

***Does use of long-term care differ between occupational classes among the oldest old? Vitality 90+ Study.***

Enroth Linda<sup>1</sup>, Aaltonen Mari<sup>1</sup>, Raitanen Jani<sup>1,2</sup>, Nosraty Lily<sup>1</sup> and Jylhä Marja<sup>1</sup>.

<sup>1</sup>Faculty of Social Sciences (Health Sciences) and Gerontology Research Center (GEREC),  
University of Tampere, Tampere, Finland

<sup>2</sup>UKK Institute for Health Promotion Research, Tampere, Finland.

Corresponding author:

Linda Enroth

Faculty of Social Sciences (Health Sciences) and Gerontology Research Center (GEREC),  
University of Tampere, Tampere, Finland.

Address: University of Tampere, Arvo-building, Arvo Ylpön katu 34, 33520 Tampere, Finland

Email: [linda.enroth@uta.fi](mailto:linda.enroth@uta.fi)

p. +358 401 901 647

## ***Abstract***

Long-term care (LTC) use increases with ageing due to an age-related increase in disability. Both the levels of disability and social resources vary among socioeconomic groups. The association of socioeconomic status with LTC use is largely unexplored for the oldest old. This study examined how occupational class is associated with LTC use among nonagenarians in the context of universal care coverage.

A population-based prospective cohort study with 2,862 participants who answered the Vitality 90+ Study surveys in 2001, 2003, 2007, or 2010 in Tampere, Finland, was combined with national register data on LTC use. LTC use in total and separately for publicly and privately provided LTC facilities was assessed in a cross-sectional setting and during the 34-month follow-up by using logistic regression and competing-risks regression methods. Functional status, multimorbidity, family relations, and help at home were controlled.

In total or public LTC use, only a few differences between occupational classes were found at baseline. However, upper non-manuals used more private LTC than lower non-manuals (OR 0.54, 95% CI 0.35-0.85), skilled manual (OR 0.40, 95% CI 0.26-0.62) or housewives (OR 0.40, 95% CI 0.22-0.74). There were no statistically significant differences in entering any kind of LTC after adjustments for all independent variables. During the study period, the share of privately provided care out of all LTC increased and the upper non-manuals no more used private care more than other groups.

This study underlines the importance of following the structural changes in LTC provision to guarantee that the need for LTC is met equally for all socioeconomic groups.

Key words: Socioeconomic Factors, Institutionalisation, Oldest Old, Mortality

## ***Introduction***

Several studies have shown that the use of institutional long-term care (LTC) increases with ageing (Tomiak et al. 2000; Luppala et al. 2010). Important LTC use predictors often associated with old age are decline in physical and cognitive functioning, (Gaugler et al. 2007; Nihtilä & Martikainen 2008; Luppala et al. 2010; Yang et al. 2013) as well as living alone (Breeze et al. 1999; Nihtilä & Martikainen, 2008). Having close relatives or having informal care is also associated with the use of LTC, however, the direction of the associations varies (Grundy & Jital 2007; Pot et al. 2009). LTC use is found to be higher among women than among men. The reasons for this difference are thought to be related to differences in aforementioned common causes for LTC use, higher morbidity and widowhood among women. (Grundy & Jital, 2007; Luppala et al. 2009; Martikainen et al., 2009).

People with high socioeconomic status have better health and functioning even in very old age (Huisman et al. 2003; Enroth et al. 2013). They also have more financial and social resources to acquire services that enable them to live at home. Previous findings on LTC use in relation to socioeconomic status are inconsistent, however. Studies that cover wide age ranges, mainly focusing on the 65+ population, have found that home occupiers (Grundy & Glaser 1997; Breeze et al. 1999; Tomiak et al. 2000; Gaugler et al. 2007; Nihtilä & Martikainen 2007; McCann et al. 2012), and people with high income (Mustard et al. 1999; Nihtilä & Martikainen 2007), high education (Mustard et al. 1999), and high social class (Nihtilä & Martikainen 2007) enter LTC less frequently. However, there are also studies that report no differences according to occupation (Breeze et al. 1999), income (Tomiak et al. 2000), or education (Gaugler et al. 2007).

Finland adheres to the Nordic welfare state tradition, where LTC for older adults is provided universally, regardless of the financial situation (Johansson, 2010). Municipalities are responsible for organising LTC provision for local residents and access to LTC is based on a functional capacity assessment by the municipal authorities. Traditionally, LTC has been provided in residential homes (nursing homes) and inpatient wards in health centers, both owned by the municipality. During the past two decades, official guidelines from the central government have encouraged living at home as long as possible and the way of organising LTC has changed. Instead of LTC facilities owned by the municipalities, LTC is increasingly organised in service homes with 24-hour assistance, which are mainly owned by the private organisations, either for-profit or not-for-profit actors. Service homes are considered more home-like than residential homes, however, both provide round-the-clock LTC. In the traditional and in the new way of organising LTC, costs are mainly covered by municipal taxation but the inhabitants also pay a fee, which is dependent on their income (Table 1). In residential

homes, rent, care and medication are included in the fee, while in service homes, inhabitants pay separately for all costs. Municipalities are however, responsible for the availability of LTC and the same rules on entering LTC (the assessment of ability to live at home) are used for all LTC facilities. (Väyrynen & Kuronen 2014; Mikkola et al. 2015). In addition, there are cases where inhabitants themselves pay the total costs of LTC in service homes with 24-hour assistance, or in a few existing private residential homes. This gives more flexibility concerning the entering criteria and more freedom to choose the care facility. These cases are however, extremely rare.

LTC needs are likely to increase due to demographic changes, where mortality is postponed to older ages and the absolute number of very old people is increasing (Martikainen et al. 2012; Forma et al. 2017). However, for the very old, the association between socioeconomic status and the use of LTC is largely unexplored. This study aims to explore equality in LTC use in the context of ongoing structural changes in LTC organization by examining whether occupational class is associated with LTC use. LTC use is assessed in total, and separately for publicly and privately provided LTC facilities in the population aged 90+ in the city of Tampere.

