Changes in Health and Health Behavior Associated With Retirement

SAGE

Astri Syse, PhD[1], Marijke Veenstra, PhD[2], Trude Furunes, PhD[3,4], Reidar J. Mykletun, PhD[3], and Per Erik Solem[2]

Abstract

Objectives: While poor health contributes to early work exits, it is less clear how early work exits affect health. This study therefore examines changes in health associated with retirement. **Method:** Survey data from gainfully employed individuals aged 57 to 66 in 2002 were used to assess changes in health status and behaviors associated with retirement (49%) 5 years later (*N* = 546). **Results:** Compared with workers, retirees were more likely to report improvements in mental health (odds ratio [OR] = 1.67), and less likely to report mental health deteriorations (OR = 0.56). Retirees were more likely to both increase (OR = 2.03) and reduce (OR = 1.87) their alcohol intake, and to increase physical activity (OR = 2.01) and lose weight (OR = 1.75). **Discussion:** As welfare states aim to extend working life to counteract repercussions of population aging, findings on possible health benefits for retirees may warrant more focus on the pros and cons of a prolonged working life.

[1]Statistics Norway, Oslo, Norway
[2]Norwegian Social Research, Centre for Welfare and Labour Research, Oslo and Akershus University College of Applied Sciences, Oslo, Norway
[3]University of Stavanger, Norway
[4]HAN University of Applied Sciences, Nijmegen, The Netherlands

Corresponding Author:
Astri Syse, Department of Research, Statistics Norway, P.O. Box 0033, Dep., N-0033 Oslo, Norway.
Email: sya@ssb.no

Introduction

Reforms aimed at delaying retirement are being implemented in many countries due to aging populations and rising pension costs, pressuring welfare states both economically and non-economically (Organisation for Economic Co-Operation and Development [OECD], 2013). Norway, Sweden, United Kingdom, and Italy are examples of countries that have implemented or are currently implementing such pension reforms (OECD, 2013; Whitehouse, D'Addio, Chomik, & Reilly, 2009). Although the content of the reforms differs across countries, most aim to secure the financial sustainability of the pension system and to increase labor force participation in later life by economically rewarding senior workers who delay retirement. Continued growth in life expectancy and improvements in health in later life are important underlying factors for the intended increase in retirement age.

Poor health is one of the main reasons for early work exits among younger workers, mainly through disability pension schemes (Börsch-Supan, 2007; OECD, 2010; Stattin, 2005). Retirement may, however, also affect on subsequent health. The aim of this study is to assess the association between retirement and 5-year changes in health and health behavior.

Theoretical Framework

We utilize key concepts from Grossman's (1972) theory on the demand for health, based on Becker's (1965) theory on the allocation of time, to explore how individuals allocate their resources to produce health. Conceptually, individuals are viewed as active producers who spend time and money on the production of health. As such, individuals invest in health to improve outcomes in both the market (work) and nonmarket (household) sectors, although health depreciates over time. The demand for health theory can be used to hypothesize how individuals' allocation of time while employed or retired may affect their health in both positive and negative ways. In general, individuals exert a relatively high degree of control over their health as they can influence health-affecting consumption patterns, health care utilization, and the environment in which they live. Individuals buy market inputs (e.g., medical care, gym memberships, food, clothing) and combine them with their own time to produce services that increase their health. Individuals must choose how to spend their resources. Incomes with which to finance health and other activities are limited, and neither is costless. Furthermore,

individuals must allocate time between different activities. They can either choose to spend time in the labor market or retire and thus increase their leisure time. The leisure time can be spent either to optimize health by, for instance, visiting the gym, or on health neutral or health damaging activities such as smoking, drinking, or over-eating. Although individuals value health, they do not value it *above* all else. If they did, they would not over-eat, smoke, or drink too much.

In Norway, health care is publicly available and almost free of charge. Furthermore, retirement pensions are relatively generous, also compared with labor income *before* retirement. As such, our focus is directed toward possible retirement associated health effects in light of the time allocation dimension, and disregard health care purchases and financial resources. According to Grossman, individuals who retire will have more time to spend on possible health investments than individuals who continue working, while the preferences for health may remain constant, increase, or decrease. As such, we expect retirement to have a positive effect on health behaviors, and subsequently on health status. However, as health depreciates with age, and age is strongly related to retirement, this must be taken into account, and we will thus compare changes in health from T1 to T2 between individuals who continue to work and individuals who retire. Self-selection is a problem, as retirement is more common among individuals in suboptimal health and with low education. At a group level, such individuals may be less prone to invest in their health following retirement. As a consequence, both positive and negative changes in health behaviors and health status may be expected.

Empirical Background

Research on health effects of retirement has so far remained inconclusive (Gallo, 2013; Oksanen & Virtanen, 2012). The U.S. *Health and Retirement Study* (HRS) shows overall negative effects of retirement on health, primarily due to a decrease in physical activity and less social participation after retirement (Dave, Rashad, & Spasojevic, 2008), which contradicts the demand for health theory as retirement should result in more time for such activities. It also suggests that negative effects of retirement are larger for involuntary retirement than for more voluntary retirement, as has been found also by van Solinge and Henkens (2007). This might suggest heterogeneity between groups in either interests or abilities to invest in health. The *English Longitudinal Study of Ageing* (ELSA) shows an increase in the number of chronic conditions reported after retirement (Behncke, 2009), perhaps related to self-selection into retirement of individuals in poorer health. The U.K.-based *Whitehall II Longitudinal Study* shows no effects of retirement on

physical health at age 60 (Mein, Martikainen, Hemingway, Stansfeld, & Marmot, 2003), but later analyses of the same cohort have shown positive effects on short-term physical health, but weakening with time since retirement (Jokela et al., 2010), again contrary to the time allocation dimension in the demand for health theory. The French *GAZEL Occupational Cohort Study* shows no effect of retirement on physical illnesses or reduced mental health (depression) after retirement (Westerlund et al., 2010), whereas data from the *Swiss Household Panel* (SHP) show positive changes in self-reported health after retirement (Mojon-Azzi, Sousa-Poza, & Widmer, 2007).

One of the core mechanisms through which retirement may affect health is changing health behaviors, such as physical activity or alcohol and cigarette consumption. The majority of studies examining effects of retirement on physical activity indicate that the frequency and duration of outdoor activities such as walking and biking appear to increase when one quits work, or at least show a smaller reduction than to those who continue working (Berger, Der, Mutrie, & Hannah, 2005; Gallo, 2013; Sjosten et al., 2012; Solem, 2012). This is in line with the demand for health theory. An exception in this regard is a panel study from the Netherlands, suggesting that physical activity like biking or walking to work was not compensated with more physical activity in the form of sport, exercise, walks, bike rides, or gardening after retirement, thus resulting in reduced physical activity levels after retirement (Slingerland et al., 2007).

Assumptions of increased alcohol consumption after retirement are partly based on coping with the loss of work, increased spare time and opportunities for consumption as people no longer need to stay sober to perform work tasks, and reduced social control (Gallo, 2013). This is also in line with preferences for investments in health and/or time allocation post retirement. So far, findings remain, however, inconclusive when it comes to changes in alcohol intake after retirement (Gallo, 2013). Some studies indicate that retirees reduce their drinking habits (Bacharach, Bamberger, Cohen, & Doveh, 2007; Neve, Lemmens, & Drop, 2000), whereas other studies show the opposite (Perreira & Sloan, 2001), or that retirement made it even harder to reduce or control problematic drinking (Henkens, van Solinge, & Gallo, 2008; Perreira & Sloan, 2002).

Henkens et al. (2008) found that those who retired involuntarily had an increased probability for initiating or increasing smoking, whereas Lang, Rice, Wallace, Guralnik, and Melzer (2007) found that those who retired twice as often quit smoking compared with those who continued to work. Others again have found no effects of retirement on smoking (Midanik, Soghikian, Ransom, & Tekawa, 1995).

