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Health and wellbeing in Norway: Population norms and the social gradient

Jan Abel Olsen^{a,b,c,*}, Marie Hella Lindberg^a, Admassu Nadew Lamu^{a,d}^a Department of Community Medicine, UiT, The Arctic University of Norway, 9037, Tromsø, Norway^b Division of Health Services, Norwegian Institute of Public Health, Oslo, Norway^c Centre for Health Economics, Monash University, Melbourne, Australia^d Department of Global Public Health and Primary Care, University of Bergen, Norway

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ABSTRACT

Measures of health-related quality of life are important in health technology assessments, and useful when analysing health inequalities across population sub-groups. This paper provides population norms on health and wellbeing in Norway based on two waves of a comprehensive health survey: Wave 6 of The Tromsø Study conducted in 2007/08 (N = 12,981) and Wave 7 conducted in 2015/16 (N = 21,083). By use of these data, the paper aims to provide new insight on how different measures of health and wellbeing, and different indicators for socio-economic position, will affect the magnitude of a reported social gradient in health.

We apply validated multi-item instruments for measuring health and subjective well-being; the health state utility instrument EQ-5D, and the satisfaction with life scale, as well as a direct valuation of health on a visual analogue scale. We apply three indicators for socio-economic position; education, occupation and household income, each measured along four levels. After descriptive statistics, regression analyses are performed separately for men and women, adjusted for age, to explain the magnitude of the social gradient along each socio-economic indicator.

The social gradient in health showed a consistent positive trend, along all three socio-economic indicators; it was strongest with income, and weakest with education. When health had been valued directly on a visual analogue scale, the gradient was steeper than when valued indirectly via the EQ-5D descriptive system. The social gradient in subjective well-being also showed consistent positive trends, except with education as the socio-economic indicator.

We have shown that the magnitude of the social gradient critically depends on which socio-economic indicator is used, and whether health is being measured indirectly via the EQ-5D descriptive system or directly on a visual analogue scale. The strongest gradient in subjective well-being was observed with income as the socio-economic indicator.

1. Introduction

From a large number of countries with diverse institutional settings, there is now overwhelming evidence of a positive association between people's social standing and their health, i.e. a *social gradient* is being observed (see e.g. Adler et al., 1994; Marmot, 2004; Stringhini et al., 2017). Socio-economic position (SEP) is commonly measured by individuals' levels of education, occupation or income (Galobardes et al., 2007; Mackenbach, 2019). As these indicators have different causal pathways to health, we would expect the observed magnitude of the social gradient to depend on which SEP indicator is being applied.

Health is measured in various ways in this literature; by mortality or morbidity, and by use of 'objective indicators' or more 'subjective reporting'. Studies are based on national statistics that provide mortality

data (Kinge et al., 2019), or registries and surveys on specific indicators of morbidity (Marmot et al., 1978). A growing literature is now using 'subjective measures' of health, most often responses to a single-item question referred to as self-assessed health (SAH) or self-rated health (SRH) (Dowd, 2012; Krokstad and Westin, 2002). An emerging question, then, is whether any 'reporting heterogeneity' exists, i.e. that different socio-economic groups rate the same 'true' health condition differently. If highly educated people respond more negatively to a given health impairment (Hanandita and Tampubolon, 2016), and/or the poor respond more positively (Rossouw et al., 2018), the reported inequalities in self-assessed health would underestimate true differences in health. However, other studies suggest the opposite direction of such discrepancies (see e.g. Shmueli, 2003; Nesson and Robinson, 2019). Thus, the magnitude and direction of any reporting

* Corresponding author. Department of Community Medicine, Faculty of Health Sciences, UiT The Arctic University of Norway, 9037, Tromsø, Norway.
E-mail address: jan.abel.olsen@uit.no (J.A. Olsen).

heterogeneity is hard to predict *a priori* (Dowd, 2012).

When attempting to reduce the potential problem of reporting heterogeneity, we agree with Nesson and Robinson (2019) that, instead of a brief single-item SAH question there is a need for multivariate measures. An important class of such descriptive systems are the generic preference-based measures of health-related quality of life (HRQoL). These measures are widely applied in health technology assessments, but rarely in the context of studying health inequalities: One study from US and Canada looked at income-related inequalities in the health utility index (HUI) (Huguet et al., 2008), while one study from England looked at occupation-class inequalities in the EQ-5D (Maheswaran et al., 2015).