**Table 1.** Formal round-the-clock long-term care in Finland.

LTC facility	Finance		Care providers	Setting
	Resident	Municipality		
Public residential home	Monthly fee, max 85% of the person's income <sup>a</sup>	Municipal budget	Municipality	Institution
Long-term inpatient ward in the Health Centre	Monthly fee, max 85% of the person's income <sup>a</sup>	Municipal budget	Municipality	Institution
Private residential home (very rare)	Monthly fee, approximately 4000–5000 euros	Social Insurance Institution <sup>b</sup>	Private organisations <sup>c</sup>	Institution
Privately or publicly <sup>d</sup> provided service home with 24-hour assistance	Monthly fee <sup>e</sup> , (gross earnings - 563 euro) x 0.35 + rent, medicines, food	Municipal budget, Social Insurance Institution <sup>b</sup>	Private organisations <sup>c</sup>	Community-based
Privately paid service home with 24-hour assistance (very rare)	Monthly fee, approximately 3000–4000 euros + rent, medicines, food	Social Insurance Institution <sup>b</sup>	Private organisations <sup>c</sup>	Community-based

<sup>a</sup>Includes care services, rent, medicines, and food. After the monthly fee, 105 euros should be left for the resident (2015).

<sup>b</sup>Reimbursements for care services, medicines, and rent costs. Dependent on income.

<sup>c</sup>For-profit and not-for-profit actors.

<sup>d</sup>Publicly provided service homes with 24-hour assistance started in Tampere in 2013, which is why they are not covered in this study.

<sup>e</sup>Included services vary between organisers, but usually only care services are included. Payments may also vary between municipalities.

## ***Methods***

Two designs were used in the study. First, LTC use was analysed cross-sectionally at baseline, and second, entering LTC was examined during the 34-month follow-up for those who were not in LTC at baseline.

### **Data**

The sample came from the Vitality 90+ Study in the city of Tampere, Finland (Jylhä et al. 2013). The population in Finland in 2010 was 5 375 276, and in Tampere it was 213 217. The proportion of 90+ year-olds was the same for both, 0.6% (Official Statistics of Finland 2016). All people aged 90 or older living in Tampere were invited to participate in mailed surveys in the years 2001, 2003, 2007, and 2010. The response rate varied from 79 to 86% between the surveys. If a person participated in the study more than once, only the first entry was included. The study sample consisted of 2,862 participants, and for the analytic data in this study response rate was 80%. The names, addresses, and places of residence were derived from the Tampere City Population Register. The Ethics Committees of the City of Tampere or Pirkanmaa Hospital District, depending on the study year, approved the study (R08192), and the participants or their legal representatives gave written informed consent.

Information about LTC use and the care provider was drawn from the National Care Registers for Health and Social Welfare, and information about mortality was derived from the Population Register. The register data were linked to the surveys until 1 January, 2013, by using Personal Identity Codes. Permission to use the anonymised register data was obtained from the National Institute for Health and Welfare (THL/506/5.0500/2009), and the data was compiled in collaboration with Statistics Finland (TK-53-623-09).

### **Long-term care as an outcome variable**

Participants were categorised as LTC users if 1) they spent 90 days or more in a residential home, in a service home with 24-hour assistance, or in the inpatient ward of a health center or hospital, or if 2) they had a confirmed LTC decision from the municipal service providers. The 90 days could be spent at the same facility or successively at several facilities without returning home for more than one night. A comprehensive assessment of physical, cognitive, psychological, and social functioning precede a confirmed LTC decision. According to Nihtilä and Martikainen (2008), in the Finnish population aged 65+, around 75% of the first stays in LTC started in hospital or the inpatient ward of a health center and 25% in residential or service homes. In this study, LTC use was dichotomised

(1/0) and analyses were run separately for total, public, and private LTC. In the variable, 1 referred to the outcome and 0 indicated that a person did not use that particular form (or forms) of LTC.

### **Explanatory variables**

Occupational class is widely used as a socioeconomic status indicator, also for older adults (Grundy & Holt 2001; Galobardes et al. 2006). Occupation largely determines income but also other available resources. In general, people higher in the hierarchy have more control over material, economic, social, political, symbolic and cultural resources (Lynch & Kaplan 2000). In this study, the participants were asked about their longest held occupation. Based on these individual occupations, four hierarchical occupational classes were constructed upper non-manual workers, lower non-manual workers, skilled manual workers, and unskilled manual workers according to Occupational and Industrial Classification by the Statistics Finland (Official Statistics of Finland 1976). These occupational classes were used as indicators of the person's position in the social hierarchy. In order to include all the participants in the analyses, housewives and those whose occupational class was not known were included as separate groups. In this study, housewives refers to a group of women who answered the questionnaire that they are housewives. The group is presumably heterogeneous including both women taking care of the housework or working in the farm and more affluent women.

As earlier studies have shown the importance of physical and cognitive functioning in LTC use (Luppa et al. 2010), multimorbidity and functioning were controlled. A summary variable of multimorbidity (range 0–5) was formed from five self-reported physician-diagnosed conditions: dementia (including Alzheimer's disease, other dementias, and a decline in cognition), depression, hip fracture, cardiovascular diseases (CVD), and diabetes. The ability to dress and undress, get in and out of bed, move indoors, walk 400 metres, and use stairs indicated functioning. For the analyses, a dichotomised variable was formed comparing those who were independent in five activities to those dependent in at least one activity.

Family relations, living arrangements, and informal care have been shown to impact LTC use (Nihtilä & Martikainen, 2008; McCann et al. 2011). Having children (yes/no) was included in baseline analyses. Information on living arrangements – living alone (1) or living with someone (0) – and receiving help at home were included in the follow-up analyses. Receiving help at home was evaluated by the question, “Does someone help you at home in tasks such as dressing, washing, or cooking?” The alternative answers a) yes, daily and b) yes, sometimes, were coded as 1, indicating help received, and c) no, even though I would need help and d) no, I do not need help, were coded as

0, indicating no help received. The question includes all help at home irrespective of the nature of the help, formal or informal.

### **Statistical methods**

Descriptive characteristics of the study sample are presented according to LTC use. Differences in age, gender, study year, health status, family relations, and home help between those who were in LTC at baseline and those who were not as well as between those who entered LTC in the follow-up and those who did not, respectively, were tested with the Mann–Whitney U test and with the chi-squared test. The multivariate analyses included four models. Analyses were first controlled for age, gender, and study year; second for functioning and multimorbidity; third for having children, and in the follow-up analyses for living alone and receiving help at home; and fourth in the fully adjusted model for all explanatory variables simultaneously. For baseline analyses, the fit of the models was tested with log likelihood ratio tests.

