Trends in the use of home care services among Norwegians 70+ and projections toward 2050: The HUNT Study 1995-2017

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Abstract

Background
Life expectancy (LE) is increasing worldwide, while there is lack of information on how this affects older individuals’ use of formal home care services.

Aim
We aimed to decompose LE into years with and without home care services and estimate projected number of users towards 2050 in Norway for people 70 years or older.

Methods
This study is based on a sample of 25,536 participants aged 70 years and older in the Trøndelag Health Study (HUNT) survey 2 (1995-97), 3 (2006-08), or 4 (2017-19) linked with national data on mortality. Prevalence of home care services were standardized to the Norwegian population by age and sex. The Sullivan method was used to estimate expected years with and without home help services and nursing services for the years 1995, 2006 and 2016. Data from HUNT4 and Statistics Norway were used to estimate projected use of these services between 2020 and 2050.

Results
During 1995-2017, the use of home help services decreased from 22.6% to 6.2% (p<0.001), and 6.4% to 5.5% (p=0.004) for home nursing services. Adjusted for age and sex the use of home help services decreased significantly over time (p<0.001), while home nursing services was stable (p=0.69). LE at age 70 increased from 11.9 to 15.3 years in men (p<0.05), and 14.7 to 17.1 in women (p<0.05). The expected years receiving home help decreased from 2.6 to 1.1 in men (p<0.05), and from 4.4 to 2.1 in women (p<0.05). The expected years receiving home nursing increased from 0.6 to 0.9 in men (p<0.05), and from 1.3 to 1.7 in women (p<0.05). Projected numbers of people 70+ in Norway in need of either of these services were estimated to rise from 64,075 in 2020 to 159,753 in 2050.

Conclusion
While overall life expectancy increased, the expected years receiving home help have decreased and home nursing slightly increased among the Norwegian population aged 70 years and older during 1995-2017. However, the substantial increase in the projected number of older adults using home care services in the future is an alert for the current health care planners.

Key words: Life expectancy, health care services, home help, home nursing, older adults, Activity of daily living (ADL), Projected use of home care services.
INTRODUCTION

The Nordic countries are well known to provide formal care and help for older adults, with good access to medical and social services including assistance with household chores (1). It is based on the theoretical framework of home health care services “universalism” in Nordic countries where its main feature is that community living older adults who require home healthcare services to remain at home as long as possible before moving into a nursing home (1,2). Formal care is defined as services provided for older adults at home and paid by the individual or by the state and municipality while informal care is defined as help provided by family members or friends without payment (3). Both types of care often occur in parallel and complement each other (4). In Norway, the municipality evaluates the eligibility for receiving formal care based on functional status in activities of daily living and cognitive impairment (2).

Aging is associated with a decline in physical function which is further linked to health consequences including loss of independence, disability, institutionalization, and mortality (5,6). However, recent evidence suggested that the current older population is healthier and has higher physical function than the earlier older generation (7,8). Life expectancy (LE), an important indicator for measuring the growth of the ageing population (9), is also increasing worldwide primarily due to declining mortality rates among older adults (10). Healthy Life Expectancy (HALE) is defined as LE by the absence of chronic disease (11,12). In Norway, HALE at age 60 years increased with 1.6 years during 2000 -2015 (13). During the same period, LE in Norway increased by 2.2 years. Thus, the increase in LE was mainly an increase in HALE (73%). At the same time, Disability-Free LE (DFLE) which is defined as years without problems with activities of daily living (ADL), has increased, which indicates that older adults today live longer without disability compared with two decades ago (8,13). The key information is whether the increase in overall LE is increasing faster than the decline of disability rate (14).

Recently, in line with the report from WHO, a Norwegian study reported increasing DFLE during the last two decades, and that most of the increase in LE among older adults in this period was disability free (8). Thus, in Norway these results suggest that DFLE is increasing faster than overall LE. Nevertheless, it is expected that countries with high LE, including Norway, will need to provide increased formal care in private homes, including nursing and other professional health care services (15–17). Current old age care policies in Norway aim at having older people living at home for as long as possible, and an increasing number of people receive advanced health care at home. It is an aim among policy makers to decrease the number of individuals in institutionalized care and
raise one’s capacity to live at home (17). Research needs to be transformative and study the more advanced age groups to find more valid population data related to health conditions, functional capacities, care needs and care service use. Although DFLE decreases over time the steady increase in LE may indicate that the older age groups living in the community may need more home help or home nursing care services in the current generation compared to earlier generation. To enhance understanding of home care use among older adults, the first research question is how home care use in the last decades has been changed in Norway by looking at self-reporting of home care use in the Trøndelag Health surveys 2 to 4.

