vegetable consumption did not differ by change in employment status, even though the trend in vegetable consumption decreased slightly more in retiring men than among those who were employed. In line with the aforementioned, there were no cross-sectional differences in vegetable consumption either at the beginning or at the end of the follow-up period between employed and retired men.

In women, the changes in *fish consumption* did not differ by change in employment status even though fish consumption remained the same in the employed and decreased slightly among the retired women during the follow-up (Table 2). When comparing fish consumption at the beginning of the follow-up period there was no statistically significant difference among employed and retired women. At the end of the follow-up, the fish consumption was higher among the employed and the differences in fish consumption were statistically significant when only age, marital status, and limiting long-standing illness were adjusted for (data not shown). However, further adjustment for household income attenuated the association and the difference was no longer significant (Table 2).

Similarly in men, no statistically significant difference in the changes of fish consumption by change in employment status was found. In addition, fish consumption did not differ at the beginning or at the end of the follow-up period between employed and retired men.

## Discussion

This study investigated longitudinal associations between transition to statutory retirement and fruit, vegetable and fish consumption as indicators of following dietary recommendations. The main findings of this study were that transition to statutory retirement was associated with a decreased consumption of vegetables among women and with an increased consumption of fruit among men, but no association was found for the consumption of fish.

The association between the transition to retirement and decreased consumption of vegetables among women could be explained by multiple reasons. Losing access to the staff canteen is a potential explanation for the descending trend of vegetable consumption after retirement, as in Finland staff canteens provide lunch options which are more in line with dietary recommendations

than those provided by e.g. restaurants.[21-23] Another explanatory factor might be the declined income after the change from paid employment to statutory retirement. Furthermore, older age groups have also been reported to have poor appetite for vegetables in general.[26] Among men, transition to retirement was not associated with vegetable consumption. The frequency of vegetable consumption was lower among men than women throughout the study period, which is in line with the nationwide cross-sectional surveys in Finland.[9,10]

Fruit consumption increased among men after transition to statutory retirement. Even though we found that this result was not confounded by marital status, the working status of a spouse could possibly explain this finding. If spouse is also retired and, for example, cooking lunch and preparing early afternoon snacks at home, this may influence men's food habits. One reason for the increased fruit but not vegetable consumption among men could be that older people, especially men, might find eating fruit less burdensome than preparing vegetables. Fruit can be also more easily available at home than at work. Fruit consumption differed between women and men both at the beginning and at the end of the follow-up period, with the level of consumption being noticeably lower among men. Among women, there was no association between retirement and fruit consumption. This result could be due to women already eating more fruit to begin with and being generally more used to eating fruits compared to men. Women could potentially be more likely to have fruits as a snack at work compared to men.

With regard to changes in fish consumption, there were no associations found for women or men. There was a difference in fish consumption at the end of the follow-up period between women who had retired and those who were still in employment, but this difference disappeared after adjusting for household income. Hence, the decrease in fish consumption after transition to retirement could be at least partly explained by participants' economic status. Furthermore, the loss of access to the staff canteen lunch might explain this to some extent as fish is a weekly meal in most staff canteens, but possibly not as common at home.

Previous studies have, overall, shown inconsistent associations between retirement and food habits. Some studies have found an association between retirement and a change to unhealthier food habits. A French prospective study found that transition to retirement was associated with a decrease in fruit consumption and overall unhealthier dietary intakes.[27] Other studies have found positive changes, such as an increased consumption of vegetables after retirement in a French prospective cohort study.[28] Some studies have found mixed or no association, including decreased fruit

consumption and increased vegetable consumption after retirement in a Dutch longitudinal study among men,[29] and no associations of retirement with fruit and vegetable consumption in a large Australian follow-up study[30] and with fish consumption in the British Whitehall II Study.[31] A cross-sectional study on data from the National Health and Nutritional Examination survey (NHANES) found retirees and non-retirees of the same age to not differ in adherence to an ideal diet.[32] In our own previous study with a shorter follow-up and using a dietary index as an outcome, women's food habits were healthier after transition to retirement, but this was not found for men.[17]

The strengths of this prospective cohort study include the use of repeated survey data, the long follow-up, and the use of same FFQ to measure food consumption in each study phase. Repeated measurements for food consumption from the same individuals allowed us to report changes in frequencies of fruit, vegetable, and fish consumption.

