## RESEARCH PAPER

# Preferred life expectancy and the association with hypothetical adverse life scenarios among Norwegians aged 60+

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## Abstract

**Background:** how long older individuals prefer to live given hypothetical adverse changes in health and living conditions has been insufficiently studied.
**Objectives:** the objective of this study is to investigate the relationship between six adverse health and living conditions and preferred life expectancy (PLE) after the age of 60 years.
**Design:** cross-sectional face-to-face interviews.
**Setting:** population-based sample.
**Participants:** 825 community dwellers aged 60 years and older in Norway.
**Methods:** logistic regression models were used to analyse PLE, measured with a single question: 'If you could choose freely, until what age would you wish to live?' The impact on PLE of several hypothetical scenarios, such as being diagnosed with dementia, spousal death, becoming a burden, poverty, loneliness and chronic pain was analysed by age, sex, education, marital status, cognitive function, self-reported loneliness and chronic pain.
**Results:** average PLE was 91.4 years (95% CI 90.9, 92.0), and there was no difference between men and women, but those at older ages had higher PLE than those at younger ages. The scenarios that had the strongest negative effects on PLE were dementia, followed by chronic pain, being a burden to society, loneliness, poverty and losing one's spouse. PLE among singles was not affected by the prospect of feeling lonely. The higher educated had lower PLE for dementia and chronic pain.
**Conclusion:** among Norwegians 60+, the desire to live into advanced ages is significantly reduced by hypothetical adverse life scenarios, with the strongest effect caused by dementia and chronic pain.

**Keywords:** preferred life expectancy, Norway, hypothetical adverse life scenarios, older people

### Key Points

- Preferred Life Expectancy (PLE) given hypothetical health and living conditions is insufficiently studied
- Based on a Norwegian 60+ sample, we find that PLE is higher among the oldest respondents
- PLE decreases most for the prospect of dementia, followed by chronic pain, being a burden to society and loneliness
- Weaker negative PLE effects were found for the prospect of losing one's spouse or being subject to poverty
- The PLE of those with higher education was particularly negative for the prospect of dementia

## Background

Reductions in mortality and increasing life expectancy at advanced ages are commonly seen as a marker of progress. For instance, the UN's *Human Development Indicator* [1] uses life expectancy as a central component in its rank-ordering of the world's countries. However, despite the fact that rising life expectancy to a large extent occurs at later ages, where the experience of loss and disability are widespread [2, 3], there is remarkably little scientific evidence on how long individuals would like to live given the impact of such adverse life conditions. There has been insufficient understanding of how preferred life expectancy (PLE) varies and which life situations might affects it.

A rather limited number of existing studies have investigated individuals' preference to reach advanced ages. However, wording and context may influence how individuals answer [4–6]. One study [5] finds that individuals would like to live to around age 85, according to two German samples (in total 1,501 respondents) of adults 20–90 using variations of the question '..what age would you like to reach?'. A US-based study of 109 individuals aged 60–99 used the question 'how many more years would you like to live?' and found a mean of 93 years [7].

Many prefer to live to an age what is relatively similar to their projected life expectancy [5, 8]. Some prefer a length of life that is considerably higher than their projected life expectancy [4]. The influence on PLE of hypothetical sociodemographic and health changes at older ages, such as widowhood or dementia, has been insufficiently studied [6, 9].

Past studies reveal differences in PLE by sociodemographic group and health. While some research suggests that PLE is not related to education [5], one USA-based survey suggests that less-educated people want to live relatively longer than those with higher education [6].

The fear of living under what is perceived as adverse conditions may outweigh the fear of death [10]. Several studies suggest that people who feel healthier want to live longer [4, 5], and conversely, those who report worse health prefer a shorter life [11]. Some studies find gender differences, and that women may have a lower desire to live to older ages [12, 13], and one study suggest that women prefer a shorter, but healthier, life [11].

This study seeks to understand the effect on PLE of six common negative health and living conditions in old age: dementia, widowhood, being a burden to society, poverty, loneliness or chronic pain. Although the innate desire to live was expected to be strong, we hypothesised that the noted life events would decrease it. We use data from Norway, a country with relatively high life expectancy at birth, rising from 73.6 years in 1960 to 82.6 years in 2019 [14].