In Norway, formal home care services include home help and home nursing (18), which are generally provided by the municipality (19). Although it is confirmed that LE at older age in Norway is increasing (8,20), there is still a lack of information on time trends of expected years receiving formal home based care services in Norwegian older population. Therefore, the aim of the current study is to examine the trend in expected years receiving formal home help and/or home nursing services among Norwegian older adult aged 70 or older during 1995-2017 and make projections for number of persons receiving care in the coming decades.

METHODS

Study population

The study population included a combination of two data sources of Norwegian adults aged 70 years or older: (1) National registry data on mortality and population size by sex, education, and year (N=1,57 million); and (2) Trøndelag Health Study surveys 2-4 (HUNT2-4); available sample with self-reported data on at least one of the main outcome variables (home help services use/home nursing services use) (N=25,536). The study population is from the former Nord-Trøndelag county, which is fairly representative of Norway except it lacks a large city and few immigrants (21–23). The municipality has an average per capita income and the prevalence of people with higher education and current smokers was a slightly lower than the average in Norway (23,24).

Data collection and measures

Mortality (official registry data): National data on mortality were provided by microdata.no with the years close to the initial years for the HUNT surveys (1995, 2006 and 2016 – latest year available). Microdata is a collaboration service from the Norwegian Centre for Research Data (NSD) and Statistics Norway (SSB). Mortality was registered for people 70 years and older who were alive
1st of January followed over 1 year and categorized by sex and education. The mortality data included 34,057 deaths among 497,679 individuals (mid-year population) in 1995, 31,703 deaths among 491,878 individuals in 2006, and 30,822 deaths among 576,537 individuals in 2016. The national education database (NUDB) assessed education on 1st January and categorized as basic (9 years or less, ISCED 2011 level 1–2) or higher (10+ years, ISCED 2011 level 3–8). Due to low numbers in the higher educational levels, the study defined two levels of education.

**HUNT survey data:** A total of 50,828 participants aged 70 years and older were invited to participate in the HUNT surveys 2-4 (16,376 in HUNT2, 15,078 in HUNT3 and 19,374 in HUNT4) (21,22). Among these, 10,939 participants completed the questionnaire in HUNT2 (1995–1997), 8,412 in HUNT3 (2006–2008), and 11,081 in HUNT4 (2017–2019) at study attendance. The available sample with self-reported data on disability and formal home help services use was 25,306, and home nursing services use was 24,478, and non-missing for either one was 25,536. The attendance (the number of people completed the data collection divided by the number of people invited to participate) was 57% in HUNT2, 46% in HUNT3 and 48% in HUNT4. The current study compared different birth cohorts at the same age at three different times, which allows participation of the same individual at different ages. Among the study participants, 15% were included more than once and 1% were included three times. The HUNT data was collected in the former Nord-Trøndelag County which is considered to be a representative population of the Norwegian (21,22,25).

**Home help services (in Norwegian: praktisk bistand, formerly known as hjemmehjelp)**

Home help services were assessed with the question “Do you have home help services?” with two choices (private and community) to choose from (yes/no in HUNT2). In HUNT3 and 4, the question did not separate on whether services were provided by private providers or by the municipality, and the respondent was asked about services use in the last year: “Have you had home help services in the last 12 months?” (yes/no).

**Home nursing services (in Norwegian: helsetjenester i hjemmet, formerly known as hjemmesykepleie)**

Home nursing services were assessed with one question in HUNT2: “Do you receive home nursing care services?” (yes/no). In HUNT3 and HUNT4 the wording was slightly changed to reflect
the services used during the last year: “Have you received home nursing care in the last 12 months?”
(yes/no).

Education

Education was self-reported, and dichotomized as primary (≤ 9 years) or secondary/tertiary (10+ years) to match with the registry data. Missing values for education were 3%, 3% and 1%, for HUNT2, HUNT3 and HUNT4, respectively.