In this paper, we extend the empirical literature in the following ways: First, we look at how the choice of a SEP indicator (education, occupation, income) will affect the magnitude of a reported health inequality. Second, we look at health inequalities by use of three different measures of health and wellbeing: i) when respondents value their HRQoL *directly* on a visual analogue scale; ii) when they value their HRQoL *indirectly* via a multivariate descriptive system, and; iii) when they respond to a multivariate 'subjective wellbeing' instrument. Third, we look at one of the most egalitarian countries in the world. Norway is among the top five when it comes to income equality. The country is known for its achievements in gender equality, and equality in educational opportunities, as well as being wedded to the principle of 'equal access to healthcare for equal need'. Thus, if inequalities in health and wellbeing can be identified in Norway, they are likely to be ubiquitous.

Based on data from a comprehensive health survey, this paper provides population norms on HRQoL and wellbeing by age groups and sex for Norway. A broad set of HRQoL values are included, using alternative EQ-5D tariffs for both the original 3-level version and the new 5-level version. By use of these data, the paper aims to provide new insight on how different measures of health and wellbeing, and different indicators for socio-economic position, will affect the magnitude of a reported social gradient in health. More specifically, we compare the magnitude of the social gradient using three alternative measures of health and wellbeing: the descriptive system EQ-5D; a visual analogue scale (VAS), and; the satisfaction with life scale (SWLS). As for the dichotomies on single vs multidimensional, and subjective vs objective, the VAS is a single-item subjective measure, while both the EQ-5D and the SWLS are multidimensional instruments. The SWLS is a most *subjective* measure, while the EQ-5D might be considered a somewhat more objective measure in that respondents are asked to *describe* their health state along five dimensions. For each of these three measures of health and wellbeing, we apply three alternative SEP indicators: education, occupation and income. Hence, we contribute to the literature on the social gradient in health by comparing: *what is measured* (EQ-5D, VAS, SWLS), and; along *which indicator* (education, occupation, income) inequalities are measured.

The paper is structured as follows. The next section describes the data, the key sets of variables and the methods. Results are presented in Section 3, and discussed in Section 4.

2. Material and method

2.1. The Tromsø Study

The Tromsø Study is a prospective cohort study of the population residing in the municipality of Tromsø. With around 80,000 inhabitants, Tromsø is the largest city in Northern Norway. The study population is considered broadly representative of the Norwegian adult population, with individuals holding a university degree being slightly overrepresented. The current paper is based on data from the sixth wave conducted in 2007/08 (N = 12,981, aged 30 and above), and the seventh wave conducted in 2015/16 (N = 21,083, aged 40 and above). The design of the Tromsø Study is described in detail elsewhere (Jacobsen et al., 2012). The study was approved by the Regional

Committee for Medical and Health Research Ethics (ID, 2016/607). All participants gave written informed consent before admission.

2.2. Sets of variables

2.2.1. Health-related quality of life (HRQoL)

HRQoL is measured by the EuroQol-5D instrument (EQ-5D), which is the most widely applied generic preference-based descriptive system. The EQ-5D describes health along five dimensions (mobility, self-care, usual activities, pain/discomfort, anxiety/depression) (<https://euroqol.org>). In the original 3L version, used in the sixth wave of the Tromsø Study, participants describe their HRQoL on each dimension along three severity levels, which broadly correspond to no, some, or extreme problems. The new 5L version, used in the seventh wave, includes five severity levels (Herdman et al., 2011).

Alternative value sets are used for estimating mean EQ-5D index values. We include the UK-TTO tariff for 3L (Dolan, 1997) and the English value set for 5L (Devlin et al., 2018). For Wave 6, we also report EQ-5D index values based on published Danish and Swedish tariffs for the 3L (Wittrup-Jensen et al., 2009; Burström et al., 2014). For Wave 7, we include an international amalgam tariff for 5L, the WePP ('Western Preference Pattern'), that was developed to represent a hybrid of four Western countries' value sets (Olsen et al., 2018). In the absence of a Norwegian or any other Scandinavian value set, we apply the WePP in the regression analysis.

In addition to the indirect valuation via the EQ-5D descriptive system, participants scored their current health state directly by use of a visual analogue scale (VAS). The VAS score is converted from the [0–100] range onto a [0–1] scale for reasonable comparison with the other measures of health and wellbeing.