## Methods

### Participants

This research used data from the population-based NORSE-Oppland study [15], a study of health and living conditions based on a representative sample of the population aged 60 and older in Oppland County in Norway. The data collection was done in three waves, during February and March in 2017, 2018 and 2019. In each wave, a stratified, random sample of 2000 Oppland County residents from the population registry among residents aged 60–69 years, 70–79 years and 80+ (equal numbers in each age group) on 1 January 2017, 2018 and 2019 for waves 1–3, respectively, were invited. The analyses included in this study were performed using data from all three study waves. A total of 948 (16%) participated in the interviews and health examinations. Our study population was restricted to 825 respondents with non-missing values for the main outcome variable PLE (Table 1). Thus, the response rate for our sample was 14%. Prospective respondents were mailed an invitation letter along with a letter of consent. Final-year nursing students at the Norwegian University of Science and Technology Gjøvik, who were specifically trained for the data collection, collected the data by standardised face-to-face interviews, either at home or in local healthcare clinics or offices. Full population data from Oppland County for 2017 by age, sex and education provided by Statistics Norway were used to create population weights to control for selection bias [16]. This provides us with information on the total population, including all non-respondents, from administrative registers. Details of population numbers can be found in Appendix, Supplementary Tables S1 and S2. We employ weights to ensure that the sample is representative at the population level regarding sex, age and education, based on information from the total population.

### Preferred life expectancy

PLE was measured with a single question: 'If you could choose freely, until what age would you wish to live?'

### Conditions affecting PLE

Respondents were asked to use a five-item scale to quantify how much certain conditions (a–f) affected their PLE. The scale was: (1) Substantially shorter, (2) Somewhat shorter, (3) No effect, (4) Somewhat longer and (5) Substantially longer. Each condition was dichotomized grouping items 1–2 and 3–5. The conditions were: (a) You are diagnosed with dementia; (b) Your spouse dies (only for married participants); (c) You have become a burden to society; (d) You have become financially poor; (e) You feel lonely and (f) You have chronic pain (only for participants without current chronic pain).

**Table 1**. Chronological age and PLE by sex, age groups, education and marital status. $N$ = 825. Mean (and 95% CI) estimates are calibrated to reflect Oppland county regarding distribution of respondents according to age, sex and education.