Activities of daily living (ADL)

ADL assessments are widely used to examine independency and disability level among older adults (6, 26–28). ADL is often divided into two categories, Personal ADL (PADL) and Instrumental ADL (IADL) (29). PADL refers to the basic activities older adults need to do in daily living, while IADL is typically more complex and includes outdoor activities. Both PADL and IADL disability increases with age and it is a major predictor of hospitalization and institutionalization among older adults (30, 31). ADL in the HUNT survey was measured with a self-reported questionnaire starting with the following question “Can you, without the help of others, do the following daily tasks?”.

PADL items included 1) move around indoors on the same floor, 2) go to the toilet, 3) wash yourself, 4) take bath or shower, 5) dress and undress yourself, 6) go to bed and get up, and 7) eat.

IADL items included 1) do heavier housework, 2) pay bills, 3) take the medicines, 4) go out, 5) do the shopping, and 6) take the bus. ADL questions were asked with three response categories (1 = yes; 2 = with some help; 3 = no) in HUNT2, and two response categories (1 = yes; 2 = no) in HUNT3 and HUNT4. Each ADL item was scored as 0 if participants answered “yes” to complete task alone and scored as 1 if answers were “no” or “with some help”. The summary scores of all 7 items of PADL, and 6 items of IADL were generated to further dichotomize disability group. No disability in PADL and IADL was defined separately if participants reported to have no disability (PADL or IADL summary score = 0), and disability was defined if participant reported any difficulty in the PADL and IADL items (PADL or IADL summary score > 0). Living arrangement was dichotomized as single or cohabitant.

Statistical methods

First, three sets of standardized prevalence estimates were estimated; i) prevalence of receiving home help services, ii) prevalence of receiving home nursing services, iii) prevalence of
having any ADL-disability. The differences in the crude prevalence of home care uses and
characteristics between HUNT surveys were examined with Chi-square test. The latter prevalence
was only used for projected future care service needs, and compared to the projected reported use.

For smoothing purposes, the prevalence was estimated by age, sex, and education, and
predicted from a general linear model with Poisson distribution and identity link, including the
predictor variables age (aggregated in 5-year age intervals), sex and education (primary versus
secondary or higher), and a dummy variable for each of the three surveys in the HUNT data. All
interactions (three-way and two-way) between these predictor variables were included to ensure full
flexibility in the modelling and allowing trends to differ by age, sex, education, and time. To get
population estimates representative for Norway, the prevalence estimates were standardized using
the full Norwegian population by year (1995, 2006 and 2016), 5-year age groups, sex, and education
(primary, higher) as post stratification weights in the regression model. Then, life expectancy (LE),
and expected years spent with home-based services in Norway were estimated by the Sullivan
method, combining the standardized services use prevalence with the mortality data (32).

Confidence intervals for LE and for expected years spent with home-based services were
calculated using the procedure developed by Chiang (32,33). Finally, prevalence at HUNT2-4 and
projections of number of Norwegians receiving home help, home nursing services, or having ADL-
problems for the years 2020, 2025, 2035 and 2050, were performed using the age, sex and education
standardized prevalences at HUNT4 as basis, and multiplying these prevalences by population
projections by age and sex from the main alternative from Statistics Norway.

RESULTS

Mean age of the 70+ population in the three HUNT surveys were similar (76.8, 77.2 and 76.6
years in HUNT2, 3 and 4 respectively). The educational level increased from HUNT2 to HUNT4;
the prevalence of secondary/tertiary education was 21.0% in HUNT2, 36.2% in HUNT3 and 57.4%
in HUNT4. From HUNT2 to HUNT4, the percentage of people living alone decreased from 38.6%
to 30.9%, PADL-disability decreased from 8.4% to 3.0% and IADL-disability decreased from 32.9%
to 15.7%. The standardized prevalence (standardized according to sex, age, and education in
Norway) of both home care services use (home help and home nursing) was higher in older age and
the highest prevalence was in the oldest age group (85+ years) (Figure 1).
Mean age of those receiving home help services was higher than for those not receiving such services; 80.1 versus 75.8 years in HUNT2 and 82.5 versus 76.2 years in HUNT4. Crude prevalence of home help services use decreased from HUNT2 to HUNT4; from 22.6% to 6.2% (chi-squared test of difference in prevalence p<0.001) (Table 1). From HUNT2 to HUNT4, the percentage of home help services use changed from 19.3% to 4.7% in men, and from 25.2% to 7.5% in women (both p<0.001). This declining time trend occurred in both educational groups. Home help services use were more prevalent among those living alone than for those living with others; 33.6% versus 15.1% (p<0.001) in HUNT2 and 12.8% versus 3.2% (p<0.001) in HUNT4. Among those reporting PADL disability in HUNT2, 58.3% received home help services, while among those without PADL disability the prevalence was 19.4%. In HUNT4 (p<0.001), the corresponding numbers were 34.3% and 5.3% (p<0.001). Similar declines in home help services use over time and between disability groups were observed for IADL. Age and sex adjusted prevalence of home help services use (standardized to the Norwegian population by age, sex and education) also declined significantly over time (test for linear trend HUNT2-4: p<0.001).