2.2.2. Subjective well-being (SWB)

SWB is assessed by the satisfaction with life scale (SWLS) (Diener et al., 1985), which has been widely used in previous studies (Steinfeld et al., 2008). We use the first three of the five SWLS items: *In most ways my life is close to my ideal*; *The conditions of my life are excellent*, and; *I am satisfied with my life*. The response options ranged from 1 (strongly disagree) to 7 (strongly agree). The omitted two items are sensitive to age as they implicate experience of life satisfaction in the past (Hultell and Gustavsson, 2008; Zou et al., 2013), and they have poorer psychometric properties than the first three items of the scale (Oishi, 2006). Total sum of score from the three items in the range [3–21] is linearly transformed onto a [0–1] scale (see Lamu and Olsen, 2016). SWB was measured identically in both waves.

2.2.3. Socio-economic position

Each of the three SEP indicators are measured along four levels (L1, L2, L3, L4), where higher levels imply a higher SEP. Education is categorized in line with an international standard: primary and lower secondary (L1); vocational/upper secondary (L2); tertiary low (L3), and; tertiary high (L4). Tertiary low corresponds to bachelor degree or shorter courses/programmes, here described 'college/university, less than 4 years', while the highest level was described as 'college/university, 4 years or more'.

For occupation, we use the following categories: unskilled or semiskilled manual jobs (L1); office, sales, service and care jobs (L2); professions that require college/university education of maximum 3 years (L3); and administrative leaders, politicians, or professions that require university degree of at least 4 years (L4). These four levels are collapsed based on responses to one out of nine categories, adapted from the International Standard Classification of Occupations (Statistics Norway, 2011).

Household income data was recorded in eight income brackets, which differed between the two waves to reflect wage inflation. In each wave, the eight brackets were then collapsed with the aim to more evenly distribute respondents into four income categories: low; lower

middle; upper middle, and; high income. Specifically, in Wave 6, the income groups were (in thousands): Low (L1) \leq NOK 300 (24.7%); Lower middle (L2) NOK 301–550 (31.9%); Upper middle (L3) NOK 551–700 (17.5%), and; High (L4) NOK \geq 701 (25.9%). In Wave 7, income groups were: Low (L1) \leq NOK 450 (22.5%); Lower middle (L2) NOK 451–750 (29.2%); Upper middle (L3) NOK 751–999 (23.5%), and; High (L4) NOK \geq 1 million (24.8%), i.e. a distribution that is close to representing income quartiles.

2.3. Statistical analysis

We use simple descriptive statistics to provide population norms for various HRQoL measures and SWB by sex and age groups in both waves. The mean values for HRQoL and SWB are reported along four levels on each of three SEP indicators: education, occupation and income.

The effect of SEP indicators on health and wellbeing vary across sex ($p < 0.001$). Thus, using data from Wave 7, separate regression analyses by sex are undertaken for each of the three outcome variables: EQ-5D, VAS and SWB. On each of these outcome variables, we run separate regressions to assess the partial effects of each of the three SEP indicators: education, occupation and income. To adjust for changes in health and wellbeing over the life course, we include age groups in all regressions. Wald tests were applied when the partial effects of these SEP indicators were compared.

To examine the simultaneous effects of education and income on health and wellbeing, multivariate regression analyses are undertaken for female and male separately, adjusted for age. The occupation variable is excluded because preliminary analysis indicated the presence of multi-collinearity. When occupation was included, the coefficients of education changed dramatically. Not only did it become insignificant, but it also changed its direction. Furthermore, the pairwise correlation between occupation and education is very high (0.75) and greater than the recommended 0.70 threshold (Pallant, 2007). The comparisons of the SEP gradients have formally been tested using the log-likelihood ratio test. Furthermore, as a sensitivity test, the appendix includes similar regression analyses based on the data set from Wave 6.

All data analyses were conducted by using Stata [®]15.1 statistical software (Stata Corporation, College Station, Texas).