| | $N$ | Chronological age Mean | Preferred life expectancy Mean (95% CI) | $P$-value[b] |
|---|---|---|---|---|
| **All** | 825 | 71.7 | 91.4 (90.9, 92.0) | |
| **Sex** | | | | |
| Men | 422 | 70.7 | 91.7 (90.8, 92.7) | 0.29 |
| Women | 403 | 72.6 | 91.1 (90.5, 91.8) | Ref |
| **Age** | | | | |
| 60–64 | 180 | 62.0 | 90.2 (89.0, 91.3) | Ref |
| 65–69 | 176 | 67.0 | 90.5 (89.2, 91.9) | 0.67 |
| 70–74 | 221 | 71.9 | 90.8 (89.5, 92.0) | 0.47 |
| 75–79 | 111 | 76.8 | 91.0 (89.9, 92.1) | 0.29 |
| 80–84 | 81 | 81.8 | 93.5 (92.3, 94.8) | <0.001 |
| 85+ | 56 | 88.6 | 96.2 (94.3, 98.2) | <0.001 |
| **Men** | | | | |
| **Education** | | | | |
| Primary | 88 | 72.3 | 90.9 (89.1, 92.7) | Ref |
| Secondary | 134 | 70.5 | 92.1 (90.3, 93.9) | 0.38 |
| Tertiary | 183 | 69.5 | 92.1 (90.7, 93.4) | 0.32 |
| **Marital status** | | | | |
| Married | 350 | 69.9 | 91.7 (90.7, 92.8) | Ref |
| Single | 30 | 69.0 | 90.5 (87.7, 93.4) | 0.44 |
| Widower | 39 | 77.8 | 92.0 (90.0, 94.0) | 0.81 |
| **Feeling lonely** | | | | |
| Seldom/never | 366 | 70.3 | 91.7 (90.7, 92.6) | Ref |
| Often/occasionally | 56 | 73.1 | 92.0 (88.9, 95.1) | 0.83 |
| **Chronic pain** | | | | |
| No | 172 | 71.2 | 92.6 (90.7, 94.4) | Ref |
| Yes | 250 | 70.4 | 91.2 (90.2, 92.3) | 0.22 |
| **Probable cognitive impairment** [a] | | | | |
| No | 300 | 69.3 | 91.9 (90.8, 93.0) | Ref |
| Yes | 122 | 73.5 | 91.4 (89.5, 93.2) | 0.60 |
| **Women** | | | | |
| **Education** | | | | |
| Primary | 102 | 75.3 | 91.2 (90.1, 92.4) | Ref |
| Secondary | 135 | 71.8 | 91.0 (90.1, 92.0) | 0.79 |
| Tertiary | 151 | 69.5 | 91.3 (90.0, 92.6) | 0.94 |
| **Marital status** | | | | |
| Married | 252 | 69.4 | 90.1 (89.2, 90.9) | Ref |
| Single | 53 | 68.7 | 89.8 (87.8, 91.8) | 0.81 |
| Widow | 98 | 80.8 | 93.9 (92.7, 95.0) | <0.001 |
| **Feeling lonely** | | | | |
| Seldom/never | 320 | 71.1 | 91.0 (90.3, 91.8) | Ref |
| Often/occasionally | 83 | 77.3 | 91.5 (90.0, 93.0) | 0.58 |
| **Chronic pain** | | | | |
| No | 118 | 72.8 | 92.4 (91.5, 93.4) | Ref |
| Yes | 285 | 72.5 | 90.6 (89.8, 91.5) | 0.006 |
| **Probable cognitive impairment** [a] | | | | |
| No | 315 | 70.7 | 90.9 (90.1, 91.6) | Ref |
| Yes | 88 | 77.8 | 91.9 (90.5, 93.2) | 0.22 |

[a]MoCA scores < 24 is indicative of cognitive impairment. [b]$P$-value estimated in linear regression.

## Covariates

We included the following covariates suspected to affect PLE: age, gender, education, marital status, cognitive function, self-reported loneliness and chronic pain. Educational attainment was grouped as primary, secondary or tertiary. Marital status categories were married, single or widow (er). Participants with Montreal cognitive assessment (MoCA) scores less than 24 were categorised as having a probable cognitive impairment and those scoring 24–30 were considered having normal cognition [17]. This cut-off has proven to have high sensitivity and specificity for mild cognitive impairment (MCI)/dementia. Self-reported feeling of loneliness was dichotomized based on occurrence as seldom/never or often/occasionally. Self-report of chronic pain in the back or joints was grouped as yes or no.

**Table 2.** Absolute difference in PLE by age, sex, education, marital status, cognition and self-reports of loneliness and chronic pain. *N* = 825.

| | Mean absolute difference in PLE (95% CI)[a] Age- and sex-adjusted | *P*-value[b] |
|---|---|---|
| **Age** | | |
| 60–64 | Ref | Ref |
| 65–69 | 0.4 (−1.4, 2.1) | 0.67 |
| 70–74 | 0.7 (−1.1, 2.4) | 0.45 |
| 75–79 | 0.9 (−0.7, 2.5) | 0.26 |
| 80–84 | 3.4 (1.7, 5.1) | <0.001 |
| 85+ | 6.3 (3.9, 8.6) | <0.001 |
| **Sex** | | |
| Men | 1.0 (−0.2, 2.2) | 0.09 |
| Women | Ref | Ref |
| **Education** | | |
| Primary | Ref | Ref |
| Secondary | 1.0 (−0.4, 2.4) | 0.17 |
| Tertiary | 1.4 (0.1, 2.8) | 0.04 |
| **Marital status** | | |
| Married | Ref | Ref |
| Single | −0.7 (−2.4, 1.1) | 0.46 |
| Widower | 0.4 (−1.3, 2.1) | 0.67 |
| **Feeling lonely** | | |
| Seldom/never | Ref | Ref |
| Often/occasionally | −1.0 (−2.5, 0.5) | 0.18 |
| **Chronic pain** | | |
| No | Ref | Ref |
| Yes | −1.3 (−2.5, −0.1) | 0.04 |
| **Probable cognitive impairment**[b] | | |
| No | Ref | Ref |
| Yes | −0.8 (−2.1, 0.5) | 0.24 |

[a]Adjusted by age and sex and calibrated to reflect Oppland County regarding distribution of respondents according to age, sex and education. [b]*P*-value estimated in linear regression, adjusted by age and sex, taking into account the survey design.