Home nursing services use

Receivers of home nursing services were older than those not receiving such services; 80.8 versus 76.4 years in HUNT2, and 81.8 versus 76.3 years in HUNT4. Crude prevalence of home nursing services use was more stable over time, but had a slight decline from HUNT2 (6.4%) to HUNT4 (5.8%) (p=0.004) (Table 2). Home nursing services use were more common in women than in men (HUNT2: 7.6% in women versus 4.9% in men (p<0.001); HUNT4: 6.9% versus 3.9% (p<0.001)). Secondary/tertiary education was associated with lower use of home nursing services, while living alone was associated with higher use. ADL disability was strongly associated with home nursing services use; among those reporting PADL disability at HUNT2, 36.1% received home nursing services, while among those without PADL the services use was 3.8% (p<0.001). Corresponding numbers at HUNT4 were 36.5% and 4.5% (p<0.001). Among those reporting IADL disabilities at HUNT2, 16.0% had home nursing services, while among those without IADL disabilities, the prevalence was 1.7% (p<0.001). At HUNT4 the corresponding numbers were 22.7% and 2.2% (p<0.001). Age and sex adjusted prevalence of home nursing services use (standardized to the Norwegian population by age, sex and education) did not decline significantly over time (test for linear trend HUNT2-4: p=0.69).
**Expected years lived with home care services after age 70 during 1995-2017 in Norway**

During 1995-2017, LE in Norway at age 70 increased by 3.4 years in men (from 11.9 to 15.3 years, test for difference: p<0.05) and by 2.4 years in women (from 14.7 to 17.1 years, p<0.05) (Table 3). During this time, the expected years receiving home help services after age 70 in Norway decreased by 1.5 years in men (from 2.6 to 1.1 years, p<0.05), and by 2.3 years in women (from 4.4 to 2.1 years, p<0.05). During the same time, expected years receiving home nursing services increased by 0.3 years in men (from 0.6 to 0.9 years, p<0.05) and by 0.4 years in women (from 1.3 to 1.7 years, p<0.05).

**Projections of home care services use, and home care services needs in Norway towards 2050**

Based on self-reported data of home care services use from HUNT4 and population projections from SSB, the estimated projection of older adults aged 70+ receiving home help services in Norway in 2020 was 47,823, while the estimate for receiving home nursing services was 40,873. By 2050, these numbers are expected to rise to 120,778 and 102,700 respectively (Figure 2). The estimated number of older adults receiving both services is expected to rise from 15,840 in 2020 to 40,190 in 2050. Receivers of either type of home care services will increase from 64,075 in 2020 to 159,753 in 2050.

Also, in the shorter time frame the expected number of older adults aged 70+ receiving either home help or home nursing services will increase; from 2020 towards 2025 the increase is projected to be 14% for home help services, and towards 2035 the increase is projected to be 75%. The corresponding projections for home nursing services are 14% towards 2025 and 74% towards 2035. Corresponding numbers of receiving either home help or home nursing services are expected to rise 74% towards 2035.

Based on ADL-data from HUNT4 and population projections from SSB, the estimated projection of older adults’ home care services need, reflected in age, sex and education standardized prevalences of having any ADL problems (indicating disability), is expected to rise from 124,783 in 2020 to 207,427 in 2035 and further to 287,773 in 2050 (Appendix, Figure A1). Thus, the projected need of services is nearly double that of projected use of services.