Occupational class differences in total, public, and private LTC use were studied at baseline by using binary logistic regression with odds ratios (ORs) and 95% confidence intervals (CIs). In addition, average marginal effects were performed as post-estimation analysis. In the follow-up analyses, each person not in LTC at baseline was followed for a maximum of 34 months, starting from the participation in the survey. It was the longest possible period for those who participated in the mailed survey in 2010. The follow-up lasted until entering LTC, death, or the end of the follow-up (ranging 4 days to 34 months). Since mortality is a major competing risk for LTC admission in the very old population, we used Fine and Gray's (1999) competing-risks regression model with subhazard ratios (SHR) and 95% CIs to assess the incidence of LTC use in the presence of mortality. Assumptions for proportional subhazards were tested by adding time interactions for all the covariates. In addition, incidence rates and the stacked cumulative incidence of LTC and mortality were examined.

In the analyses of LTC use at baseline as well as in the follow-up, the interaction terms between occupational class and gender on LTC use, and of occupational class and study year on LTC use, respectively, were tested for statistical significance. Interactions terms were run in order to test whether the analyses could be run combined for men and women, and for all study years. All analyses were performed with the statistical package Stata 14.0 with the level of statistical significance at  $p < 0.05$ .



## Results

There were 2,862 participants in the study (mean age 91.5), of whom 2,276 (80%) were women (Table 2). Altogether, 908 (32%) were in LTC at baseline, 606 (21%) entered LTC during the 34-month follow-up, and 1,348 (47%) did not use LTC during the study period. Overall, 1,321 (46%) participants used public LTC facilities and 509 (18%) private LTC facilities. Thus, 316 participants (11% of the population) used both kinds of LTC facilities.

Those who were in LTC at baseline were older, more frequently women, had poorer functioning, and had more diseases than those who were not in LTC at baseline ( $p < 0.001$  for all analyses). In the follow-up analyses, those who entered LTC were older, had more diseases ( $p < 0.001$ ), received help at home ( $p < 0.001$ ) and lived alone ( $p = 0.005$ ) more frequently than those who did not enter LTC in the follow-up. The proportion of those who were in LTC at baseline and of those who entered LTC during the follow-up became gradually lower from the study year 2001 to 2010 ( $p < 0.001$ ).

**Table 2.** Study sample at baseline and characteristics of those who were in long-term care (LTC) at baseline, for those who entered LTC in the 34-month follow-up and for non-LTC users. Participants in the Vitality 90+ Study.

	Baseline	LTC at baseline	Entering LTC in 34-month follow-up	Non-LTC users
Total sample	2,862 N	31.7	21.2	47.1
Age, mean	91.5	92.0	91.4	91.1
Gender				
Women	2,276	34.6	21.8	43.6
Men	586	20.6	18.6	60.8
Study year				
2001	892	39.1	27.6	33.3
2003	476	31.3	19.5	49.2
2007	687	31.1	18.6	50.2
2010	807	24.3	17.2	58.5
Occupational class				
Upper non-manual workers	230	29.1	18.3	52.6
Lower non-manual workers	801	27.8	21.0	51.2
Skilled manual workers	1,019	29.5	22.9	47.6
Unskilled manual workers	232	39.7	24.6	35.8
Housewives	254	26.0	22.8	51.2
Unknown occupation	326	48.8	14.7	36.5
Functioning				
Independent in five activities	1,265	10.5	22.5	67.0
Dependent in at least in one activity	1,507	49.2	20.6	30.3
Multimorbidity				
Number of diseases, mean	1.45	1.95	1.37	1.15
Family relations				
Have children	2,105	29.9	21.1	48.9
Do not have children	645	32.4	23.1	44.5
Live with someone	449		24.9	75.1
Live alone	1,379		32.0	68.0
Help at home				
Home help	978		39.5	60.5
No home help	900		21.9	78.1

Functioning: dressing and undressing, getting in and out of bed, moving indoors, walking 400 metres, and using stairs. Diseases: dementia, depression, hip fracture, cardiovascular diseases and diabetes. For variables “live with someone or live alone” and “help at home”: information was available only for those who were not in LTC at the baseline.

### **LTC use at baseline**

In public LTC use, a significant interaction term was found between occupational class and gender and in private LTC use between occupational class and study year implying varying impacts for the unknown occupation group. Thus, among the unknown occupation group, results are shown separately for men and women in public LTC use and separately for each study year in private LTC use (Table 3).

There were no statistically significant differences in total or in public LTC use between the hierarchical occupational classes when analyses were adjusted for age, gender, and study year (model 1). Yet, when functioning, multimorbidity, and having children were taken into account, skilled manuals (OR 0.68, 95% CI 0.46–0.99) were less likely to use LTC than upper non-manuals, and when only having children was taken into account, unskilled manuals (OR 1.59, 95% CI 1.02–2.48) were more likely to use public LTC. For private LTC use differences were more pronounced, as both lower non-manuals (OR 0.54, 95% CI 0.35–0.85) and skilled manuals (OR 0.40, 95% CI 0.26–0.62) were less likely to use it than upper non-manuals (Table 3). Adjustments had no effect on private LTC use. Post-estimation analysis of average marginal effects, based on the fully adjusted model, showed that other groups used 6–10% less private LTC than upper non-manuals.

Housewives used less frequently LTC in total (OR 0.53, 95% CI 0.33–0.87) and private LTC (OR 0.40, 95% CI 0.22–0.74) than upper non-manuals. Those with an unknown occupation were more frequently in LTC (OR 1.76, 95% CI 1.21–2.56) than upper non-manuals. This was true also when having children was taken into account but not in the models that took into account morbidity and functioning. Women with an unknown occupation were more frequently in public LTC (OR 2.23, 95% CI 1.24–4.04) than upper non-manual women, but among men, no differences were found. Those with an unknown occupation seemed to have variation in private LTC use between the study years; they were less frequently in private LTC in 2003 than upper non-manuals, but in 2010, odds ratios were higher for the unknown occupation group, however, the result was not statistically significant.

Log likelihood ratio tests showed that the fit of the models were significantly better in total, public, and private LTC use when functioning and multimorbidity (model 2) and all explanatory variables (model 4) were added to model 1 ( $p < 0.001$ , respectively).

### **Entering LTC during the 34-month follow-up**

The only difference between the occupational classes in entering LTC in total, when age, gender, and study year were included in the model (model 1), was that unskilled manuals (SHR 1.52, 95% CI 1.02–2.27) entered LTC more frequently than upper non-manuals. After adjustments for functioning and multimorbidity and/or for living alone and receiving help at home, the difference was no longer statistically significant. Adjustments did not notably affect the results in entering public LTC. Entering private LTC was less frequent among skilled manuals (SHR 0.58, 95% CI 0.35–0.97) than among upper non-manuals when analysis was adjusted for functioning and multimorbidity, but not in the other models including living alone and receiving help at home (Table 4).