3. Results

Table 1 presents sample characteristics for Wave 7. A corresponding table on Wave 6 is provided in the Appendix Table A1. Comparisons of HRQoL across Wave 6 and Wave 7 are hard to make. First, when the descriptive systems differ (the 3L in Wave 6, the 5L in Wave 7), the proportion of respondents ticking level 1 (no problems) in all 5 dimensions (11111) of the EQ-5D descriptive system, classified as 'Full health', will differ. The lower proportion in Wave 7 than in Wave 6 can be explained by the fact that the more fine-grained 5L system allows subjects to report 'slight problems' (for a discussion of the 3L vs 5L system, see www.euroqol.org). Second, index values are based on different preference-weighted value sets (the UK tariff for the 3L in Wave 6, and the English tariff for the 5L in Wave 7). Lastly, the VAS was explained differently in the two waves, neither of which followed the standard EQ-VAS. The distribution of EQ-5D item scores are reported in the Appendix Table A2 for both waves.

Table 2 provides mean EQ-5D index values using different value sets, as well as VAS and SWB, by age group and sex. (A corresponding table for Wave 6 is provided in Appendix Table A3). Health and wellbeing generally remain stable over age, with only a weak decline in health after turning 70. As for SWB, it increases with age. This is illustrated by Fig. 1, which depicts the three measures of health and wellbeing, by age groups and sex.

Fig. 2 shows age-adjusted health and wellbeing by sex, using education, occupation, and income gradients, respectively. In the appendix,

Table 1
Sample characteristics, Wave 7.

Variables	Female		Male		Total	
	N	Mean/%	N	Mean/%	N	Mean/%
Age, mean (SD)	11,074	57.2 (11.45)	10,009	57.4 (11.39)	21,083	57.3 (11.42)
Education level						
Primary/lower secondary	2,617	24.1	2,179	22.2	4,796	23.2
Vocational/upper secondary	2,759	25.4	2,997	30.5	5,756	27.8
College/university, < 4 yrs	1,917	17.6	2,091	21.3	4,008	19.4
College/university, \geq 4 yrs	3,581	32.9	2,564	26.1	6,145	29.7
Occupation level						
Unskilled	1,567	14.6	3,018	31.1	4,585	22.5
Intermediary	4,220	39.4	1,716	17.7	5,936	29.1
Lower profession	1,486	13.9	1,783	18.4	3,269	16.0
Higher profession	3,429	32.0	3,173	32.7	6,602	32.4
Household income						
Low	2,800	26.9	1,745	17.9	4,545	22.5
Lower middle	3,088	29.6	2,796	28.6	5,884	29.2
Upper middle	2,271	21.8	2,470	25.3	4,741	23.5
High	2,257	21.7	2,758	28.2	5,015	24.8
Health; EQ-5D						
Full health (11111)	2,631	24.7	3,117	32.4	5,748	28.3
English value set, mean (SD)	10,648	0.89 (0.12)	9,631	0.91 (0.11)	20,279	0.90 (0.11)
WePP, mean (SD)	10,648	0.88 (0.11)	9,631	0.90 (0.10)	20,279	0.89 (0.11)
VAS, mean (SD)	10,840	0.76 (0.17)	9,827	0.76 (0.16)	20,667	0.76 (0.16)
Wellbeing; SWLS, mean (SD)	10,407	0.71 (0.21)	9,553	0.71 (0.20)	19,960	0.71 (0.21)

Note: Mean index values for EQ-5D-5L are based on the English EQ-5D-5L value set, and the WePP, Western Preference Pattern; VAS, visual analogue scale; SWB, subjective well-being (based on the first three items of the Satisfaction With Life Scale) converted onto a [0–1] scale; SD, standard deviation in parentheses.

Table A4 provides the numbers on which Fig. 2 is based. In addition, Table A4 includes mean index values based on the English value set to compare with the WePP model. As can be seen, the English index values are consistently 0.01 higher, i.e. the social gradients exhibit the same pattern.

Table 3 shows the different magnitudes of the age-adjusted social gradient in EQ-5D for each SEP indicator. While the magnitudes differ, they all show a consistent increase, i.e. for each increase in SEP level, the mean EQ-5D index value improves. Income has the strongest effect; the difference between the lowest and the highest level involves 0.068 better health in women, and 0.064 in men. The sex difference, though small, is statistically significant ($p = 0.043$). When compared with education, the health effect of the highest level of income is twice the magnitude of the education gradient ($p < 0.001$). Furthermore, when comparing the R-squared across the three SEP indicators, the Income model is the one that performs best. The analyses based on Wave 6 (Table A5 in appendix) are supportive, in that the income model shows the strongest gradient. The higher coefficients can be explained by a longer scale [-0.594 – 1] when using the UK-TTO value set for 3L in Wave 6 compared to the WePP scale [-0.24 – 1] in Wave 7.