### Statistical approach

STATA 16.0 was used for all analyses. Due to the low response rate and possible selection bias, study participants were weighted to represent Oppland County in 2017 regarding age, sex and education (see details in Appendix, Supplementary Data). Mean PLE was calculated with an accompanying 95% confidence interval (CI). Linear regression was used to assess whether PLE differed by sex, chronological age, education, marital status, loneliness, chronic pain and probable cognitive impairment. Logistic regression was used to assess whether the six various life event conditions affected PLE differently by covariate levels.

### Results

#### Views on preferred life expectancy

The crude average PLE for the entire population was 91.4 years (95% CI 90.9, 92.0), and PLE was similar for men and women (Table 1).

After adjusting for age there was a tendency for higher PLE in men compared to women, but the difference of 1.0 year was not significant (*P* = 0.09) (Table 2). PLE did not differ according to age for those younger than 80, but those aged 80–84 had 3.4 years higher PLE than those aged 60–64, and those aged 85+ had 6.3 years higher PLE. The difference in PLE between these two oldest age groups was significant (*P* = 0.02). After adjusting for age and sex, PLE differed by education and chronic pain, while marital status, loneliness or cognitive impairment did not affect PLE significantly. After adjusting for age and sex, those with tertiary education had 1.4 years higher PLE than those with primary education (*P* = 0.04), and those reporting chronic pain had 1.3 years lower PLE than those without chronic pain (*P* = 0.04).

### Assessment of the potential impact of six hypothetical scenarios on PLE

Being diagnosed with dementia was the scenario most often negatively affecting PLE (Table 3); 89% considered this to have substantial or some negative impact (95% CI 86, 91). Those with higher education were significantly more likely to state that they wanted a shorter PLE in the case of dementia, while singles were less likely than married to state that dementia would affect PLE. For 85% of the participants, chronic pain was associated with lower PLE. The proportion was similar across all covariates (Table 3).

Becoming a burden negatively affects PLE, with 71% stating that this would lead them to wanting to live shorter lives (95% CI 68, 75) (Table 3). Almost two thirds, 66% (95% CI 62, 69), said loneliness would have a strong negative effect on PLE. Notably, singles were less likely to say that this affected PLE, compared with married. A slight majority, 56% (95% CI 53, 60), prefer shorter lives if falling into poverty. Participants with the highest education, however, were significantly less likely to state that poverty matters for PLE. For participants with probable cognitive impairment this mattered more than for the cognitively normal. Among married respondents, the passing of one's spouse would affect PLE for 62% (95% CI 58, 66) of the sample, and there were no significant differences between background characteristics for this scenario.

### Discussion

The current study addressed how long individuals want to live and under a set of adverse hypothetical life scenarios. The sample was a population of adults aged 60 years and above in Norway from the NORSE study. The results suggest a relatively high desired lifetime compared to findings from other investigations, although comparisons across culture and context are inherently problematic [5, 13, 18, 19]. The desire to live is considered a basic driving force, but high life expectancy may also be related to individual unfinished business aims, and tasks one would like to finish before dying. Older age translated into higher PLE, particularly

**Table 3**. Negative impact on PLE in adverse scenarios, such as having dementia, loss of spouse, being a burden, poor or lonely, or having chronic pain. Odds ratios (OR) estimated in logistic regression, adjusted by sex and age. All results are calibrated to reflect Oppland County regarding distribution of respondents according to age, sex and education.