There were no significant interaction terms between occupational class and gender in entering LTC. In entering private LTC, significant interaction terms were found between occupational class and study year. Because of the finding, analyses were conducted separately in each study year (results not shown). In 2001, 2003, and 2007, other occupational groups had clearly lower SHRs in entering private LTC than upper non-manuals. Differences were statistically significant for lower non-manuals and skilled manuals in 2001 ( $p = 0.04$  for both groups) and for unskilled manuals in 2003 ( $p < 0.001$ ). In 2010, lower non-manuals, skilled manuals, and those with an unknown occupation had higher SHR than upper non-manuals, suggesting a higher rate of entering private LTC; however, these differences were not statistically significant.

**Table 3.** Probability of being a resident in any kind of long-term care (LTC), in public LTC, or in private LTC at baseline, according to occupational class. ORs (95% CIs) from logistic regression models with upper non-manual workers as the reference group.

	LTC in total OR (95% CI)			
	Model 1	Model 2	Model 3	Model 4
Upper non-manual workers	1	1	1	1
Lower non-manual workers	0.83 (0.59-1.16)	0.72 (0.48-1.06)	0.81 (0.57-1.15)	0.70 (0.47-1.04)
Skilled manual workers	0.90 (0.65-1.25)	0.68 (0.47-1.00)	0.89 (0.64-1.25)	<b>0.68 (0.46-0.99)</b>
Unskilled manual workers	1.27 (0.85-1.91)	0.98 (0.62-1.57)	1.31 (0.87-1.98)	0.99 (0.62-1.59)
Housewives	<b>0.59 (0.39-0.90)</b>	<b>0.54 (0.33-0.87)</b>	<b>0.58 (0.38-0.89)</b>	<b>0.53 (0.33-0.87)</b>
Unknown occupation	<b>1.76 (1.21-2.56)</b>	1.51 (0.97-2.34)	<b>1.49 (1.01-2.21)</b>	1.29 (0.82-2.03)

	Public LTC OR (95% CI)			
	Model 1	Model 2	Model 3	Model 4
Upper non-manual workers	1	1	1	1
Lower non-manual workers	1.01 (0.69-1.46)	0.88 (0.58-1.34)	0.99 (0.68-1.46)	0.86 (0.56-1.32)
Skilled manual workers	1.14 (0.80-1.63)	0.89 (0.59-1.33)	1.15 (0.79-1.65)	0.88 (0.58-1.33)
Unskilled manual workers	1.52 (0.98-2.36)	1.17 (0.71-1.92)	<b>1.59 (1.02-2.48)</b>	1.19 (0.73-1.96)
Housewives	0.79 (0.50-1.24)	0.73 (0.44-1.22)	0.80 (0.50-1.27)	0.76 (0.45-1.28)
Unknown occupation				
Women	<b>3.12 (1.90-5.11)</b>	<b>2.74 (1.55-4.84)</b>	<b>2.64 (1.56-4.46)</b>	<b>2.23 (1.24-4.04)</b>
Men	0.84 (0.36-1.94)	0.64 (0.23-1.76)	0.74 (0.30-1.82)	0.67 (0.24-1.86)

	Private LTC OR (95% CI)			
	Model 1	Model 2	Model 3	Model 4
Upper non-manual workers	1	1	1	1
Lower non-manual workers	<b>0.56 (0.37-0.86)</b>	<b>0.56 (0.36-0.87)</b>	<b>0.54 (0.35-0.83)</b>	<b>0.54 (0.35-0.85)</b>
Skilled manual workers	<b>0.44 (0.29-0.67)</b>	<b>0.41 (0.26-0.63)</b>	<b>0.44 (0.29-0.67)</b>	<b>0.40 (0.26-0.62)</b>
Unskilled manual workers	0.73 (0.43-1.23)	0.64 (0.37-1.11)	0.73 (0.43-1.24)	0.63 (0.36-1.09)
Housewives	<b>0.42 (0.24-0.74)</b>	<b>0.43 (0.23-0.77)</b>	<b>0.40 (0.22-0.72)</b>	<b>0.40 (0.22-0.74)</b>
Unknown occupation				
2001	0.47 (0.21-1.08)	<b>0.41 (0.17-0.99)</b>	0.52 (0.24-1.15)	0.48 (0.20-1.20)
2003	<b>0.05 (0.01-0.48)</b>	<b>0.06 (0.01-0.56)</b>	<b>0.06 (0.01-0.54)</b>	<b>0.07 (0.01-0.65)</b>
2007	0.64 (0.24-1.75)	0.54 (0.19-1.54)	0.68 (0.25-1.85)	0.56 (0.20-1.59)
2010	1.65 (0.58-4.69)	1.48 (0.46-4.75)	2.03 (0.68-6.02)	1.70 (0.52-5.49)

Adjustments: Model 1 = age, gender, and study year; Model 2 = Model 1 + functioning and multimorbidity; Model 3 = Model 1 + having children; and Model 4 = Model 1+ functioning and multimorbidity + having children.

Because of the statistically significant interaction terms between gender and occupational class in public LTC and between study year and occupational class in private LTC, results are shown separately for the unknown occupation group.