**DISCUSSION**

**Summary of findings**
During the last two decades, self-reported use of home help services decreased substantially among older adults, while home nursing services use was more stable with only a slight decrease. During 1995-2017, LE at age 70 years increased by more than three years in men and by two years in women. At the same time, expected years receiving home help services decreased, and in 2017, men and women could expect to live approximately one and two years with home help services, respectively. During the same time-period, expected years receiving home nursing services were stable; men could expect to live approximately one year with home nursing and women around a year and a half with such services. Towards 2050 the number of persons in need of home help or home nursing services are projected to increase by a factor of 2.5, from around 64,000 in 2020 to 160,000 in 2050.

Our prevalence estimates of home nursing services use were similar to the prevalence in official registries for Nord-Trøndelag, which suggest our sample might be representative of the general population of Nord-Trøndelag; The prevalence of home nursing services use among older adults aged 80+ (age is restricted to this age group in the data base) from official Norwegian registry data in 2017 for the former Nord-Trøndelag County was 14.2% (34), which is similar to the prevalence of home nursing services use in the same age group in HUNT4 (2017-2019) in our study (13.2%).

LE at age 70 increased during the two decades covered in our study, while the time expected to live with home help services decreased and the time expected to live with home nursing services was stable. This implies that the more recent born cohorts of older adults started to receive home help and nursing services at a higher age compared with the earlier born cohorts, suggesting that the most recent cohorts had the functions to continue independent daily living longer than the earlier cohorts did. To our knowledge, the current study is the first to investigate time trends in years with home-based help services and home nursing services in Norway.

**Previous findings and current care system & Norwegian health care system**

Through its public health and welfare policy, Norway provides generous health and social care to its citizens. As the population becomes older there is a growing need for long-term care and increased health care costs for individuals and society (35,36). The current health care model in Norway has been transformed from institutional care to home-based care to adapt to an increasing need for home-based health care (37). The home-based health care services has emerged in the past decades and aims to address the increased volume of urgent health care needs among the older population in Norway (2). According to the 2010 data on health care cost in Norway, 15% of the
total population who were 65 or older were responsible for almost half of the total health care cost which dominantly used for people under age 80 (36). Those who receive home help services also suffer from various chronic diseases, and physical and cognitive functional impairment (38,39). Both physical and cognitive impairment were strongly and positively associated with the amount of home help services provided to older adults in Norway (40). An observational study found that the majority of older adults receiving daily home help services in Norway were people with frailty in need of more flexible and pro-active ways to preserve current function and prevent hospitalization (37).

The decline of the home care services from 1995 to 2017 in the current study could be partly explained by the policy changes as well as expanded private care services in Nordic countries (1,37).

Home care policies have been focused on retrenchment and prioritization on the coverage of long term care services in the last two decades (1,41) which is linked to the declining tendency of the home care services use in Nordic countries. The Swedish care system started to offer prioritized home care for those with the most demanding care needs in 1980s (which Norway followed in 2010s), resulting dramatic drop of the age group care coverage rate (42,43). Targeting the most frail older adults for the home care services implies that access to home care is prioritized for those with highest needs which may further increase unmet need and decline of home care services use among older adults (44). The private care services section has also vastly expanded over the last two decades along the care service policy changes (2,45,46). Therefore, the current older generation are given more available options to choose the private care services than the previous older generation.

**Interpretation of the decreasing trend of home care services use**

One of our main findings was that during the past two decades the expected years of receiving home help services decreased among people aged 70 years and older, which suggests a healthier 70+ population. The former hypothesis is backed up by recent studies reporting improved grip strength and cognition, much-used indicators of intrinsic capacity (47), in later born cohorts of older Norwegians (48,49). In line with this, another study using HUNT data, found increased DFLE, while years of disability were compressed (8). An alternative explanation is that the threshold for receiving home based services may have become higher as it was reported in the same period in Sweden (43). In general, the allocation of the home help services requires functional assessment to confirm reduced/impaired ability to maintain independent living (40,50). Therefore, the decreasing years receiving home help services in the current study can be due to several factors, such as better health
and physical function among the recent cohort of older adults, higher threshold for receiving home
based services, or other effects of the changes in policy from institutional care to more home-based care. Hence, this study may indicate that the recent cohort of older adults maintain independent
living until a more advanced age without a need of receiving home help services, but may also imply
that needs are not met. Increased educational level during HUNT2-4 (secondary/tertiary education:
21% in HUNT2 to 57% in HUNT4) may also have contributed on the declining trend of home help
services use over time because it is found that older adults with higher education are less likely to have
need of care than those with lower education (51).

