

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.

1 **Introduction**

2

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

7

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

16

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

33

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

40

41 **Methods**

42

43 *Participants and the assessment of retirement*

44 This research is part of the Helsinki Health Study (HHS), a longitudinal cohort among ageing
45 employees of the City of Helsinki, Finland.⁽²⁴⁾ The data were derived from postal surveys. In 2000–
46 2002 baseline questionnaires were mailed to the employees who turned 40, 45, 50, 55 or 60 in one
47 of those years (Phase 1, *n* 8960, response rate 67%). The first follow-up survey was collected in
48 2007 among the respondents to the baseline survey (Phase 2, *n* 7332, response rate 83%), the
49 second follow-up in 2012 (Phase 3, *n* 6814, response rate 79%), and third follow-up in 2017 (Phase
50 4, *n* 6832, response rate 82%). Majority of the participants were women (80% at baseline),
51 corresponding to the target population and the Finnish municipal sector in general. Further,
52 according to non-response analyses, the baseline data reflect the target population decently, even
53 though men, younger participants, manual workers, and those with poorer health as indicated by
54 sickness absence were slightly underrepresented among the respondents.⁽²⁴⁾

55

56 The four study phases consisted of three follow-up periods: Follow-up period 1 between Phases 1
57 and 2 (2002-2007); Follow-up period 2 between Phases 2 and 3 (2007-2012); and Follow-up period
58 3 between Phases 3 and 4 (2012-2017). Each follow-up period included participants who were
59 employed for the entire period (later ‘employed’), and those entering statutory retirement during the
60 period (later ‘retired’). We considered individuals as employed if they responded to be working
61 full-time or part-time. Statutory retirement was defined as retiring at the ‘normal, age-based
62 retirement age’ (, i.e., not premature retirement, such as early retirement or disability retirement),
63 using questions regarding main type of activity, the date of retirement, and the retirement type. If
64 the respondents had reported to be both retired and working they were classified as employed.
65 Individuals who retired due to disability were excluded from analysis.

66

67 For each follow-up period, participants were part of the period if they were employed and working
68 at the beginning of the period. For instance, to be included in the follow-up period 2 a participant
69 had to be employed in 2007. Participants were no longer part of the sequential follow-up period
70 after transitioning to statutory retirement or moving out of working life. For example, a participant
71 who was included in the follow-up period 1 and 2, but retired or stopped working for other reasons
72 during the second period was no longer included in the follow-up period 3. All the follow-up
73 periods were pooled in the analysis. The final data for the analysis consisted of 6887 participants
74 (81% women) with a total of 14 357 follow-up periods across the four study phases. During the
75 follow-up there were 3526 transitions to statutory retirement.

76
77 The ethics committees of the Department of Public Health, University of Helsinki and the health
78 authorities of the City of Helsinki, Finland approved the study protocol.

79
80 *Fruit, vegetable, and fish consumption*

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

93
94 *Covariates*

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

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

114
115

116 *Statistical analyses*

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

128

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

134

135 Data were analysed using IBM SPSS statistics version 24. The GENLIMIXED procedure in SPSS
136 takes into account the correlation between observations that appear in designs with repeated
137 measures.⁽²⁵⁾

138

139 **Results**

140

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

149

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

155

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

161

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

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

171

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

177

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

186

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

190

191 **Discussion**

192

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

198

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

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

209
210 Fruit consumption increased among men after transition to statutory retirement. Even though we
211 found that this result was not confounded by marital status, the working status of a spouse could
212 possibly explain this finding. If spouse is also retired and, for example, cooking lunch and preparing
213 early afternoon snacks at home, this may influence men's food habits. One reason for the increased
214 fruit but not vegetable consumption among men could be that older people, especially men, might
215 find eating fruit less burdensome than preparing vegetables. Fruit can be also more easily available
216 at home than at work. Fruit consumption differed between women and men both at the beginning
217 and at the end of the follow-up period, with the level of consumption being noticeably lower among
218 men. Among women, there was no association between retirement and fruit consumption. This
219 result could be due to women already eating more fruit to begin with and being generally more used
220 to eating fruits compared to men. Women could potentially be more likely to have fruits as a snack
221 at work compared to men.

222
223 With regard to changes in fish consumption, there were no associations found for women or men.
224 There was a difference in fish consumption at the end of the follow-up period between women who
225 had retired and those who were still in employment, but this difference disappeared after adjusting
226 for household income. Hence, the decrease in fish consumption after transition to retirement could
227 be at least partly explained by participants' economic status. Furthermore, the loss of access to the
228 staff canteen lunch might explain this to some extent as fish is a weekly meal in most staff canteens,
229 but possibly not as common at home.

230
231 Previous studies have, overall, shown inconsistent associations between retirement and food habits.
232 Some studies have found an association between retirement and a change to unhealthier food habits.
233 A French prospective study found that transition to retirement was associated with a decrease in
234 fruit consumption and overall unhealthier dietary intakes.⁽²⁷⁾ Other studies have found positive
235 changes, such as an increased consumption of vegetables after retirement in a French prospective
236 cohort study.⁽²⁸⁾ Some studies have found mixed or no association, including decreased fruit

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

244

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

249

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

268

269 **Conclusions**

270

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

285

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291

292 **Conflict of Interest**

293

294 None.

295

296 **Authorship**

297

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

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- 403

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
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*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†				P interaction‡	Time†				P interaction‡
	0	95% CI	1	95% CI		0	95% CI	1	95% CI	
Fruit consumption										
Employed	28.9	(28.2-29.5)	28.3	(27.8-28.8)	0.292	16.8	(15.8-18.0)	16.1	(15.2-17.1)	0.004
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)	
Vegetable consumption										
Employed	31.5	(31.0-32.1)	31.7	(31.2-32.2)	0.062	23.7	(22.6-24.8)	23.4	(22.5-24.4)	0.317
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)	
Fish consumption										
Employed	6.6	(6.5-6.8)	6.6	(6.4-6.7)	0.455	6.5	(6.1-7.0)	6.3	(6.0-6.7)	0.986
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)	

*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.