Weight gain after retirement may be associated with a loss of job-related physical activity. If retirees keep up their food intake, they may gain

weight unless the work activity is compensated by alternative physical activity by actively investing in health. Similar holds if retirees increase their caloric intake by, for instance, eating more or differently. Research suggests that it is particularly the retirees with previous physical work (i.e., "blue-collar workers") who experience weight gains after retirement, most likely linked to the associated reduction in physical activity (Gallo, 2013).

The Norwegian Setting

Norway is a social-democratic welfare state with around a quarter of its population of five million relying on welfare benefits as a means of a living, and welfare benefits account for around one third of the state budget. The welfare system is rights-based and funded through a "pay as you go" principle (Kjonstad, 2007). All Norwegian inhabitants are members of the National Insurance Scheme (NIS), which ensures free or low-cost health care regardless of age (Molven & Ferkis, 2011). NIS further includes various retirement schemes, sickness and disability benefits, work assessment allowances, unemployment insurance, and secures a minimum income, termed social assistance, unrelated to poor health and/or prior income (Kjonstad, 2007). The magnitude of most public benefits is linked to prior labor earnings.

For the period studied here, the upper mandatory retirement age was 70 years, whereas the formal standard retirement age was 67 years. A few specific occupational groups had, however, lower age limits (from 55 to 65 years; Norwegian Ministry of Labour, 2012). A contractual early retirement program in Norway includes the entire public sector and around 60% of the private sector, and allows workers to retire at age 62 with a compensation rate similar to what it would have been had the worker remained employed until the standard retirement age. The majority of workers thus had a right to retire whenever they wished within the 62 to 70 year age limit, and at T2, our sample was within this age range.

Labor force participation in later life is relatively high in Norway. In 2001, around 85% of individuals aged 55 to 59 were employed, whereas this was the case for 65% among those aged 60 to 64 and around 30% among persons aged 65 to 69 (Norwegian Ministry of Labour, 2010). The pension reform, effective from 2011, established age 62 to 70 as a general and flexible pension period with actuarial deductions by early take up and additions by late take up, honoring postponement up to 75 years of age (Norwegian Ministry of Labour, 2010).
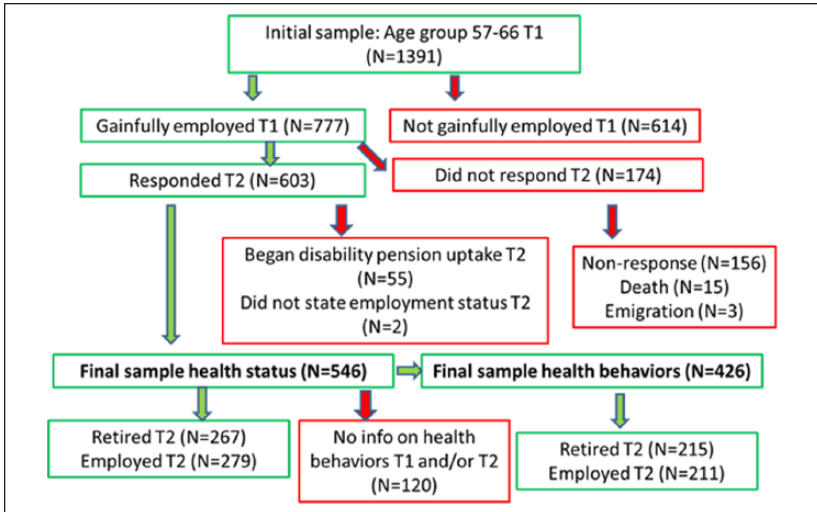
Figure 1. Flow chart of the sample selection process and the final samples.

Method

Panel data from 2002 (T1) and 2007 (T2) are derived from the Norwegian study on Life course, Ageing and Generation (NorLAG), which has been merged with the international Gender and Generations Study. A stratified community sample consisting of 5,589 adults aged 40 to 79 years answered an initial telephone survey at T1 (response rate = 67%). In addition, data from public registers (e.g., the Population register, the Tax and Income register, the National Database on Education and the Birth Register) have been linked to the individual survey data. The respondents were also asked to respond to a postal questionnaire. A total of 4,169 individuals complied (response rate = 75%). Participation and linkage to public register data were based on informed consent. Data for T2 were collected 5 years later in a similar manner. Of those who participated at T1, 264 persons had died and 25 persons had moved abroad. Altogether, 3,796 respondents participated in both waves. Further details of the NorLAG design, sampling procedures, data collection, and response rates are available.[1]

For the analyses of the present article, we include gainfully employed individuals aged 57 to 66 at T1 who also participated at T2 (see Figure 1). At T1, a total of 1,391 persons were in the age group 57 to 66. Of these, 777 were gainfully employed. At T2, 156 of the 777 chose not to participate, whereas 15 had died and three had emigrated. We thus had a total of 174

non-responders at T2. This left us with 603 responders at T2 in the relevant age group who were gainfully employed at T1 (response rate = 78%). Altogether 55 reported disability benefit uptake between T1 and T2, and were excluded because the effects of retirement on health and health behaviors may be different for those who have to stop working for health reasons, as is the case for disability pensioners.[2] Finally, two respondents who did not state their work status at T2 were excluded. This left us with a sample of 546 persons. A total of 287 of the respondents were men (53%). Mean age at T1 was 60.5 years (*SD* = 2.7). Health status was assessed by telephone interviews, while health behaviors were assessed by postal questionnaires. We thus have information on all the respondents' health, whereas we only have information on health behaviors for the 426 who also completed the postal questionnaire in both rounds.[3]

Measures

Retirement. Retirement was ascertained by the question, *What is your main activity?* Those who stated they were occupational pensioners, early contractual pensioners, or ordinary old age pensioners at T2 were defined as retired. Involuntary retirement was determined by the question, *Why did you stop work?* Retirees who stated they were let go, their workplace was shut down, or they had to retire because they had reached the mandatory retirement age were defined as having retired involuntary.

Health status. Short Form 12 (SF-12) was used (Ware, Kosinski, & Keller, 1996). The responses on the 12 items in this scale were transformed according to established algorithms into two summary measures: the Physical (PCS-12) and Mental (MCS-12) Component Scores. These are standardized scores (*M* = 50, *SD* = 10, in the 1998 general U.S. population), with higher scores indicating better physical or mental health. Five-year individual change scores in PCS and MCS were calculated by computing the difference between subsequent measures. A noteworthy change was defined as greater than ±1.99 for the PCS-12 and ±2.99 for MCS-12. These change scores are referred to as physical and mental health changes for short.[4]

Health behaviors. Respondents' self-reported smoking behavior was assessed as *Do you use, or have you used, cigarettes*? The original response categories were current (rarely, sometimes, and daily), never, and former. The latter two categories were collapsed, and we were thus left with four categories. Changes in tobacco use were measured as switch from one category to another. In addition, we also examined possible differences in groups who

quit or took up smoking. Alcohol consumption was measured with the question *Consider your alcohol consumption the past 12 months. About how often have you consumed alcohol? Count even the times you only drank a little.* The response categories were daily or almost daily/2 to 3 times per week/ once per week/2 to 3 times per month/once per month/more rarely/not last year/never. The latter two categories were collapsed. The definition of hazardous drinking is a topic of much debate, and some studies suggest that even minor levels of alcohol consumption may carry risks (Hallgren, Högberg, & Andreasson, 2009). As alcohol consumption has been found to often be underreported in survey research (Hoyer, Nilssen, Brenn, & Schirmer, 1995), any change between categories from T1 to T2 is considered a change in alcohol consumption. Respondents' outdoor and indoor physical activity level was measured by the questions *About how often do you do the following? Tracking or training outdoor (walks, bicycle rides, skiing, etc.)* and *indoor training (training studio, aerobics, gymnastics, etc.)*, with six response categories ranging from *daily* to *never*. Weight was reported in kilograms (kg). Weight change was measured as a change in at least 1.0 kg between T1 and T2. The use of medication was ascertained by the question *Have you during the last 4 weeks used any of the following prescription medications: (1) Pain killers, (2) Sedatives, (3) Anti-depression medication,* and/or *(4) Sleep medication*, with yes/no responses to each question. A positive response to any of these four questions was categorized as indicative of use at T1 and/or T2, respectively. A change in use was indicated if the response changed from yes to no or vice versa between T1 and T2.