Most home help and home nursing care services are skewed towards older age because of an
increased burden of disease and disability with increasing age (52,53). Although the sex gap in LE is
narrowing (8), our results suggest that women use home help services and home nursing services
more often than men, which was also suggested by a previous study from Norway (40). This sex
difference might be due to the longer LE and higher comorbidity among women in the older age
groups (36). A recent study reflected our finding that women outlives men and due to higher number
of women at higher ages, women have higher share of health care costs than men in Norway, and the
difference was more pronounced for long-term care that included home nursing (60.5%) than for
home help services (52.6%) (36). While periods of recent cohort participants spent with home help
after the age 70 were shorter than that of the earlier two cohorts, the time spent with home nursing
were very stable in all three cohorts. The results could also be explained by women’s longer LE than
men, which causes chronic non-fatal and disabling conditions to last longer in women. However,
men are known more likely to experience ‘life-threatening’ conditions, which contributes to higher
mortality among men (54). Our estimates indicate that the projected use of home care services will
rapidly increase towards 2050. Projected need of services, however, using ADL disability estimates
from HUNT4 is more than double the size of actual use of services.

A simple comparison of numbers between ADL disability and receiving care in our study
may not fully reflect the care receiving process in municipality. However, those in need of home
care services according to the ADL function who receive less home care services than needed may
have replaced it with informal care from spouses, relatives, or other social networks which tend to be
the case for those who live with others (55). Use of private care service could also be one of the
reason contributed to the decreased home care service use.

**Strengths and Limitations**
There are several limitations of the current study worth mentioning. First, when the outcome of the current study is interpreted, it should be considered that the data was based on the use of home help services provided by both municipality and private health care service companies. Second, the self-reported data on home help services use were based on slightly different questions in three HUNT surveys, which might hamper a direct comparison between study surveys. In HUNT3-4, a time-period was specified (the last year) for services use, while in HUNT2, the questions asked about current services use. The longer time frame in the last two surveys could potentially increase the reported services use. Third, our data is lacking information on frequency, regularity and classification of home help services received. Fourth, attendance in HUNT2 (57%), was higher than in HUNT3 (46%) and in HUNT4 (48%), which might have resulted in HUNT2 being a more representative sample of older adults than HUNT3-HUNT4. Of note, however, HUNT3 and HUNT4 had similar attendance and the prevalence rates for both care services were very similar to the rates calculated for the same region in the Norwegian Registry data. Overall, the non-participants had lower socio-economic status and a higher mortality than participants (21,22). Thus, possible selection bias should be taken into consideration. Fifth, the reports on home help services use did not take into account the informal care and help that participants may have received from their personal networks. Although informal care is an important part of health care, it is not counted as official data (45). Thus, it is possible that older adults receiving informal help because of physical or cognitive impairment, similar to those receiving formal care, are included among those not receiving the home help services. Therefore, the results on LE among the users of care services need to take into account that the informal care data was not available for the LE estimation. The current study did not look at the physical or social activity levels in conjunction with overall changes in LE and the use of home care services as this information was not consistently collected. However, healthy lifestyle including physical and social activity has a strong association with education (56,57) which our analysis adjusted for. Higher education was associated with both lower home help services use and lower home nursing services use in HUNT4 (also in age and sex adjusted analysis, results not shown). The projections of home services use in the future were based on age-sex-and-education-standardized prevalence estimates using the Norwegian population as the standard. Thus, the projections are then fixed at this educational distribution. However, most likely education level will continue to increase, but this increase was not built into our projections. Therefore, the projections might be somewhat overestimated, especially for home nursing services where education mattered most.
One of the strengths of the study is the large number of older adults included and the inclusion of multiple birth cohorts of the same age group over 24 years, enabling us to examine the trend of home-based formal care services use among older adults over time. Second, the use of formal care services data from one particular county, ensured that the data are based on consistent services allocation rules. A major strength is also the high correspondence with registry data on actual home based services use, which suggests representability.

CONCLUSIONS

The current study investigated time spent with and without home care services among older adults during 1995-2017, and while overall life expectancy increased, the expected years receiving home help decreased and home nursing slightly increased. The substantial increase in the projected number of older adults using home care services in the future is an alert for the current health care planners.