The limitations of the present study include the nature and representativeness of the sample. It comprised primarily women, thus, statistical power to detect changes within men may have been limited due to the low number of male participants. At baseline, all respondents were municipal employees who lived in the Helsinki metropolitan area. Thus, food habits might differ from the overall Finnish population and generalisations should be made with caution. The FFQ in our survey provided information on the usual consumption frequency of food items but portion sizes were not included. Thus, we could not calculate food consumption in quantities, or total energy and nutrient intakes. The FFQ, however, remained similar at all follow-up survey phases, and short FFQs have been considered as suitable for monitoring changes in food patterns at a group level and for frequently consumed foods in particular.[33,34] Some of the changes in diet may reflect more temporal trends than changes due to employment status. Finally, there was a relatively long gap between baseline and follow-up surveys (5 to 7 years), i.e. measurement of food habits. Moreover, some participants might have retired immediately after returning their baseline survey, while others might have retired just before the follow-up. On the one hand this means that the time spent in retirement could vary from days to years, which could affect the changes in food habits that have taken place. On the other hand, the time between the actual retirement date and the study phases could have removed the so-called honeymoon effect of better health behaviour shortly after retirement.

## Conclusions

Statutory retirement can have mixed effects on the food habits of employees transitioning to retirement. In this study, statutory retirement was associated positively with fruit consumption in men but negatively with vegetable consumption in women. Changes in the consumption of these foods were between 1-2 portions/month. It is difficult to evaluate the clinical relevance of this finding as we did not have any information on the portion size. However, increasing fruit and vegetable consumption in all populations is important from the public health perspective. A recent systematic review and dose-response meta-analysis concluded that daily increment of 200g in fruit and vegetable consumption (both separately and combined consumption) is associated from 8-18% reduction in the risk of coronary heart disease, stroke, cardiovascular disease as well as all-cause mortality [35]. Thus, individuals increasing their fruit intake by two 50g portions from 100g to 200g per day may help prevent future diseases. Retirement as a window of opportunity for positive dietary changes should be better utilized in improving the diets of the elderly. There is a need for intervention studies that more thoroughly investigate the effects of retirement on diet and the cost-effectiveness of health guidance targeted at retiring employees.

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**Conflict of Interest**

None.

**Authorship**

KA, OP, SJ, OR, TL and NK participated in designing the study. KA and OP analysed the data. KA and EM wrote the manuscript. KA, OP, SJ, OR, TL and NK participated in interpreting the results and revised the manuscript thoroughly. All authors have approved the final version of the manuscript.

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**Table 1**. Characteristics of 6887 participants with 14357 observations across pooled follow-up period within the Helsinki Health Study by participants employment status at the beginning of follow-up *

| Characteristics † | Employment status | | | |
|---|---|---|---|---|
| | Retired § | SD / % | Employed ‡ | SD / % |
| **Women, obs** | 2806 | 79.6 | 9005 | 83.1 |
| Age, years | 59.8 | 2.6 | 49.8 | 5.5 |
| Marital status | | | | |
| Married or cohabiting, obs | 1786 | 63.9 | 6119 | 68.2 |
| Single, divorced, or widowed, obs | 1008 | 36.1 | 2852 | 31.8 |
| Household income, mean euros per month | 2866 | 1328 | 3007 | 1331 |
| Limiting long-standing illness, obs | 1339 | 49.6 | 3194 | 36.3 |
| Vegetable consumption frequency per month | 33.2 | 15.8 | 33.5 | 16.3 |
| Fruit consumption frequency per month | 33.8 | 17.0 | 30.3 | 17.4 |
| Fish consumption frequency per month | 7.7 | 5.9 | 7.2 | 5.9 |
| **Men, obs** | 720 | 20.4 | 1826 | 16.9 |
| Age, years | 59.7 | 2.9 | 50.3 | 5.7 |
| Marital status | | | | |
| Married or cohabiting, obs | 596 | 83.1 | 1412 | 77.8 |
| Single, divorced, or widowed, obs | 121 | 16.9 | 403 | 22.2 |
| Household income, euros per month | 3305 | 1278 | 3244 | 1265 |
| Limiting long-standing illness, obs | 321 | 46.1 | 594 | 33.3 |
| Vegetable consumption frequency per month | 27.0 | 14.7 | 26.3 | 14.7 |
| Fruit consumption frequency per month | 22.4 | 15.6 | 19.8 | 14.8 |