Covariates. The categorizations of covariates are shown in Table 1. Information on potentially confounding sociodemographic covariates at T1 was based on registry data for age, gender, marital status, and educational level. Relevant work characteristics were assessed through the telephone interview, such as public versus private sector employment, number of hours worked per week (less than full time, full time, or more than full time), reports of stressful work situations, and reports of sickness absence over the last 12 months.

Various measures were used to account for the possible impact of health status at T1. The single question of self-rated health (Table 1) was not robust in multivariate analyses and was thus substituted by a dichotomized version distinguishing only between fair or poor, and good or better health (Tables 3-5). In sensitivity analyses, we also examined the contribution of physical and/or mental limitations (see Footnote 3), and also included PCS-12 and MCS-12 scores as continuous variables.

Table 1. Characteristics of the Study Cohort at T1 by Retirement Status at T2: Percentages and numbers (*n*).

Status at T1	Working at T2	Retired at T2	*n*	*p* value
Age				<.001
57-59 years	71.7	28.3	237	
60-62 years	50.0	50.0	172	
63-66 years	16.8	83.2	137	
Sex				.08
Men	54.7	45.3	287	
Women	47.1	52.9	259	
Marital status				.74
Single	52.4	47.6	124	
Married/cohabiting	50.7	49.3	422	
Education				<.01
<High school	52.4	47.6	82	
High school diploma	46.6	53.4	247	
Some college education	49.0	51.0	149	
≥Bachelor degree	70.6	29.4	68	
Employment sector				.15
Public sector	48.0	52.0	273	
Private sector	54.2	45.8	273	
Working hours				<.001
<37 hr/week	36.8	63.2	144	
37-40 hr/week	52.0	48.0	300	
>40 hr/week	68.6	31.4	102	
Work related stress				.14
Stressful work situation	45.9	54.1	148	
Unstressful work situation	53.0	47.0	398	
Sickness absence				.02
Absence last year	44.8	55.2	201	
No absence last year	54.8	45.2	345	
Self-reported health				<.01
Excellent	61.3	38.7	155	
Very good	52.9	47.1	174	
Good	42.6	57.4	136	
Fair	43.8	56.3	64	
Poor	35.3	64.7	17	
Physical health causing				.04
Daily life limitations	44.4	55.6	162	
No daily life limitations	53.9	46.1	384	
Mental health causing				.02

(continued)

Table 1. (continued)

Status at T1	Working at T2	Retired at T2	*n*	*p* value
Daily life limitations	42.8	57.2	138	
No daily life limitations	53.9	46.1	408	
Tobacco smoking[a]				.38
Current smoker	45.9	54.1	111	
Former/never smoker	50.8	49.2	315	
Alcohol use[a]				.16
Never or very rarely	53.6	46.4	28	
Maximum 1/month	46.9	53.1	81	
Maximum 1/week	44.0	56.0	168	
Multiple times/week	56.4	43.6	149	
Physical activity[a]				.57
At least weekly	50.3	49.7	322	
<Weekly	47.1	52.9	104	
Body weight[a]				.24
Normal weight/below[b]	52.3	47.7	214	
Overweight/obese	46.7	53.3	212	
Medication[a,c]				.56
At least weekly	45.2	54.8	42	
<Weekly	50.0	50.0	384	

[a]120 respondents did not complete the postal questionnaire at T1 and/or T2 where health behaviors were measured, and only 426 respondent are thus included in analyses on health behaviors. The retirement status distribution for this subsample is, however, similar to that of the full study cohort.
[b]Only three individuals were underweight.
[c]Includes pharmaceutical sleeping aids, pain killers, sedatives, anti-depression drugs, or other similar medications.

Also health behaviors at T1 were simplified before they were included in multivariate models. Individuals were categorized as current (regardless of frequency) versus former and never smokers. For alcohol use, individuals were divided into four groups: never or rarely/once per month/once per week/ multiple times per week. For physical activity, respondents indicating at least weekly indoor training or daily outdoor training were considered physically active on a regular basis. This procedure is in line with research suggesting that the recommended 30 min or more of moderate intensity physical activity can be accumulated from various activities. Such an "active living" approach is considered particularly appropriate for older adults (Berger et al., 2005). Body mass index (BMI) was calculated from reports of both weight and height in the postal questionnaire, and the WHO criteria of underweight or normal weight (<25.0) versus overweight or obese (≥25.0) were used.

Statistical Analysis

The associations between a change in retirement status and changes in health status and health behaviors were analyzed in four steps. First, we used descriptive statistics to explore the association between retirement status and characteristics related to work variables, sociodemographic features, and/or health and health behaviors at T1 (Table 1). Second, we used chi-square to examine the relationship between 5-year changes in health and health behaviors and retirement status (Table 2). Third, we used multinomial multivariate logistic regression models to assess the degree to which positive or negative changes in physical and mental health status as well as health behaviors varied across retirement status, while taking relevant covariates into account (Tables 3-5). Several robustness checks were undertaken (see "Sensitivity Analyses" section). All analyses were undertaken in Stata 12. The statistical significance level was set at 5%. Due to small sample size, results at the 10% level are also discussed.

Results

In the course of 5 years, 49% retired. The mean retirement age was 65.3 years (SD = 2.5), and the mean time to retirement from T1 was 2.0 years (SD = 1.2).[5] Of the 267 retirees, 89 (33%) stated that they quit work because they "had to." Baseline descriptives across retirement status (Table 1) show that retirement was associated with higher age, lower educational attainment, and part time work. Sickness absence, poorer self-rated health, and physical or mental health limitations were associated with retirement, whereas no differences were observed across various health behaviors.

Changes in Health Status

Descriptive analyses. For self-reported health, four out of 10, both among those still working and those retired, reported no change over the 5-year period (Table 2). A larger proportion of retired (27%) than workers (18%) reported improvements in health. Nevertheless, larger proportions of both workers and retirees experienced health deteriorations rather than improvements.

Overall mean PCS-12 scores were 50.6 (SD = 8.6) at T1 and 50.3 (SD = 8.2) at T2. The mean MCS-12 score was 56.4 (SD = 6.9) at T1 and 56.8 (SD = 6.4) at T2. Behind this seemingly stable health status over the 5-year period, changes occurred in both directions, and differences between workers and retirees were observed. The change in combined sum score (PCS and MCS) from T1 to T2 was −1.4 for workers, with a 95% confidence interval (CI)

Table 2. Changes in Health Status and Behaviors From T1 to T2 by Retirement Status at T2: Percentages and Numbers (*n*).

Health status	Working at T2	Retired at T2	*n*	*p* value	Health behaviors	Working at T2	Retired at T2	*n*	*p* value
Self-reported health				.02	Smoking				.81
No change	41.9	40.4	225		No change	70.1	72.6	304	
Negative change	40.1	32.2	198		Increase	23.7	7.9	37	
Positive change	17.9	27.3	123		Reduction	20.4	19.5	85	
Physical health (PCS-score)				.07	Alcohol consumption				<.01
Minor change[a]	41.9	34.1	208		No change	62.6	46.5	232	
Negative change	33.3	33.0	181		Increase	22.3	33.0	118	
Positive change	24.7	33.0	157		Reduction	15.2	20.5	76	
Mental health (MCS-score)				<.01	Outdoor physical activity				<.01
Minor change[b]	54.8	47.6	280		No change	57.8	47.9	225	
Negative change	25.4	18.7	121		Increase	16.6	31.2	102	
Positive change	19.7	33.7	145		Reduction	25.6	20.9	99	
Physical health limitations				.17	Indoor physical activity				.12
No change	75.3	68.2	392		No change	46.0	54.4	214	
More limitations	12.5	15.4	76		Increase	31.3	29.8	130	
Fewer limitations	12.2	16.5	78		Reduction	22.7	15.8	82	
Mental health limitations				<.01	Major change physical activity[c]				<.01
No change	72.4	63.3	371		No major change	59.7	49.3	232	
More limitations	15.8	15.0	84		Major increase	25.6	40.0	140	
Fewer limitations	11.8	21.7	91		Major reduction	14.7	10.7	54	
Physical/ mental health limitations				.10	Change in weight[d]				.03