| | (a) You are diagnosed with dementia (N = 784) | (b) Your spouse dies (N = 599)[a] | (c) You have become a burden to society (N = 787) | (d) You have become financially poor (N = 781) | (e) You feel lonely (N = 783) | (f) You have chronic pain (N = 280)[b] |
|---|---|---|---|---|---|---|
| Substantial or some negative impact on PLE, % (95% CI) | 89% (86, 91) | 62% (58, 66) | 71% (68, 75) | 56% (53, 60) | 66% (62, 69) | 85% (80, 89) |
| Substantial or some negative impact on preferred life expectancy (OR) for conditions a–f: | | | | | | |
| | OR (95% CI) | OR (95% CI) | OR (95% CI) | OR (95% CI) | OR (95% CI) | OR (95% CI) |
| **Age, years** | | | | | | |
| 60–69 | Ref | Ref | Ref | Ref | Ref | Ref |
| 70–79 | 1.14 (0.67, 1.93) | 1.20 (0.83, 1.75) | 1.17 (0.82, 1.69) | 1.09 (0.79, 1.50) | 0.71 (0.50, 0.99) | 0.76 (0.36, 1.61) |
| 80+ | 0.83 (0.44, 1.57) | 1.23 (0.65, 2.35) | 0.76 (0.48, 1.20) | 0.83 (0.54, 1.26) | 0.93 (0.59, 1.47) | 1.18 (0.45, 3.08) |
| **Sex** | | | | | | |
| Women | Ref | Ref | Ref | Ref | Ref | Ref |
| Men | 0.83 (0.52, 1.33) | 1.27 (0.88, 1.83) | 0.74 (0.53, 1.03) | 1.11 (0.82, 1.49) | 0.89 (0.65, 1.23) | 0.90 (0.46, 1.80) |
| **Education** | | | | | | |
| Primary | Ref | Ref | Ref | Ref | Ref | Ref |
| Secondary | 1.18 (0.67, 2.07) | 0.82 (0.49, 1.37) | 1.36 (0.87, 2.12) | 1.06 (0.71, 1.58) | 1.27 (0.84, 1.91) | 2.46 (0.94, 6.44) |
| Tertiary | 1.88 (1.02, 3.46) | 0.73 (0.44, 1.20) | 0.99 (0.64, 1.51) | 0.60 (0.41, 0.89) | 1.28 (0.85, 1.91) | 1.51 (0.64, 3.56) |
| **Marital status** | | | | | | |
| Married | Ref | – | Ref | Ref | Ref | Ref |
| Single | 0.42 (0.20, 0.88) | – | 0.79 (0.45, 1.37) | 1.03 (0.62, 1.71) | 0.51 (0.31, 0.84) | 0.61 (0.18, 2.07) |
| Widow | 0.83 (0.42, 1.62) | – | 0.59 (0.35, 1.00) | 0.68 (0.43, 1.08) | 0.68 (0.42, 1.10) | 1.79 (0.57, 5.56) |
| **Feeling lonely** | | | | | | |
| Seldom/never | Ref | Ref | Ref | Ref | Ref | Ref |
| Often/occasionally | 0.74 (0.38, 1.42) | 0.96 (0.51, 1.78) | 1.35 (0.82, 2.20) | 1.24 (0.82, 1.86) | 0.96 (0.61, 1.50) | 3.29 (0.90, 11.96) |
| **Chronic pain** | | | | | | |
| No | Ref | Ref | Ref | Ref | Ref | – |
| Yes | 1.02 (0.64, 1.65) | 0.98 (0.68, 1.42) | 0.99 (0.70, 1.39) | 1.30 (0.95, 1.78) | 1.29 (0.93, 1.80) | – |
| **Probable cognitive impairment**[c] | | | | | | |
| No | Ref | Ref | Ref | Ref | Ref | Ref |
| Yes | 0.71 (0.42, 1.20) | 1.03 (0.65, 1.62) | 0.68 (0.46, 1.01) | 1.50 (1.03, 2.18) | 1.23 (0.84, 1.82) | 1.14 (0.49, 2.64) |

[a]Analysis performed only among married respondents. [b]Analysis performed only among respondents with no current chronic pain. [c]MoCA score less than 24 is defined as probable cognitive impairment.