References


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45. Døhl Ø, Garåsen H, Kalseth J, Magnussen J. Variations in levels of care between nursing home patients in a public health care system. BMC Health Serv Res. 2014 Mar 5;14:108.


Table 1. Home help services use, the Norwegian HUNT study 1995-2017. N=25,306

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<td></td>
<td>Participants</td>
<td>Home help receivers</td>
<td>Participants</td>
<td>Home help receivers</td>
</tr>
<tr>
<td></td>
<td>(N)</td>
<td>n (%)</td>
<td>(N)</td>
<td>n (%)</td>
</tr>
<tr>
<td>Total</td>
<td>9239</td>
<td>2089 (22.6)</td>
<td>6870</td>
<td>765 (11.1)</td>
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<tr>
<td>Women</td>
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<td>1305 (25.2)</td>
<td>3810</td>
<td>520 (13.7)</td>
</tr>
<tr>
<td>Men</td>
<td>4061</td>
<td>784 (19.3)</td>
<td>3060</td>
<td>245 (8.0)</td>
</tr>
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<td></td>
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<tr>
<td>70-74</td>
<td>3619</td>
<td>388 (10.7)</td>
<td>2513</td>
<td>89 (3.5)</td>
</tr>
<tr>
<td>75-79</td>
<td>3140</td>
<td>597 (19.0)</td>
<td>2234</td>
<td>156 (7.0)</td>
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<tr>
<td>80-84</td>
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<td>621 (36.8)</td>
<td>1454</td>
<td>267 (18.4)</td>
</tr>
<tr>
<td>85+</td>
<td>793</td>
<td>483 (60.9)</td>
<td>669</td>
<td>253 (37.8)</td>
</tr>
<tr>
<td>Education</td>
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</tr>
<tr>
<td>Primary</td>
<td>7076</td>
<td>1666 (23.5)</td>
<td>4253</td>
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<tr>
<td>Secondary/tertiary</td>
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<td>359 (18.9)</td>
<td>2416</td>
<td>193 (8.0)</td>
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<tr>
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<td>3470</td>
<td>1167 (33.6)</td>
<td>2445</td>
<td>488 (20.0)</td>
</tr>
<tr>
<td>Cohabitant</td>
<td>5454</td>
<td>824 (15.1)</td>
<td>4392</td>
<td>268 (6.1)</td>
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<td>PADL disability</td>
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<td></td>
</tr>
<tr>
<td>Yes</td>
<td>755</td>
<td>440 (58.3)</td>
<td>224</td>
<td>117 (52.2)</td>
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<td>No</td>
<td>8332</td>
<td>1612 (19.4)</td>
<td>6583</td>
<td>637 (9.7)</td>
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<tr>
<td>Yes</td>
<td>2909</td>
<td>1583 (54.4)</td>
<td>1433</td>
<td>584 (40.8)</td>
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<tr>
<td>No</td>
<td>5932</td>
<td>408 (6.9)</td>
<td>5339</td>
<td>166 (3.1)</td>
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</table>

N: Number of participants, PADL: Personal activities of daily living, IADL: Instrumental activities of daily living.

* P-value based on chi-square test for home nursing (yes/no) by the three hunt study surveys.
Table 2. Home nursing services use, the Norwegian HUNT study 1995-2017. N=24,478.