(continued)

Table 2. (continued)

Health status	Working at T2	Retired at T2	n	p value	Health behaviors	Working at T2	Retired at T2	n	p value
No change	60.2	52.4	308		No change	20.4	20.0	86	
More limitations	20.1	20.6	111		Weight gain	50.7	39.5	192	
Fewer limitations	19.7	27.0	127		Weight loss	28.9	40.5	148	

[a]±1.99 PCS-score is considered a minor change.
[b]±2.99 MCS-score is considered a minor change.
[c]A major increase is defined as individuals taking up physical activity up to several times per week.
[d]Weight change was measured as a change in at least 1.0 kg.

ranging from −2.5 to −0.2, whereas the corresponding change for retirees was 1.6 (CI = [0.2, 3.0]). When we applied the aforementioned cutoff points for MCS, retirees reported positive changes in mental health more frequently than workers (34% vs. 20%), whereas they reported negative changes less frequently (19% vs. 25%). Similarly, a larger share of retirees (33%) tended to experience a positive change in physical health compared with workers (25%), but this difference was not statistically significant at the 5% level ($p <$ .07). Compared with workers, retirees more frequently reported a decline in mental daily life limitations at T2 compared with status at T1 (22% vs. 12%). No differences between retirees and workers were observed for reported changes in physical daily life limitations. Note, however, that relatively few respondents reported limitations of any kind at T1.

Multivariate analyses. Many of the presumed important characteristics such as age, sex, various workplace characteristics, health status at T1, and health behaviors such as smoking, drinking, physical activity, and so on contributed little or not at all in multivariate regression models of retirement associated health status changes, regardless of whether we analyzed changes in PCS, MCS, a combination of the two, the single question of self-rated health, or health limitations. As the results were fairly similar, we have opted to only show the changes in PCS-12 (Table 3) and MCS-12 (Table 4).[6] For physical health as measured by the categorized PCS-12 score, retirement status at T2 was statistically significant for positive changes in physical health only prior to inclusion of health status and/or behaviors at T1 (odds ratio [OR] = 1.53, CI = [1.01, 2.34]). No statistically significant findings were observed for negative changes in physical health. As such, the univariate findings did not hold up in multivariate models (Table 3).

14

Table 3. Multinomial Analyses of Characteristics Associated With Physical Health Status Changes.

| | Positive change in phyical health (PCS-score)[a] | | | | | | Negative change in phyical health (PCS-score)[a] | | | | | |
| | Model without health status | | Model with health status[b] | | Model with health behaviors[c] | | Model without health status | | Model with health status | | Model with health behaviors[a] | |
	OR	CI	OR	CI	OR	CI	OR	CI	OR	CI	OR	CI
Still working at T2	1.00	ref	1.00	ref	1.00	ref	1.00	ref	1.00	ref	1.00	ref
Retired at T2	1.53*	[1.01, 2.34]*	1.44	[0.91, 2.26]	1.37	[0.82, 2.28]	1.21	[0.81, 1.80]	1.17	[0.78, 1.75]	1.08	[0.68, 1.71]
Female	1.00	ref	1.00	ref	1.00	ref	1.00	ref	1.00	ref	1.00	ref
Male	0.57	[0.38, 0.88]	0.49	[0.31, 0.77]	0.47	[0.28, 0.79]	0.86	[0.57, 1.28]	0.83	[0.55, 1.24]	0.90	[0.57, 1.44]
Low education	1.00	ref					1.00	ref				
High education	0.60	[0.39, 0.94]					1.03	[0.69, 1.55]				
Self-reported health and behaviors												
Excellent/very good/good health			1.00	ref	1.00	ref			1.00	ref	1.00	ref
Fair/poor health			18.67	[7.70, 45.25]	22.04	[7.56, 64.24]			4.46	[1.76, 11.33]	5.10	[1.65, 15.74]
Physically active < weekly					1.00	ref					1.00	ref
Physically active ≥ weekly					0.55	[0.30, 1.01][d]					0.55	[0.31, 0.96]

Note. Models originally included all variables shown in Table 1, with the exception of variables indicating health. Control variables that did not contribute significantly are not shown, and a blank thus implies that the variable was excluded. The univariate OR for retired at T2 is 1.64 (1.08-2.49) for positive changes in physical health, and 1.22 (0.82-1.81) for negative changes. OR = odds ratio; CI = confidence interval.

[a]The most parsimonious models were chosen.

[b]This model included an indicator of health status at T1. With linear control for PCS at T1, the OR for retired at T2 is 1.11 (0.64-1.90) for positive changes in physical health, and 1.16 (0.77-1.74) for negative changes.

[c]This model included health behaviors at T1 and were thus restricted to the 426 individuals with such information. Weekly physical activity was the only variable that contributed significantly.

[d]Significant at the 10% level.

*implies that the result is statistically significant at the 5% level.

Table 4. Multinomial Analyses of Characteristics Associated With Mental Health Status Changes.

	Positive change in mental health (MCS-score)[a]						Negative change in mental health (MCS-score)[a]					
	Model without health status		Model with health status[b]		Model with health behaviors[c]		Model without health status		Model with health status		Model with health behaviors	
	OR	CI	OR	CI	OR	CI	OR	CI	OR	CI	OR	CI
Still working at T2	1.00	ref	1.00	ref	1.00	ref	1.00	ref	1.00	ref	1.00	ref
Retired at T2	1.70*	[1.07, 2.70]*	1.67*	[1.05, 2.67]*	1.71*	[1.01, 2.89]*	0.57*	[0.34, 0.96]*	0.56*	[0.33, 0.94]*	0.50*	[0.28, 0.90]*
Female	1.00	ref	1.00	ref	1.00	ref	1.00	ref	1.00	ref	1.00	ref
Male	0.56	[0.36, 0.86]	0.53	[0.34, 0.81]	0.48	[0.30, 0.78]	0.42	[0.26, 0.66]	0.40	[0.25, 0.63]	0.34	[0.20, 0.56]
57-59 years	1.00	ref	1.00	ref	1.00	ref	1.00	ref	1.00	ref	1.00	ref
60-62 years	1.15	[0.70, 1.87]	1.19	[0.73, 1.95]	1.27	[0.73, 2.22]	0.96	[0.56, 1.64]	1.00	[0.58, 1.72]	0.85	[0.46, 1.57]
63-66 years	1.09	[0.61, 1.95]	1.04	[0.58, 1.86]	0.82	[0.42, 1.58]	1.89	[1.02, 3.50]	1.82	[0.98, 3.40][d]	1.24	[0.61, 2.51]
Work related factors												
Works < 37 hr/week	1.00	ref	1.00	ref			1.00	ref	1.00	ref		
Works 37-40 hr/week	0.93	[0.56, 1.54]	1.00	[0.60, 1.66]			0.78	[0.46, 1.32]	0.82	[0.48, 1.40]		
Works > 40 hr/week	0.56	[0.28, 1.11]	0.61	[0.30, 1.23]			0.50	[0.24, 1.03][d]	0.54	[0.26, 1.11]d		
Self-reported health and behaviors												
Excellent/very good/good health					1.00	ref			1.00	ref	1.00	ref
Fair/poor health	2.45	[1.36, 4.41]	2.45	[1.36, 4.41]	2.40	[1.24, 4.63]			2.34	[1.26, 4.37]	2.06	[1.01, 4.18]
Physically active < weekly					1.00	ref					1.00	ref
Physically active ≥ weekly	0.74	[0.42, 1.30]			0.74	[0.42, 1.30]					0.49	[0.28, 0.87]

Note. Models originally included all variables shown in Table 1, with the exception of variables indicating health. Control variables that did not contribute significantly are not shown, and a blank thus implies that the variable was excluded. The univariate OR for retired at T2 was excluded. The univariate OR for retired at T2 was 1.97 [1.31, 2.97] for positive changes in mental health, and 0.84 [0.55, 1.31] for negative changes. OR = odds ratio; CI = confidence interval.

aThe most parsimoneous models were chosen.
bThis model included an indicator of health status at T1. With linear control for MCS at T1, the OR for retired at T2 is 1.80 [1.03, 3.16] for positive changes in mental health, and 0.55 [0.33, 0.94] for negative changes.
cThis model included health behaviors at T1 and were thus restricted to the 426 individuals with such information. Weekly physical activity was the only variable that contributed significantly.
dSignificant at the 10% level.
*Implies that the result is statistically significant at the 5% level.