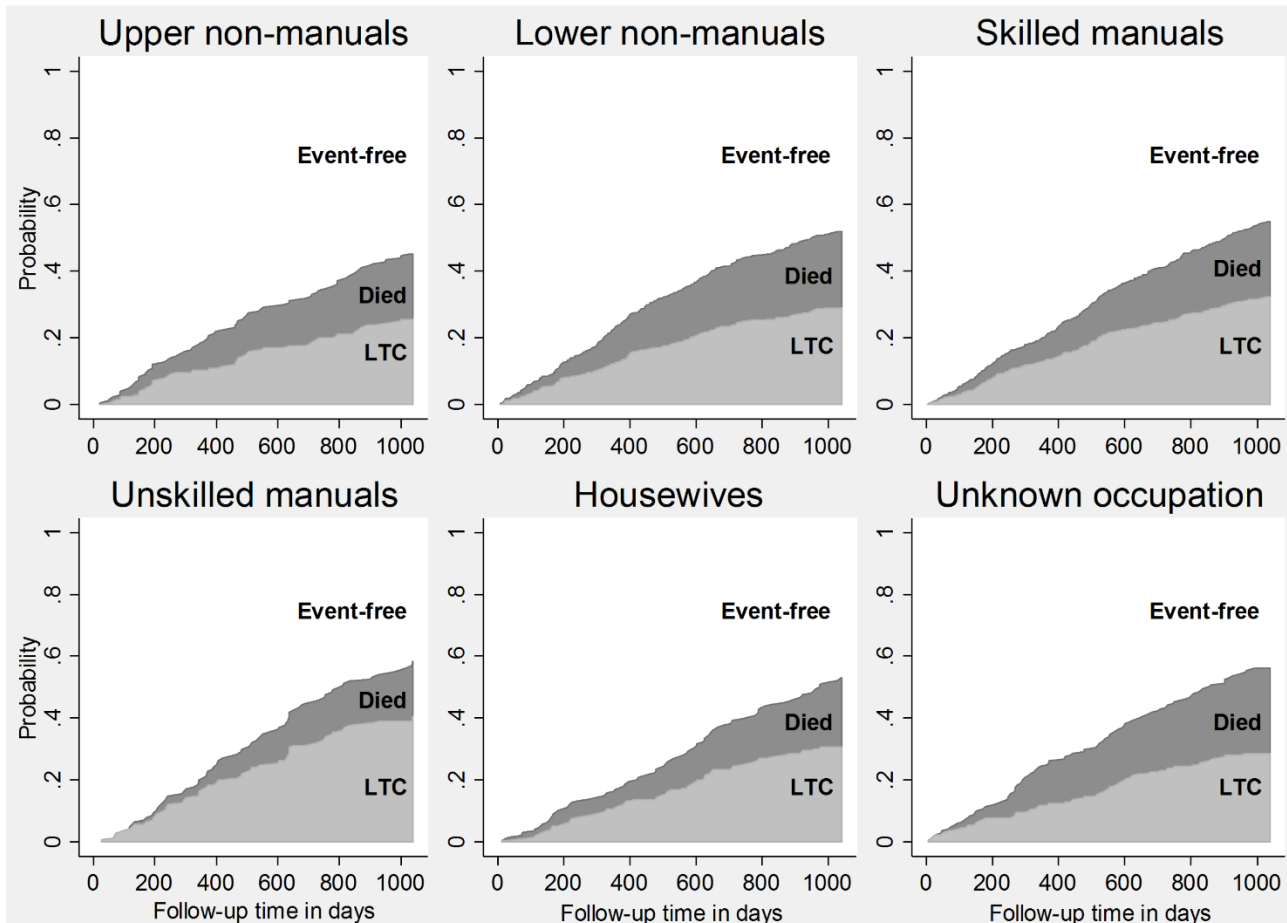
**Table 4.** Incidence of entering any kind of long-term care (LTC), public LTC, or private LTC in the 34-month follow-up according to occupational class. Subhazard ratios (95% CIs) from competing-risks regression models with mortality as a competing event.

		LTC in total SHR (95% CI)			
	IR	Model 1	Model 2, a	Model 3	Model 4, a
Upper non-manual workers	0.12	1	1	1	1
Lower non-manual workers	0.15	1.17 (0.83-1.65)	1.09 (0.78-1.53)	1.18 (0.82-1.69)	1.11 (0.78-1.59)
Skilled manual workers	0.16	1.23 (0.88-1.71)	1.12 (0.81-1.56)	1.25 (0.89-1.77)	1.19 (0.84-1.68)
Unskilled manual workers	0.21	<b>1.52 (1.02-2.27)</b>	1.34 (0.90-2.00)	1.48 (0.98-2.25)	1.40 (0.92-2.12)
Housewives	0.15	0.99 (0.66-1.48)	0.88 (0.59-1.31)	1.09 (0.72-1.65)	0.99 (0.65-1.51)
Unknown occupation	0.15	0.97 (0.64-1.46)	0.97 (0.64-1.48)	1.13 (0.74-1.74)	1.11 (0.72-1.71)
		Public LTC SHR (95% CI)			
	IR	Model 1	Model 2, a	Model 3	Model 4, a
Upper non-manual workers	0.11	1	1	1	1
Lower non-manual workers	0.13	1.19 (0.83-1.71)	1.13 (0.78-1.61)	1.24 (0.84-1.82)	1.19 (0.81-1.74)
Skilled manual workers	0.15	1.29 (0.91-1.84)	1.20 (0.85-1.70)	1.37 (0.95-1.99)	1.31 (0.91-1.90)
Unskilled manual workers	0.18	1.45 (0.94-2.23)	1.30 (0.85-2.00)	1.44 (0.92-2.27)	1.38 (0.88-2.17)
Housewives	0.12	0.93 (0.61-1.43)	0.85 (0.55-1.32)	1.08 (0.69-1.69)	1.01 (0.65-1.59)
Unknown occupation	0.14	1.07 (0.70-1.65)	1.08 (0.70-1.68)	1.30 (0.83-2.03)	1.26 (0.80-2.00)
		Private LTC SHR (95% CI)			
	IR	Model 1, b	Model 2, a, b	Model 3, b, c	Model 4, b
Upper non-manual workers	0.06	1	1	1	1
Lower non-manual workers	0.05	0.77 (0.46-1.27)	0.71 (0.43-1.18)	0.79 (0.45-1.37)	0.74 (0.42-1.30)
Skilled manual workers	0.04	0.63 (0.38-1.04)	<b>0.58 (0.35-0.97)</b>	0.64 (0.36-1.11)	0.61 (0.35-1.08)
Unskilled manual workers	0.04	0.52 (0.25-1.09)	0.49 (0.23-1.02)	0.58 (0.26-1.27)	0.56 (0.25-1.25)
Housewives	0.05	0.65 (0.34-1.23)	0.56 (0.29-1.09)	0.72 (0.36-1.45)	0.64 (0.31-1.32)
Unknown occupation	0.05	0.71 (0.37-1.38)	0.74 (0.37-1.45)	0.84 (0.41-1.72)	0.90 (0.44-1.85)

Adjustments: Model 1 = age, gender, and study year (b); Model 2 = Model 1 + functioning (a) and multimorbidity; Model 3 = Model 1 + living alone and home help (c); and Model 4 = Model 1 + functioning and multimorbidity + living alone and home help.

IR = Incidence rate, event/person year.

a, b, c = main effects and time-dependent variables in the analysis.