among the very old respondents, similar to [6], but contrasting [5]. In our study, there was a tendency for longer PLE among men compared to women, but the difference was not significant. Thus, we did not replicate findings from other studies reporting that women prefer somewhat shorter lives [6, 11, 13]. For instance, the Norwegian respondents had a fairly high PLE compared to e.g. the findings from Germany [5]. Some potential causes of these differences include the different regions and periods (life expectancy was initially higher and has increased to the later period when the Norwegian sample was tested), that Norway could have higher living standards than Germany about a decade earlier (proxied as GDP) and that age distributions are older (older Norwegian respondents report a higher PLE). Another possible reason is healthy selection bias due to the low response rate in our study. Unfortunately, we lack health information about non-responders, but the educational level is much higher among the responders compared to registry data for the population of Oppland County. Even though we have weighted our sample for this educational discrepancy,

we do not know if we have removed all this potential healthy selection bias.

Adverse health and living conditions prevalent at older ages may reduce preference to live longer. This study investigated the relationship between six hypothetic situations and PLE: dementia, spousal death, becoming a burden, poverty, loneliness or chronic pain. The finding that dementia had the strongest negative effect on PLE concurs with prior studies suggesting a widespread fear of dementia [20]. Chronic pain was also strongly associated with lower PLE in this study. For many people, chronic pain has been found to reduce quality of life and limit opportunities for social activities [21, 22]. It is also noteworthy that the third-highest ranked reason for lower PLE in this study was the belief that one represents a burden. Perceiving oneself to be a burden can relate to other outcomes in terms of self-view, including a loss of dignity at older ages [23].

The majority report lower PLE if they were to become lonely, while the effects are weaker for those who are single. Loneliness can have severe consequences for wellbeing [24]

and health [25]. Advanced age tends to relate to a shrinking social network, which for some is aggravated by spousal loss [26].

Slightly above half of the respondents stated that poverty would decrease how long they would like to live. Poverty increases the risk of lower quality of life, autonomy and wellbeing at older ages [27] and relates to a greater disease burden [28]. Severe poverty is rare in Norway, as it is one of the richest countries in the world, with a universal and generous social security system and low levels of economic inequality compared to most other advanced economies. Especially older age groups have experienced rapid decreases in poverty levels over the last decades [29]. Nevertheless, the fear of poverty in old age can still be widespread among older individuals, many of whom have grown up in a context where poverty was more prevalent.

## Limitations

This investigation has several limitations. The sample comes from drop only one region in Norway and may not be generalizable to other regions or countries. This study is restricted to a limited set of determinants of PLE. Moreover, the evidence is cross-sectional. The inclusion of confounding factors is not exhaustive. Further, being willing to respond may imply positive selection in the sample.

Linkage to registers shows that the sample is representative when it comes to age and sex, yet skewed towards higher education. For this reason, our analyses were weighted by education to minimise selection biases. If the sample differs in other factors other than those included the results might still be biassed. The participation rate was low (14%), which may have led to selection bias. Because the present research questions involve comparisons and not absolute values of the PLE, the biases due to the sampling are reduced.

## Conclusions

We study how long older individuals would like to live given a set of hypothetical adverse life scenarios. Our investigation suggests that PLE (91.4 years) among men and women in our survey exceeds Norwegian life expectancy estimates at age 70 (86.7 years in 2019). We find that PLE was significantly negatively affected by several of the hypothetical adverse life events, such as dementia, chronic pain or believing that one has become a burden to society. It is difficult for individuals to form any clear preferences towards life events before these either take place or they can gain knowledge from their own experiences (or those of close friends and family). In many cases, such insights may be lacking. Hence, our PLE results could be influenced by life scenarios participants are most acquainted with. Reflection on how hypothetical adverse life events can affect how long individuals would like to live is an important issue that deserves more awareness, particularly in countries with rapidly ageing populations. When discussing the ongoing increase in life expectancy

and how to safeguard a good quality of life at older ages, it is important to consider how older individuals view rising life expectancy. Understanding variation in life expectancy preferences can help health care, social service providers and the general public better understand fears and concerns held by older individuals.

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