For mental health as measured by the categorized MCS-12 score, retirement status at T2 was statistically significant for both positive and negative changes, in models with both health status and health behaviors (Table 4). Significant contributions were observed for sex, age, work hours, poor health, and weekly physical activity. With control for health behaviors at T1, the OR for retirees relative to workers for a positive change in mental health was 1.71 (CI = [1.01, 2.89]), whereas the OR for a negative change was 0.50 (CI = [0.28, 0.90]).

Changes in Health Behaviors

Descriptive analyses. All in all, 10% quit smoking in the course of 5 years, whereas 2% started smoking. Differences in increased or reduced smoking were, however, not statistically significant across retirement status. Retirement was, however, associated with an increased intake of alcohol: 33% of the retirees increased their alcohol consumption versus 22% of those still working. A larger share of retirees reported an increase in outdoor activity relative to workers (31% vs. 17%). Furthermore, a larger share of workers reported that they had taken up physical activity up to several times per week (i.e., a major increase) compared with those still working (40% vs. 26%). Weight gain was less common among retirees than workers (40% vs. 51%), whereas weight loss was more commonly observed among retirees (41% vs. 29%). Few individuals (9%) started to use pharmaceutical sleeping aids, pain killers, sedatives, anti-depression drugs, or other similar medications weekly between T1 and T2, and there was only a slight difference between retirees and workers (p = .08, not shown).

Multivariate analyses. Multivariate analyses of changes in health behaviors largely confirm the results from the descriptive analyses (Table 5). Retirement is unlikely to lead to pronounced changes in smoking behavior. Retirement is, however, associated with both an increase and a reduction in alcohol intake. For retired individuals, the OR for an increase in alcohol intake was 2.03 (CI = [1.28, 3.21]), and whereas being married and having had a stressful job may be protective, initial poor health may be harmful. The OR for retired individuals to reduce their alcohol intake was of almost the same magnitude: 1.87 (CI = [1.10, 3.17]). Having had a stressful job was not conducive for helping reduce the intake. Except for the variables mentioned explicitly here, none of the covariates were associated with neither an increased nor a reduced intake.

For physical activity, significant results were observed only for an *increase* in outdoor activity in multivariate models. The OR for an increase in outdoor

Table 5. Multinomial Analyses of Characteristics Associated With Health Behavior Changes.

| | Alcohol intake | | | | Outdoor physical activity | | | | Weight | | | |
| | Increase | | Reduction | | Increase | | Reduction | | Weight gain | | Weight loss | |
	OR	CI	OR	CI	OR	CI	OR	CI	OR	CI	OR	CI
Still working at T2	1.00	ref	1.00	ref	1.00	ref	1.00	ref	1.00	ref	1.00	ref
Retired at T2	2.03*	[1.28, 3.21]*	1.87*	[1.10, 3.17]*	2.01*	[1.16, 3.47]*	0.83	[0.48, 1.44]	0.78	[0.47, 1.31]	1.75	[1.12, 2.71]
57-59 years					1.00	ref	1.00	ref				
60-62 years					1.21	[0.67, 2.16]	1.14	[0.64, 2.01]				
63-66 years					1.65	[0.85, 3.19]	2.09	[1.07, 4.07]				
Single	1.00	ref	1.00	ref								
Married/cohabiting	0.59	[0.35, 0.99]	0.90	[0.47, 1.72]								
Work related factors												
Unstressful work situation	1.00	ref	1.00	ref								
Stressful work situation	0.61	[0.36, 1.03]a	0.46	[0.24, 0.88]								
Works <37 hr/week					1.00	ref	1.00	ref				
Works 37-40 hr/week					1.50	[0.83, 2.72]	1.16	[0.64, 2.10]				
Works >40 hr/week					2.20	[1.01, 4.79]	2.05	[0.98, 4.28]a				
Public sector									1.00	ref	1.00	ref
Private sector									0.92	[0.55, 1.54]	1.50	[0.96, 2.34]a

(continued)

17

Table 5. (continued)

	Alcohol intake				Outdoor physical activity				Weight			
	Increase		Reduction		Increase		Reduction		Weight gain		Weight loss	
	OR	CI	OR	CI	OR	CI	OR	CI	OR	CI	OR	CI
Self-reported health and behaviors												
Excellent/very good/good health	1.00	ref	1.00	ref								
Fair/poor health	1.76	[0.95, 3.26][a]	1.37	[0.65, 2.88]								
Cont. PCS-12 score					0.97	[0.94, 0.99]	0.99	[0.96, 1.02]				
Former/never smoker									1.00	ref	1.00	ref
Current smoker									2.10	[1.05, 4.21]	1.57	[0.97, 2.55][a]
Medication ≥ weekly									1.00	ref	1.00	ref
Medication < weekly									0.68	[0.26, 1.73]	2.75	[1.30, 5.83]

Note. Final multinomial models of health behavior changes from T1 to T2 in alcohol intake, physical activity, and weight. The most parsimoneous models were chosen as final models, only including control variables that contributed significantly. A blank implies that the variable was excluded. The models originally included all variables shown in Table 1, with the exception of variables indicating health and/or health behaviors which were added subsequently and not all at the same time due to colinearity. Cont. refers to continuous. No significant changes in smoking behaviors were associated with retirement, and the analyses are thus not shown (available upon request). The univariate OR for retirees relative to works at T2 is 0.81 [0.41, 1.60] for increased and 0.93 [0.57, 1.50] for reduced smoking; 1.99 [1.27, 3.13] for increased and 1.82 [1.07, 3.07] for reduced alcohol consumption; 2.27 [1.40, 3.69] for increased and 0.99 [0.61, 1.59] for reduced outdoor physical activity; and 0.79 [0.48, 1.32] for weight gain and 1.80 [1.16, 2.77] for weight loss. OR = odds ratio; CI = confidence interval.

[a]Significant at the 10% level.

*implies that the result is statistically significant at the 5% level.

18

physical activity for retirees compared with workers was 2.01 (CI = [1.16, 3.47]). Those who had worked more than full time were more likely to *increase* their levels, whereas the same was true for those with a poorer physical health as measured by the PCS-12.

Weight gain was more common than weight loss in our study population, but no significant associations between retirement status and weight gain were observed in multivariate models. Compared with workers, retirees were more likely to experience weight loss (OR = 1.75, CI = [1.12, 2.71]). Smokers and individuals using medication were slightly more likely to lose weight, and the same was observed for workers in the private sector.

Sensitivity Analyses

To examine attrition, we looked at differences between the 603 responders and the 174 non-responders at T1 by chi-square analysis, and found no differences between the two groups in terms of gender ($p = .30$), age ($p = .58$), or sector ($p = .25$). On average, the non-responders were lower educated than the responders ($p < .001$). Relative to the responders, the non-responders were more likely to be unmarried or previously married than currently married ($p = .03$). In terms of self-reported health, the non-responders were less likely to report excellent or very good health ($p = .03$) relative to the responders, whereas the percentages were fairly similar for good, fair, and poor health. Of the 15 responders who later died, one reported excellent, five very good, four good, five fair, and zero poor health.

An analysis comparing the final sample of 546 individuals with the 57 excluded showed that those excluded held a lower education ($p = .02$) and were younger ($p < .001$). In terms of health, those excluded reported a much worse health at T1 than those not excluded ($p < .001$). This is not surprising, as disability benefits are awarded individuals in poor health, as determined by physicians. In summary, our final sample comprised individuals somewhat higher educated, more likely to be married, and in better health compared with the initial survey responders. A robustness check including also the excluded disability pensioners showed a statistically significant *reduction* in PCS-12 scores for retirees relative to workers (coefficient = −2.13, *SE* = 0.72), whereas we observed an increase in MCS-12 scores (coefficient = 1.08, *SE* = 0.49). Multinomial analyses showed borderline significant changes of similar magnitude in both directions for physical health. No significant results were observed for deteriorations in mental health, whereas retirees were more likely to experience improvements in mental health (OR = 1.76, CI = [1.16, 2.65]). For smoking, alcohol intake, and physical activity, the results were comparable with those already reported, whereas no significant

changes were observed for weight changes in either direction (not shown, available on request).