| | | | | |
|---|---|---|---|---|
| Fish consumption frequency per month | 7.3 | 5.6 | 6.9 | 5.6 |

*The four study phases consisted of three follow-up periods: Follow-up period 1 between Phases 1 and 2; Follow-up period 2 between Phases 2 and 3; and Follow-up period 3 between Phases 3 and 4. Each follow-up period included participants who were employed for the entire period (employed), and those entering statutory retirement during the period (retired). All the follow-up periods were pooled in the analysis. The final data for the analysis consisted of 6887 participants (81% women) with a total of 14 357 follow-up periods across the four study phases.

† All continuous variables are presented as mean and SD of all observations. For categorical variables, number of observations (obs) and percentage (%) are presented.

‡ Participants who were employed over the follow-up period.

§ Participants entering statutory retirement during the follow-up period.

Table 2. Association between employment status and change in fruit, vegetable, and fish consumption frequency per month *

| | Women | | | | | Men | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Time† | | | | | Time† | | | | |
| | 0 | 95% CI | 1 | 95% CI | P interaction‡ | 0 | 95% CI | 1 | 95% CI | P interaction‡ |
| **Fruit consumption** | | | | | | | | | | |
| Employed | 28.9 | (28.2-29.5) | 28.3 | (27.8-28.8) | | 16.8 | (15.8-18.0) | 16.1 | (15.2-17.1) | |
| Retired | 29.1 | (28.3-29.9) | 28.0 | (27.0-28.8) | | 17.3 | (16.0-18.7) | 19.3 | (17.5-21.2) | |
| | | | | | 0.292 | | | | | 0.004 |
| **Vegetable consumption** | | | | | | | | | | |
| Employed | 31.5 | (31.0-32.1) | 31.7 | (31.2-32.2) | | 23.7 | (22.6-24.8) | 23.4 | (22.5-24.4) | |
| Retired | 31.0 | (30.3-31.8) | 30.2 | (29.4-31.19 | | 23.3 | (22.0-24.6) | 22.2 | (20.7-23.7) | |
| | | | | | 0.062 | | | | | 0.317 |
| **Fish consumption** | | | | | | | | | | |
| Employed | 6.6 | (6.5-6.8) | 6.6 | (6.4-6.7) | | 6.5 | (6.1-7.0) | 6.3 | (6.0-6.7) | |
| Retired | 6.5 | (6.3-6.7) | 6.3 | (6.1-6.6) | | 6.2 | (5.8-6.7) | 6.1 | (5.5-6.6) | |
| | | | | | 0.455 | | | | | 0.986 |

*The four study phases consisted of three follow-up periods: Follow-up period 1 between Phases 1 and 2; Follow-up period 2 between Phases 2 and 3; and Follow-up period 3 between Phases 3 and 4. Each follow-up period included participants who were employed for the entire period (employed), and those entering statutory retirement during the period (retired). All the follow-up periods were pooled in the analysis.

† Time 0 is the beginning of the follow-up period. Time 1 is the end of follow-up period.

‡ Associations between change in employment status and vegetable consumption was analysed using negative binomial mixed model, by placing an interaction term between the variable indicating employment status and follow-up time. To account for repeated measures within individuals, a subject specific random intercept was included in the models. We calculated marginal effect at mean holding age as constant in all models. The model is adjusted for age, marital status, limiting long-standing illness, and household income.