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<td>Participants</td>
<td>Home nursing</td>
<td>Participants</td>
<td>Home nursing</td>
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<td></td>
<td>(N)</td>
<td>receivers (n %)</td>
<td>(N)</td>
<td>receivers (n %)</td>
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<tr>
<td>Total</td>
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<td>560 (6.4)</td>
<td>6475</td>
<td>432 (6.7)</td>
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<td>Women</td>
<td>4853</td>
<td>368 (7.6)</td>
<td>3578</td>
<td>292 (8.2)</td>
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<tr>
<td>Men</td>
<td>3949</td>
<td>192 (4.9)</td>
<td>2897</td>
<td>140 (4.8)</td>
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<td>Age group, years</td>
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<td></td>
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<td>70-74</td>
<td>3517</td>
<td>82 (2.3)</td>
<td>2353</td>
<td>63 (2.7)</td>
</tr>
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<td>75-79</td>
<td>2963</td>
<td>163 (5.5)</td>
<td>2088</td>
<td>87 (4.2)</td>
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<tr>
<td>80-84</td>
<td>1589</td>
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<td>1382</td>
<td>150 (10.9)</td>
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<tr>
<td>85 +</td>
<td>733</td>
<td>152 (20.7)</td>
<td>652</td>
<td>132 (20.2)</td>
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<tr>
<td>Primary</td>
<td>6707</td>
<td>480 (7.2)</td>
<td>3979</td>
<td>316 (7.9)</td>
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<tr>
<td>Secondary/tertiary</td>
<td>1854</td>
<td>64 (3.5)</td>
<td>2305</td>
<td>99 (4.3)</td>
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<td>Living arrangement</td>
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<td>3263</td>
<td>340 (10.4)</td>
<td>2342</td>
<td>259 (11.1)</td>
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<td>Cohabitant</td>
<td>5258</td>
<td>191 (3.6)</td>
<td>4102</td>
<td>168 (4.1)</td>
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<td>PADL disability</td>
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<td>Yes</td>
<td>696</td>
<td>251 (36.1)</td>
<td>217</td>
<td>114 (52.5)</td>
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<td>7988</td>
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<td>6204</td>
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<td>5707</td>
<td>95 (1.7)</td>
<td>5007</td>
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N: Number of participants, PADL: Personal activities of daily living, IADL: Instrumental activities of daily living.
* P-value based on chi-square test for home nursing (yes/no) by the three hunt study surveys.
Table 3. Life Expectancy and expected years of receiving formal home care services at age 70 in Norway (95% CI), the Norwegian HUNT study 1995-2017.

<table>
<thead>
<tr>
<th>Year</th>
<th>LE at age 70 (95% CI)</th>
<th>LE at age 70 (95% CI)</th>
<th>LE at age 70 (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Men</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1995</td>
<td>11.9 (11.7-12.0)</td>
<td>2.6 (2.4-2.7)</td>
<td>0.6 (0.5-0.7)</td>
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<tr>
<td>2006</td>
<td>13.9 (13.7-14.0)</td>
<td>1.5 (1.3-1.7)</td>
<td>0.8 (0.7-0.9)</td>
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<tr>
<td>2017</td>
<td>15.3 (15.2-15.5)</td>
<td>1.1 (0.9-1.3)</td>
<td>0.9 (0.8-1.1)</td>
</tr>
<tr>
<td>Women</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1995</td>
<td>14.7 (14.6-14.9)</td>
<td>4.4 (4.2-4.6)</td>
<td>1.3 (1.1-1.4)</td>
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<tr>
<td>2006</td>
<td>16.0 (15.8-16.1)</td>
<td>2.7 (2.5-2.9)</td>
<td>1.5 (1.4-1.7)</td>
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<tr>
<td>2017</td>
<td>17.1 (16.9-17.3)</td>
<td>2.1 (1.9-2.3)</td>
<td>1.7 (1.5-1.9)</td>
</tr>
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</table>

CI: confidence interval, LE: life expectancy.
Figure 1. Standardized prevalence estimates of home help and home nursing services use by sex in HUNT2 (1995-1997), HUNT3 (2006-2008) and HUNT4 (2017-2019). Standardized using the 70+ Norwegian population in 1995 for HUNT2, in 2006 for HUNT2 and 2016 for HUNT4, as standard populations. Standardized according to sex, age, and education.
Figure 2. Projected number of home help and home nursing services users in Norway 2020-2050. Projections are based on self-reported data on home care services use from HUNT4 (2017-2019) standardized by age, sex and education (primary, secondary/tertiary) combined with population projections (main alternative) by age (70-74, 75-79, 80-84, 85+) and sex from Statistics Norway.
Appendix

Figure A1. Home help and home nursing services in Norway 2020-2050: projected number of actual users (orange color) and projected number in need of home care services based on ADL (blue color). Projections are based on self-reported data on home care services use from HUNT4 (2017-2019) standardized by age, sex and education (primary, secondary/tertiary) combined with population projections (main alternative) by age (70-74, 75-79, 80-84, 85+) and sex from Statistics Norway.

* Any ADL-problems reported in HUNT4 among home dwellers (prevalence numbers are reported in Table 1 in (8))

** Reported home help services and/or home nursing services use in HUNT4. All prevalence estimates are standardized by age, sex and education using the Norwegian population in 2019 as standard population.

All numbers are for interviews performed at HUNT4 station, and thus excluding home visits and nursing homes.