In comparing changes in health and health behaviors between retirees who "had to" retire and those who opted to retire, the only substantial difference was that the positive change in physical health associated with retirement was statistically significant also after inclusion of health status at T1 for involuntary retirees (OR = 2.07, CI = [1.09, 3.93]) relative to workers. For all other measures, the magnitudes of change were basically similar for voluntary and involuntary retirees relative to workers (not shown, available on request).

As a robustness check, we fitted linear models on the change in PCS-12 and MCS-12 from T1 to T2 (first difference models), with and without control for the baseline scores on these measures at T1. Retirement was not significantly associated with a change in PCS-12, regardless of the model fitted (not shown, available on request). Retirement was, however, significantly associated with a positive change in MCS-12. The coefficient of being retired was 1.95 (*SE* = 0.56) with control for baseline MCS-12 scores.

Furthermore, we ran models for changes in physical and mental limitations. No significant results were observed for more or less physical limitations, or for an increase in mental limitations (not shown), but the multivariate OR for retirees relative to workers for reductions in mental limitations was 2.23 (CI = [1.08, 4.60]).

Finally, we also analyzed changes from T1 to T2 in the single question of self-rated health. No statistically significant differences between retirees and workers were observed for deteriorations in health in multivariate analyses. The OR for improvements in health for retirees relative to workers was 1.58 (CI = [1.01, 2.47]) in univariate analyses, and 1.54 (CI = [0.97, 2.44], *p* = .06) in multivariate analyses (not shown, available on request).

To avoid concerns regarding the inclusion of missing values in the reference category of "no change" in analyses of health behaviors, we ran models excluding individuals with missing information on the relevant outcome variable. This did not change the significance level of our results, and rendered the point estimates virtually identical for retirement associated changes in alcohol intake, outdoor physical activity, and weight (not shown, available on request).

Discussion

As health care is publicly available and retirement pensions are relatively high in Norway, our focus has been directed toward individuals' allocation of time during work and after retirement. Individuals who retire will, theoretically, have more time to spend on possible health investments than

individuals who continue working. However, health depreciates with age, and age and health are strongly related to retirement. As such, retirement may affect different individuals' health dissimilarly. With the increased emphasis on prolonged labor force participation in later life across aging populations, focus on its potential impact on subsequent health and health behaviors for various subgroups becomes important. Our results, from a Nordic welfare state setting, indicate that retirees were more likely than workers to report improvements in mental health, and similarly less likely to report deteriorations. Retirees were also more likely to report an increase in physical activity and weight loss. On the contrary, while one group of retirees was more likely to report a *reduction* in alcohol intake, a different group was more likely to report an *increase*, not conducive to good health.

Who Retires?

Retirement becomes more prevalent with increasing age, and early retirement is least common among those with a college education and among those who work more than full time. Those who report better health and/or no limitations have the lowest probability of retiring. As such, there is a natural self-selection into retirement, as has been shown previously (Gallo, 2013). In our opinion, the observed self-selection is a reflection of a real life situation and not merely a consequence of attrition and/or non-response bias in studies. This may, for instance, be linked to the type of jobs individuals hold. For people in suboptimal health, continued work may not be manageable in physically demanding jobs, whereas it may be possible in less physically taxing and professional work. As such, workers have dissimilar starting points from where they will (or will not) "decide" to retire, which may impact on the selection into retirement. In line with this, a recent Norwegian study by Solem et al. (2014) found that blue-collar workers tended to retire earlier than they would have liked.

However, our findings may suggest that retirees nevertheless are a diverse group. In light of the investment in health hypothesis, individuals can either choose to spend time in the labor market or retire and thus increase their leisure time. The leisure time can be spent either to optimize health, or on health neutral or health damaging activities. Whereas some individuals may exert a relatively high degree of control over their health by engaging in healthy consumption patterns, actively utilizing health care services, and opting to live in an environment conducive to good health, others may choose differently. As a consequence, the experience of retirement may be positive or negative for different people, which perhaps may explain previously reported overall zero main effects of retirement (Gallo, 2013; Oksanen & Virtanen, 2012).

Health Consequences of Retirement

Retirees were more likely than workers to report improvements in mental health, whereas workers tended to more often experience deteriorations. The changes are not dramatic, but statistical significant even in a limited sample. In line with this, some studies report that mortality risks are lower for those who retire early compared with those who retire later, when disability pensioners are excluded (Brockmann, Muller, & Helmert, 2009). Disability pensioners were excluded in our study. As a consequence, our results do not generalize to individuals with the poorest initial health. In line with this, some discrepancies were observed in robustness checks including disability pensioners.

Retirement appears to increase the likelihood of feeling better and experiencing fewer difficulties due to suboptimal mental health. It is, however, important to bear in mind that health depreciates with age. As such, the relative benefits observed for retirees compared with workers do no suggest that health actually improves, but that it is reduced less for retirees compared with workers. Although work usually involves different kinds of activities which are likely to be reduced with retirement, it seems that retirees to a large extent are able to compensate and even increase their activity level after retirement, in line with the findings of others (Barnett, van Sluijs, & Ogilvie, 2012; Berger et al., 2005). Weight maintenance or weight reduction was more common among retires, perhaps as a consequence of the increased physical activity and/or the increased time and effort available to prepare healthy meals. Other studies mainly report weight gains after retirement (Chung, Domino, & Stearns, 2009; Forman-Hoffman et al., 2008), although not for physically active retirees (Sjosten et al., 2012). Inconsistent results were found for alcohol use. Half of those who retired changed their alcohol intake, compared with one in three of those who continued to work—but the changes went in both directions. This is in line with reports from a recent review study (Kuerbis & Sacco, 2012). Our null findings on changes in smoking behavior are in line with most other studies.

Quitting stressful or straining work may lead to improvements in health (see, for example, Mojon-Azzi et al., 2007; Sjosten et al., 2011). On the contrary, workforce participation entails different forms of physical and cognitive activities, depending on type of occupation, which may be conducive to good health (Dendinger, Adams, & Jacobson, 2005; Mor-Barak, 1995). Work also provides daily activity, structure, engagement, and social networks, and loss of these may adversely affect health unless substituted (Altschuler, 2004; Mutran, Reitzes, Bratton, & Fernandez, 1997). This goes back to the investment in health hypothesis, suggesting that consequences for health may

depend on what the extra free time is spent on, and on whether the job one was holding prior to retirement was health conducive or not.

Finally, retirement does not lead to uniform consequences—some drink more whereas others drink less; some get poorer health whereas others get better health. The increased flexibility in retirement timing opportunities inherent in the revised Norwegian pension scheme may, as such, facilitate improvements in health if those benefitting from retiring actually retire, while those benefitting from continued work prolong work to a larger extent.

Strengths and Limitations

Health effects have been hypothesized to differ in various phases following retirement (Atchley, 1976), and this has been observed also empirically (Kim & Moen, 2002; Sahlgren, 2013; Solem, 1987). Others have, however, failed to identify such a pattern (van Solinge & Henkens, 2008). Our findings suggest that retirement may be associated with certain changes conducive to mental health and healthy behaviors in general, but our sample size was too limited to examine potential time effects. However, descriptive analyses did not suggest this.

Second, changes in health and health behaviors primarily become evident when we compare workers and retirees. If we had only compared those who retired with themselves before and after retirement, we would have had to conclude that there were no positive changes because of age-related health depreciation. As such, this highlights the importance of utilizing a relevant control group in this type of studies. In addition, regression to the mean may influence results with measurements from only two points in time, as those who later retire are likely to report poorer health initially. However, for regression to the mean to be a major problem, the degree of regression to the mean must relate also to the primary variable of interest, that is, retirement. From our background analyses, it is not clear that this is the case.