**Figure 1.** Stacked cumulative incidence of entering long-term care (LTC), dying, or being free from the two events in the 34-month follow-up according to occupational class in the Vitality 90+ Study. The figure shows the cumulative incidence for LTC use in total. The light grey area shows the probability of entering LTC, and the dark grey area shows the probability of dying without entering LTC. The white area, “event-free”, indicates people who did not enter LTC or die during the follow-up.

During the follow-up, 719 (37%) of those who were not in LTC at baseline died. Of those who died, 280 entered LTC before death and 439 died without entering LTC. Of the total population included in the follow-up, 909 (47%) lived in the community at the end of the follow-up. Figure 1 illustrates the results of the competing risk regression analysis. It shows the stacked cumulative incidence of entering LTC, dying, or being free from the two events for each occupational class. The light grey area in the figure indicates that the probability of entering any kind of LTC was highest among unskilled manuals (41%), while it was 26% among upper non-manuals, and around 30% among all the other groups at the end of the follow-up. The dark grey area shows the proportion of those who died during the follow-up without entering LTC. The probability was highest among the unknown occupation group (28%), lowest among unskilled manuals (18%), and varied from 20% to 23% among other groups. Upper non-manuals had the highest (55%) and unskilled manuals the lowest

(41%) probability of being free from the two events, meaning that these proportions of people lived at home until the end of the follow-up. The proportion of those who entered LTC and died during the follow-up was lowest among housewives (11%) and around 15% among all the other groups (result not shown).

## ***Discussion***

This study examined occupational class differences in LTC use in the 90+ population in Tampere, the third largest city in Finland. LTC use was assessed in total and separately for public and private LTC facilities. In total or public LTC use, only a few inconsistent differences between occupational classes were found at baseline. However, upper non-manuals used more private LTC than the other groups. Findings from the follow-up analyses showed that other hierarchical occupational classes had higher incidences of entering LTC in total and public LTC, and a lower incidence of entering private LTC than upper non-manuals. The differences were systematic but only a few of them reached statistical significance.

Typically, access to LTC requires a thorough assessment of functional capacity by the municipal authorities, LTC is primarily financed through taxation, and the costs for the users depend on the personal income. These mechanisms are expected to guarantee that LTC use is based on the need for care, irrespective of socioeconomic status. Yet, similar LTC use in the occupational groups does not necessarily mean equality, since the need for care and care-seeking behaviour may differ. We know in general that people with a high socioeconomic status have better health (Huisman et al. 2003; Rueda et al. 2008; Enroth et al. 2013), thus there would be a reason to believe that the need for LTC is lower among upper non-manuals. At baseline however, skilled manual workers were less likely to be in LTC than upper non-manuals when accounting for functioning, multimorbidity, and having children. This suggests higher LTC use for upper non-manuals compared to skilled manual workers at the same level of health and functioning. This could be interpreted as a slower health decline for upper non-manuals if people in all occupational classes were originally admitted in LTC at a similar level of health. On the other hand, if upper non-manuals used more privately purchased LTC where there is more flexibility in entering criteria, they could use LTC more often at the same health level as the others. However, it is difficult to say which mechanisms led to this result since the health status was measured at baseline of this study but people who were in LTC at baseline were admitted in LTC a few days or several years ago.

An earlier Finnish study found that LTC use was higher among people in low social classes than among people in high social classes in the total population aged 65+ (Nihtilä & Martikainen 2007). The current study focuses on the very old population. Health problems increase with ageing, and poor functioning and health are the main drivers for entering LTC. Minor differences between occupational classes in LTC use among this population may be related to the overall high prevalence of dementia, other diseases and disabilities, which lead to high need of care in all socioeconomic groups. High



prevalence of poor functioning and health may reduce relative differences in LTC use in this very old population in comparison to younger old adults.

Several factors contributing to the association between occupational class and LTC use were assessed in the study. In the follow-up analyses, adjustments for functioning and multimorbidity slightly decreased the differences between occupational classes in entering LTC in total and in public LTC, but in entering private LTC, differences increased. After adjustments, statistical significance changed in only two cases. This result implies that differences in functioning and multimorbidity between occupational classes do not explain the lower use of private LTC among the lower occupational classes. Admission to LTC is based on the possibility to live at home. This means that aspects other than health issues are also considered. Previous studies suggest that having children nearby (Pot et al. 2009) or living with someone (Nihtilä & Martikainen 2008) increases the availability of informal care. However, having children or a partner, or having informal care are likely to have two kinds of effects on LTC use (Geerlings et al. 2005). A study from England and Wales showed that having children or a partner was a protective source against institutionalisation, especially among older women (Grundy & Jital 2007). Similarly, a study from the Netherlands showed that having a partner prevents or delays institutionalisation but it also showed that having informal care facilitates access to other care services including institutional LTC (Geerlings et al. 2005). In the current study, unskilled manuals used more public LTC than upper non-manuals at baseline when having children was controlled. The result implies that if the same proportion of unskilled manuals would have had no children as upper manuals, they would have used more public LTC. Living alone or receiving help at home did not clearly affect the association between occupational classes and entering LTC. At very old age, the need for care is often so comprehensive that it may be difficult to meet by other means than round-the-clock LTC, even if income would allow rather intensive care given at home.

Despite the minor differences in total LTC use between the occupational classes, the type of LTC facility seemed to vary, at least at baseline. Upper non-manuals were more frequently in privately provided LTC facilities than other groups. It is known that the care delivery system characteristics, the availability of LTC by different providers, affect the use of LTC services in Finland (Pulkki et al. 2015). Participants in this study, however, reside in the same municipality, where service provision is the same for all inhabitants. It has been shown in several European countries (Broese van Groenou et al. 2006), including the Nordic countries (Puthenparambil et al. 2015), that people with a high socioeconomic status use more privately purchased homecare services than people with a low socioeconomic status. However, not much is known about the privately purchased or provided round-the-clock LTC use.

Our earlier analyses (Enroth et al. 2013, 2015) suggest different health patterns for housewives and for those with an unknown occupation in comparison to the examined occupational classes. This study showed differences between these groups also in the use of LTC. In general, housewives used less LTC than upper non-manuals. None of the controlled factors, e.g. age, gender, health status or having children explained the difference. However, only a few of the housewives were childless, while among upper non-manuals, 24% did not have children. It was not possible to adjust baseline analyses for receiving help at home, which left one important factor out of reach. For the unknown occupation group, LTC use was more frequent than for upper non-manuals. Among those with an unknown occupation, the prevalence of memory problems and proxy respondents was high, which may also explain why occupational class was not known for them in the first place.