Third, our findings may be affected by selective attrition. Our final sample comprised individuals somewhat higher educated, more likely to be married, and in better health compared with the initial survey responders, in line with findings on the overall sample by Koløen, Lima, and Veenstra (2013). The implications of this selective non-response may be that our respondents are atypical and not fully representative of the general population, as may be suggested by the unusual small differences between men and women as well as between older and younger respondents. It is, however, difficult to anticipate how our results may have been influenced by the possible presence of selective attrition. Inclusion of the variables most likely to be associated with non-response influenced the modeled estimates only weakly.

Fourth, our study was undertaken in a society with generous social welfare provisions. Retirees in Norway receive relatively high pensions compared with the situation in many other rich, developed countries. Furthermore, health care is free of charge and readily available, and not tied to employment as is the case for the under 65s in, for instance, the United States. The existence of such welfare provisions, and participants' knowledge and expectations of these, might affect on retirement decisions and thus result in a selection into retirement different from what may be observed in studies from countries with dissimilar welfare systems. As such, our findings may be limited to elderly workers in countries with comparable welfare systems. Further research is warranted to confirm cross-national generalizability in this area.

Finally, the panel survey currently involves only two waves of data collection, 5 years apart. As such, this study cannot address issues of causality. Current research with measures from more than two time points have employed more rigorous designs, and thus been able to investigate within-individual changes around retirement using trajectories (see, for example, Oksanen et al., 2011; Westerlund et al., 2010). These studies conclude that retirement is beneficial for mental health (Oksanen et al., 2011) and associated with a substantial reduction in mental and physical fatigue and depressive symptoms (Westerlund et al., 2010), in line with our finding. Unfortunately, we do not have monitored trajectory measurements, and our sample is too small to look at changes in relation to time of retirement. Similarly, although changes in health and behaviors may be related to retirement, we cannot rule out the significance of other important life events that may have occurred simultaneously.

Conclusion

In general, retirement appears to be associated with positive changes in mental health and certain health behaviors. The tendency is that, compared with those who continue to work, fewer retirees experience deteriorations in mental health, more remain or become physically active, more maintain or reduce their weight, but some drink more. Our study only looks at fairly short-term consequences, and we cannot predict how postponed retirement will affect seniors' health in the longer run. In line with the general perspectives in the demand for health theory, and in particular the issue of time allocation for health investments, our results suggest that early retirement is associated with positive health changes for some, but that continued work activity also has positive consequences for some, although a lower number of individuals. Additional research is warranted to determine for which workers there is a strong potential for prolonging working life and what the consequences would be.

Declaration of Conflicting Interests

Funding

Notes

1. Information on the sample is available from http://norlag.nova.no/id/24312.0?language=1. Furthermore, the data file used in this study and information on variables and so on is available from http://nsddata.nsd.uib.no/webview/index.jsp?node=0&submode=ddi&study=http%3A%2F%2F129.177.90.161%3A80%2Fobj%2FfStudy%2FNSD1813&gs=6&gs=11&gs=6&mode=documentation&top=yes&;language=en.

2. Disability pensioners were excluded, as our focus is directed toward the association between retirement and subsequent health changes, and not the reverse. The number was not sufficient to warrant a separate analysis.

3. As background information and health status were measured by a telephone interview, there was virtually no missing information in this subsample in these areas. However, there was a relatively minor number of missing responses for health behaviors measured by the postal questionnaire. Individuals with missing information were included in the reference category ("no change"). More information is available on request.

4. The Short Form 12 (SF-12) also includes an item measuring general self-rated health: In general, would you say your health is, with response categories, excellent/very good/good/fair/poor. As a robustness check, we also calculated 5-year change scores for this single item by computing the differences between responses at T1 and T2. Similarly, we constructed an indicator of physical and/or mental limitations based on multiple SF-12 questions. For physical limitations, we used the following four questions: Over the past 4 weeks, has your health limited you in (1) daily activities? (yes/no); (2) performing certain tasks? (yes/no); In general, does your health limit you in performing (3) heavier tasks? (yes, frequently/yes, at times/no, not at all); and (4) easier tasks? (yes, frequently/yes, at times/no, not at all). A yes to any of the four questions was defined as having a physical limitation. A change in physical limitations was indicated if the response changed from yes to no or vice versa between T1 and T2. The presence of mental limitations was constructed based on seven questions: In general, does your mental health limit you in (1) your daily activities? (yes/no); (2) performing certain tasks? (yes/no); (3) Over the past 4 weeks, has pain limited you in your daily activities? (very much/much/quite a bit/somewhat/not at all); Over the past

4 weeks, how often have you felt (4) calm and harmonic?; (5) full of energy?; (6) depressed or sad?; and (7) that your mental health has limited your social life? Six response categories for Questions 4 to 7 ranged from *all the time* (1) to *not at all* (6). A yes to Questions 1 or 2 was defined as a mental limitation. Yes was also recorded if the response to Question 3 was very much or much, the response to Questions 4 and 5 was 4 to 6, and/or the response to Questions 6 and 7 was 1 to 3. A change in mental limitations was indicated if the response changed from yes to no or vice versa between T1 and T2.

5.   Descriptive chi-square tests examining health status differences between those who retired within the first 2 years or later did not reveal any effect of timing on physical ($p = .72$) or mental ($p = .23$) health changes.

6.   Reports from multinomial analyses of the other health status variables are commented on in the "Sensitivity Analyses" section, and are available on request.

References

Altschuler, J. (2004). Beyond money and survival: The meaning of paid work among older women. *International Journal of Aging & Human Development*, *58*, 223-239.

Atchley, R. (1976). *The sociology of retirement*. New York, NY: Schenkman.

Bacharach, S., Bamberger, P., Cohen, A., & Doveh, E. (2007). Retirement, social support and drinking behavior: A cohort analysis of males with a baseline history of problem drinking. *Journal of Drug Issues*, *37*, 525-549.

Barnett, I., van Sluijs, E. M., & Ogilvie, D. (2012). Physical activity and transitioning to retirement: A systematic review. *American Journal of Preventive Medicine*, *43*, 329-336.

Becker, G. (1965). A theory of the allocation of time. *The Economic Journal*, *75*, 493-517.

Behncke, S. (2009). *How does retirement affect health?* (IZA Discussion Paper No. 4253). Retrieved from http://ftp.iza.org/dp4253.pdf

Berger, U., Der, G., Mutrie, N., & Hannah, M. K. (2005). The impact of retirement on physical activity. *Ageing & Society*, *25*, 181-195.

Börsch-Supan, A. (2007). *Work disability, health, and incentive effects* (Mannheim University SFB 504 series). Retrieved from https://ub-madoc.bib.uni-mannheim.de/2546/1/dp07_23.pdf

Brockmann, H., Muller, R., & Helmert, U. (2009). Time to retire—Time to die? A prospective cohort study of the effects of early retirement on long-term survival. *Social Science & Medicine*, *69*, 160-164.

Chung, S., Domino, M. E., & Stearns, S. C. (2009). The effect of retirement on weight. *The Journals of Gerontology Series B: Psychological Sciences and Social Sciences*, *64*, 656-665.

Dave, D., Rashad, R. I., & Spasojevic, J. (2008). The effects of retirement on physical and mental health outcomes. *Southern Economic Journal*, *75*, 761-782.

Dendinger, V. M., Adams, G. A., & Jacobson, J. D. (2005). Reasons for working and their relationship to retirement attitudes, job satisfaction and occupational

self-efficacy of bridge employees. *International Journal of Aging & Human Development*, *61*, 21-35.

Forman-Hoffman, V. L., Richardson, K. K., Yankey, J. W., Hillis, S. L., Wallace, R. B., & Wolinsky, F. D. (2008). Retirement and weight changes among men and women in the health and retirement study. *The Journals of Gerontology Series B: Psychological Sciences and Social Sciences*, *63*, S146-S153.

Gallo, W. (2013). The association of retirement with physical and behavioural health. In M. Wang (Ed.), *The Oxford handbook of retirement* (pp. 325-338). Oxford, UK: Oxford University Press.

Grossman, M. M. (1972). On the concept of health capital and the demand for health. *Journal of Political Economy*, *80*, 223-255.

Hallgren, M., Högberg, P., & Andreasson, S. (2009). *Alcohol consumption among elderly European Union citizens: Health effects, consumption trends and related issues*. Stockholm: Swedish National Institute of Public Health.

Henkens, K., van Solinge, H., & Gallo, W. T. (2008). Effects of retirement voluntariness on changes in smoking, drinking and physical activity among Dutch older workers. *European Journal of Public Health*, *18*, 644-649.

Hoyer, G., Nilssen, O., Brenn, T., & Schirmer, H. (1995). The Svalbard study 1988-89: A unique setting for validation of self-reported alcohol consumption. *Addiction*, *90*, 539-544.

Jokela, M., Ferrie, J. E., Gimeno, D., Chandola, T., Shipley, M. J., Head, J., . . .Kivimaki, M. (2010). From midlife to early old age: Health trajectories associated with retirement. *Epidemiology*, *21*, 284-290.

Kim, J. E., & Moen, P. (2002). Retirement transitions, gender, and psychological well-being: A life-course, ecological model. *The Journals of Gerontology Series B: Psychological Sciences and Social Sciences*, *57*, 212-222.

Kjonstad, A. (2007). *Public Insurance Act with comments* [in Norwegian]. Oslo, Norway: Gyldendal Akademisk.

Koløen, K., Lima, I., & Veenstra, M. (2013). *Non-response and attrition in the NorLAG panel study*. Oslo: Norwegian Social Research.

Kuerbis, A., & Sacco, P. (2012). The impact of retirement on the drinking patterns of older adults: A review. *Addictive Behaviors*, *37*, 587-595.

Lang, I. A., Rice, N. E., Wallace, R. B., Guralnik, J. M., & Melzer, D. (2007). Smoking cessation and transition into retirement: Analyses from the English Longitudinal Study of Ageing. *Age and Ageing*, *36*, 638-643.

Mein, G., Martikainen, P., Hemingway, H., Stansfeld, S., & Marmot, M. (2003). Is retirement good or bad for mental and physical health functioning? Whitehall II longitudinal study of civil servants. *Journal of Epidemiology & Community Health*, *57*, 46-49.

Midanik, L. T., Soghikian, K., Ransom, L. J., & Tekawa, I. S. (1995). The effect of retirement on mental health and health behaviors: The Kaiser Permanente Retirement Study. *The Journals of Gerontology Series B: Psychological Sciences and Social Sciences*, *50*, S59-S61.

Mojon-Azzi, S., Sousa-Poza, A., & Widmer, R. (2007). The effect of retirement on health: A panel analysis using data from the Swiss Household Panel. *Swiss Medical Weekly*, *137*, 581-585.

Molven, O., & Ferkis, J. (2011). *Healthcare, welfare and law: Health legislation as a mirror of the Norwegian welfare state*. Oslo, Norway: Gyldendal Akademisk.

Mor-Barak, M. E. (1995). The meaning of work for older adults seeking employment: The generativity factor. *International Journal of Aging & Human Development*, *41*, 325-344.

Mutran, E. J., Reitzes, D. J., Bratton, K. A., & Fernandez, M. E. (1997). Self-esteem and subjective responses to work among mature workers: Similarities and differences by gender. *The Journals of Gerontology Series B: Psychological Sciences and Social Sciences*, *52*, S89-S96.

Neve, R. J. M., Lemmens, P. H., & Drop, M. J. (2000). Changes in alcohol use and drinking problems in relation to role transitions in different stages of the life course. *Substance Abuse*, *21*, 163-178.

Norwegian Ministry of Labour. (2010). *Pensioners in Norway*. Retrieved from https://www.regjeringen.no/no/dokumenter/prop-130-l-2010--2011/id644804/?ch=1&q=

Norwegian Ministry of Labour. (2012). *Age limits for specific employment sectors*. Retrieved from www.regjeringen.no/nb/dep/fin/tema/finansmarkedene/otp/stikkordsliste.html?id=491191

Oksanen, T., Vahtera, J., Westerlund, H., Pentti, J., Sjosten, N., Virtanen, M., . . .Kivimaki, M. (2011). Is retirement beneficial for mental health?: Antidepressant use before and after retirement. *Epidemiology*, *22*, 553-559.

Oksanen, T., & Virtanen, M. (2012). Health and retirement: A complex relationship. *European Journal of Ageing*, *9*, 221-225.

Organisation for Economic Co-Operation and Development. (2010). *Sickness, disability and work: Breaking the barriers—A synthesis of findings across OECD countries*. Paris, France: Author.

Organisation for Economic Co-Operation and Development. (2013). *Pensions at a glance 2013: Retirement-income systems in OECD and G20 countries*. Paris, France: Author.

Perreira, K. M., & Sloan, F. A. (2001). Life events and alcohol consumption among mature adults: A longitudinal analysis. *Journal of Studies on Alcohol and Drugs*, *62*, 501-508.

Perreira, K. M., & Sloan, F. A. (2002). Excess alcohol consumption and health outcomes: 6-year follow-up of men over age 50 from the health and retirement study. *Addiction*, *97*, 301-310.

Sahlgren, G. H. (2013). *Work longer, live healthier*. London, England: Institute of Economics Affairs.

Sjosten, N., Kivimaki, M., Singh-Manoux, A., Ferrie, J. E., Goldberg, M., Zins, M., . . .Vahtera, J. (2012). Change in physical activity and weight in relation to retirement: The French GAZEL Cohort Study. *BMJ Open*, *2*, e000522.

Sjosten, N., Nabi, H., Westerlund, H., Singh-Manoux, A., Dartigues, J. F., Goldberg, M., . . .Vahtera, J. (2011). Influence of retirement and work stress on headache prevalence: A longitudinal modelling study from the GAZEL Cohort Study. *Cephalalgia*, *31*, 696-705.

Slingerland, A. S., van Lenthe, F. J., Jukema, J. W., Kamphuis, C. B., Looman, C., Giskes, K., . . .Brug, J. (2007). Aging, retirement, and changes in physical activity: Prospective cohort findings from the GLOBE study. *American Journal of Epidemiology*, *165*, 1356-1363.

Solem, P. E. (1987). Mortality during the first five years after reaching retirement age. In L. Levi (Ed.), *Society, stress and disease. Volume 5:* Old age (pp. 236-248). Oxford, UK: Oxford University Press.

Solem, P. E. (2012). Changes in housework, leisure activities and voluntary work after retirement [in Norwegian]. *Tidsskr Velferdsforskn*, *15*, 207-221.

Solem, P. E., Syse, A., Furunes, T., Mykletun, R. J., de Lange, A., Schaufeli, W., & Ilmarinen, J. (2014). To leave or not to leave: Retirement intentions and retirement behaviour. *Ageing and Society*, 1-23. doi:10.1017/S0144686X14001135

Stattin, M. (2005). Retirement on grounds of ill health. *Occupational and Environmental Medicine*, *62*, 135-140.

van Solinge, H., & Henkens, K. (2007). Involuntary retirement: The role of restrictive circumstances, timing, and social embeddedness. *The Journals of Gerontology Series B: Psychological Sciences and Social Sciences*, *62*, S295-S303.

van Solinge, H., & Henkens, K. (2008). Adjustment to and satisfaction with retirement: Two of a kind? *Psychology and Aging*, *23*, 422-434.

Ware, J., Kosinski, M., & Keller, S. D. (1996). A 12-Item Short-Form Health Survey: Construction of scales and preliminary tests of reliability and validity. *Medical Care*, *34*, 220-233.

Westerlund, H., Vahtera, J., Ferrie, J. E., Singh-Manoux, A., Pentti, J., Melchior, M., . . .Kivimaki, M. (2010). Effect of retirement on major chronic conditions and fatigue: French GAZEL occupational cohort study. *British Medical Journal*, *341*, c6149.

Whitehouse, E., D'Addio, A., Chomik, R., & Reilly, A. (2009). Two decades of pension reform: What has been achieved and what remains to be done? *The Geneva Papers*, *34*, 515-535.