In this study, differences in LTC use seemed to be more pronounced at baseline, at least for private LTC. This may be partly because of the different kinds of study samples; those with the highest need of assistance (LTC at baseline) were not included in the follow-up analyses. Nevertheless, between the years 2000 and 2013 in Finland, traditional round-the-clock LTC in residential homes and in the inpatient wards of health centers decreased (8.3% to 3.1%), and LTC in service homes increased (1.7% to 6.5%) among the 75+ population (Väyrynen & Kuronen 2014). Municipalities increasingly purchase LTC in privately-owned service homes. In Tampere, the change means a shift from public residential homes to LTC provision in privately provided service homes with 24-hour assistance. Both public and private LTC facilities respond to the similar need for care, however, the funding system differs. In the current study, of those who were not in LTC at baseline, in each study year (2001, 2003, 2007, and 2010), 10–12% of participants entered private LTC, while the total percentage of entering LTC decreased from 45% to 23%. The figures demonstrate the increasing role of private sector in LTC provision, also in care that is organised by the municipality. This trend likely underlies the finding that upper non-manuals used private LTC more than other groups in the beginning of the study period but no more in 2010.

The study additionally provided information on mortality as a competing event for entering LTC. Mortality for those who were not in LTC at baseline was 37% during the study period. It is notable that the majority of those who died did not use LTC at all (61%), and that of the total population in the follow-up analyses, 47% did not die or enter LTC. Mortality for those who entered LTC was largely similar in all occupational classes.

The strengths of the study include a high number of the oldest old in a population-based sample with a high response rate. The study used reliable register data on LTC use, which was linked to survey

data through Personal Identity Codes. Information on participants' functioning, multimorbidity, family relations, and availability of help at home gave the opportunity to study the role of these factors in the association between occupational class and LTC use. The LTC definition was formed in a way that considers the consecutive periods in different LTC facilities since there is evidence that people often move between care facilities (Aaltonen et al. 2010). The applied method of analysis, competing-risks regression, was chosen to account for the very high mortality in the 90+ population. This is particularly important because people with a low socioeconomic status have higher mortality, even in very old age (Enroth et al. 2015).

There were also limitations in the study. The information on functioning and multimorbidity as well as on other independent variables came from baseline, and we did not know the severity of the diseases. Private LTC provision was still quite rare during the study, which is why the number of people entering it was quite low. Results should be interpreted with caution, especially when all study years were analysed separately. We had information about the LTC provider, but we could not distinguish municipality-organised private LTC from the private LTC that users organise themselves and pay directly to the service provider. The latter type of private LTC use is very rare in Finland, however.

This study provides evidence that use of LTC is largely similar for all occupational classes in the Finnish context among the oldest old. There is some evidence that upper non-manuals stay in and enter privately provided LTC facilities more frequently than other occupational classes. Privatisation of the provision of health and social care services that traditionally have been provided by public actors is under discussion all over Europe (Albrecht 2009; Stolt et al. 2011). The policy encourages living at home for as long as possible, and at the same time municipalities increasingly organise LTC in privately provided LTC facilities. Based on this study, it seems that in the beginning of the 21st century, in the society that relies on universal care services, LTC use is rather similar for all occupational classes and the use of privately provided LTC has relatively increased in other occupational classes than among upper non-manuals. Health and social care systems are experiencing a great change, which is why equality of the care services should be followed in the future. Further studies should follow the socioeconomic differences in LTC use to understand the impact of ongoing structural changes in service organisation on equality in care provision.

## ***Funding***

This work was supported by grants from the Academy of Finland (250 602) and the Competitive Research Funding of the Pirkanmaa Hospital District (9N019) to MJ. LE received economic support from the NordForsk project, Social Inequalities in Ageing (74637).

## ***Conflict of interest***

Authors had no competing interests and the funders had no role in the planning or preparation of the manuscript or choosing the Journal.

## ***Acknowledgements***

Gerontology Research Center is a joint effort between the Universities of Tampere and Jyväskylä. The authors wish to thank municipal and private home care and elderly care units in Tampere for their help in data collection.

## ***References***

- Aaltonen M, Forma L, Rissanen P, Raitanen J, Jylhä M (2010) Transitions in health and social service system at the end of life. *Eur J Ageing* 7:91-100. doi:10.1007/s10433-010-0155-3
- Albrecht T (2009) Privatization processes in health care in Europe—a move in the right direction, a ‘trendy’ option, or a step back? *Eur J Public Health* 19: 448-450. doi: 10.1093/eurpub/ckp146
- Breeze E, Sloggett A, Fletcher A (1999) Socioeconomic and demographic predictors of mortality and institutional residence among middle aged and older people: Results from the longitudinal study. *J Epidemiol Community Health* 53:765-774. doi:10.1136/jech.53.12.765
- Broese van Groenou M, Glaser K, Tomassini C, Jacobs T (2006) Socio-economic status differences in older people's use of informal and formal help: A comparison of four European countries. *Ageing Soc* 26:745-766. doi:10.1017/S0144686X06005241
- Enroth L, Raitanen J, Hervonen A, Jylhä M (2013) Do socioeconomic health differences persist in nonagenarians? *J Gerontol B Psychol Sci Soc Sci* 68:837-847. doi:10.1093/geronb/gbt067
- Enroth L, Raitanen J, Hervonen A, Nosraty L, Jylhä M (2015) Is socioeconomic status a predictor of mortality in nonagenarians? *The Vitality 90+ Study. Age Ageing* 44:123-129. doi:10.1093/ageing/afu092
- Fine J, Gray R (1999) A proportional hazards model for the subdistribution of a competing risk. *J Am Stat Assoc* 94:496-509.
- Forma L, Aaltonen M, Pulkki J, Raitanen J, Rissanen P, Jylhä M (2017) Long-term care is increasingly concentrated in the last years of Life: A change from 2000 to 2011. *Eur J Public Health*, accepted 2.1.2017. doi:10.1093/eurpub/ckw260
- Galobardes B, Shaw M, Lawlor DA, Lynch JW, Smith G (2006) Indicators of socioeconomic position (part 1). *J Epidemiol Community Health* 60:7-12. doi:10.1136/jech.2004.023531

Gaugler JE, Duval S, Anderson KA, Kane RL (2007) Predicting nursing home admission in the U.S: A meta-analysis. *BMC Geriatr* 7:13. doi:10.1186/1471-2318-7-13

Geerlings S, Pot A, Twisk J, Deeg D (2005) Predicting transitions in the use of informal and professional care by older adults. *Ageing Soc* 25:111-130. doi:10.1017/s0144686x04002740

Grundy E, Glaser K (1997) Trends in, and transitions to, institutional residence among older people in England and Wales, 1971-91. *J Epidemiol Community Health* 51:531-540.

Grundy E, Holt G (2001) The socioeconomic status of older adults: How should we measure it in studies of health inequalities? *J Epidemiol Community Health* 55:895-904.

Grundy E, Jitlal M (2007) Socio-demographic variations in moves to institutional care 1991–2001: a record linkage study from England and Wales. *Age Ageing* 36:424-30. doi:10.1093/ageing/afm067

Huisman M, Kunst AE, Mackenbach JP (2003) Socioeconomic inequalities in morbidity among the elderly; a European overview. *Soc Sci Med* 57:861. doi:10.1016/S0277-9536(02)00454-9"

Johansson E (2010) Long-term care in Finland. Report no. 76, the research institute of the Finnish economy, European network of economic policy research institutes. <http://www.ceps.eu/book/long-term-care-system-elderly-finland>. Accessed 2 January 2017.

Jylhä M, Enroth L, Luukkaala T (2013) Trends of functioning and health in nonagenarians: The Vitality 90+ Study. In: Robine J, Jagger C, Crimmins E (eds) *Annual review of gerontology and geriatrics* 33, healthy longevity, A global approach. Springer Publishing Company, New York, pp 313-332

Luppa M, Luck T, Weyerer S, König H, Riedel-Heller SG (2009) Gender differences in predictors of nursing home placement in the elderly: a systematic review. *Int Psychogeriatr* 21:1015-25. doi.org/10.1017/S1041610209990238

Luppa M, Luck T, Weyerer S, König H, Brähler E, Riedel-Heller SG (2010) Prediction of institutionalization in the elderly. A systematic review. *Age Ageing* 39:31-38. doi:10.1093/ageing/afp202

Lynch, J. W., & Kaplan, G. A (2000) Socioeconomic position. In: L. F. Berkman, & I. Kawachi (eds.) *Social epidemiology*, Oxford: Oxford University Press, pp 13-35

Martikainen P, Moustgaard H, Murphy M, Einiö EK, Koskinen S, Martelin T, et al. (2009) Gender, living arrangements, and social circumstances as determinants of entry into and exit from long-term institutional care at older ages: a 6-year follow-up study of older Finns. *Gerontologist* 49:34-45. doi.org/10.1093/geront/gnp013

Martikainen P, Murphy M, Metsä-Simola N, Häkkinen U, Moustgaard H (2012) Seven-year hospital and nursing home care use according to age and proximity to death: Variations by cause of death and socio-demographic position. *J Epidemiol Community Health* 66:1152-1158. doi:10.1136/jech-2011-200756

- McCann M, Donnelly M, O'Reilly D (2011) Living arrangements, relationship to people in the household and admission to care homes for older people. *Age Ageing* 40:358-363. doi:10.1093/ageing/afr031
- McCann M, Grundy E, O'Reilly D (2012) Why is housing tenure associated with a lower risk of admission to a nursing or residential home? Wealth, health and the incentive to keep 'my home'. *J Epidemiol Community Health* 66:166-169. doi:10.1136/jech-2011-200315
- Mikkola M, Rintanen H, Nuorteva L, Kovasin M, Erhola M (2015). Valtakunnallinen sosiaali- ja terveydenhuollon laitospaikkaselvitys. Report no. 8/2015, National Institute for Health and Welfare. <http://urn.fi/URN:ISBN:978-952-302-472-4>. Accessed 2 January 2017
- Mustard C, Finlayson M, Derksen S, Berthelot JM (1999) What determines the need for nursing home admission in a universally insured population? *J Health Serv Res Policy* 4:197-203
- Nihtilä E, Martikainen P (2007) Household income and other socio-economic determinants of long-term institutional care among older adults in Finland. *Population Studies* 61:299-314. doi:10.1080/00324720701524193
- Nihtilä E, Martikainen P (2008) Why older people living with a spouse are less likely to be institutionalized: The role of socioeconomic factors and health characteristics. *Scand J Public Health* 36:35-43. doi:10.1177/1403494807086421
- Official Statistics of Finland (OSF) (1976) Occupational and industrial classification
- Official Statistics of Finland (OSF) (2016) Population structure. [http://www.stat.fi/til/vaerak/tau\\_en.html](http://www.stat.fi/til/vaerak/tau_en.html). Accessed 2 January 2017
- Pot A, Portrait F, Visser G, Puts M, van Groenou M, Deeg D (2009) Utilization of acute and long-term care in the last year of life: Comparison with survivors in a population-based study. *BMC Health Serv Res* 9:139. doi: 10.1186/1472-6963-9-139
- Pulkki J, Jylhä M, Forma L, Aaltonen M, Raitanen J, Rissanen P (2016) Long-term care use among old people in their last 2 years of life: Variations across Finland. *Health Soc Care Community* 24:439-49. doi:10.1111/hsc.12224
- Puthenparambil JM, Kröger T, Van Aerschot L (2017) Users of home-care services in a Nordic welfare state under marketisation: The rich, the poor and the sick. *Health Soc Care Community* 25:54-64. doi:10.1111/hsc.12245
- Rueda S, Artazcoz L, Navarro V (2008) Health inequalities among the elderly in Western Europe. *J Epidemiol Community Health* 62:492-498. doi:10.1136/jech.2006.059279
- Stolt R, Blomqvist P, Winblad U (2011) Privatization of social services: Quality differences in Swedish elderly care. *Soc Sci Med* 72:560-67. doi:10.1016/j.socscimed.2010.11.012
- Tomiak M, Berthelot JM, Guimond E, Mustard CA (2000) Factors associated with nursing-home entry for elders in Manitoba, Canada. *J Gerontol A Bio Sci Med Sci* 55:M279-M287.

Väyrynen R, Kuronen R (2014) Institutional care and housing services in social care 2013. Statistical report 27/2014. Official statistics of Finland, Social protection 2014 and National institute for health and welfare. <http://urn.fi/URN:NBN:fi-fe2014111246228>. Accessed 2 January 2017.

Yang S, Hoshi T, Nakayama N, Wang S, Kong F (2013) The effects of socio-economic status and physical health on the long-term care needs of Japanese urban elderly: A chronological study. *Environ Health Prev Med* 18:33-39