Table 4 presents regression results when health is measured by VAS instead of the EQ-5D. Note the much wider gap between the lowest and the highest income level; 0.103 in women, and 0.095 in men. Thus, there is a stronger social gradient in how people value their health directly, as compared to how they value it indirectly via a descriptive system. Compared to Table 3, the adjusted R-squared are higher when

Table 2
Health and wellbeing by sex and age, Wave 7.

	40–49			50–59			60–69			70–79			80+		
	Female	Male	Total	Female	Male	Total	Female	Male	Total	Female	Male	Total	Female	Male	Total
Wave 7															
Full health, (%)	26.2	32.4	29.2	24.0	30.6	27.0	24.8	33.1	28.8	24.1	36.2	30.1	19.0	26.9	22.6
English value set	0.89 (0.12)	0.91 (0.10)	0.90 (0.11)	0.89 (0.12)	0.91 (0.11)	0.90 (0.11)	0.90 (0.10)	0.92 (0.11)	0.91 (0.10)	0.88 (0.13)	0.92 (0.10)	0.90 (0.12)	0.83 (0.16)	0.88 (0.14)	0.86 (0.16)
WePP	0.88 (0.11)	0.90 (0.10)	0.89 (0.11)	0.88 (0.11)	0.90 (0.1)	0.89 (0.11)	0.89 (0.10)	0.90 (0.10)	0.90 (0.10)	0.87 (0.12)	0.91 (0.10)	0.89 (0.11)	0.83 (0.15)	0.87 (0.14)	0.85 (0.15)
VAS	0.77 (0.16)	0.77 (0.15)	0.77 (0.16)	0.77 (0.17)	0.77 (0.15)	0.77 (0.16)	0.77 (0.17)	0.77 (0.16)	0.77 (0.16)	0.73 (0.18)	0.75 (0.16)	0.74 (0.17)	0.67 (0.18)	0.69 (0.18)	0.68 (0.18)
SWB	0.70 (0.22)	0.70 (0.20)	0.70 (0.21)	0.70 (0.22)	0.70 (0.21)	0.70 (0.21)	0.72 (0.21)	0.73 (0.20)	0.72 (0.20)	0.74 (0.21)	0.74 (0.19)	0.74 (0.20)	0.79 (0.21)	0.78 (0.20)	0.78 (0.21)

Note: English EQ-5D-5L value set; WePP, Western Preference Pattern for EQ-5D-5L; VAS, visual analogue scale; SWB, subjective well-being (based on the first three items of the Satisfaction With Life Scale) converted onto a [0–1] scale; SD, standard deviation in parentheses.

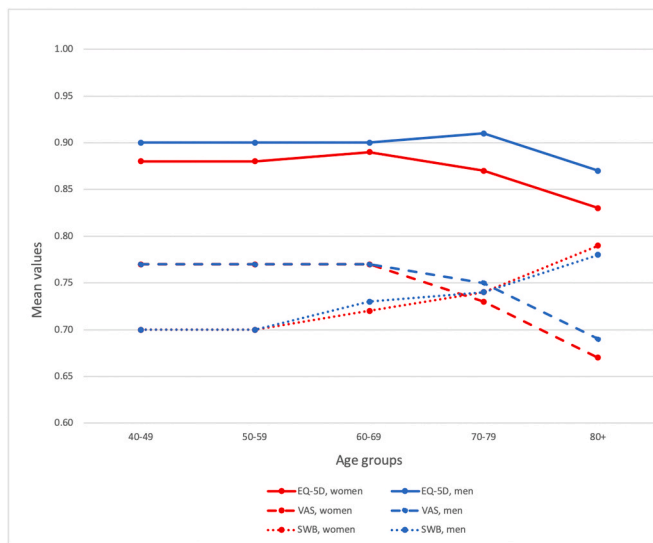


Fig. 1. Health (EQ-5D and VAS) and wellbeing (SWB) by age groups and sex. Note: Blue for men, red for women. EQ-5D (solid lines), described by the 5L system, using the WePP, Western Preference Pattern, value set. VAS, visual analogue scale (semi-dashed lines), transformed to [0–1] scale. SWB, subjective wellbeing (dashed lines, based on the first three items of the Satisfaction With Life Scale), converted onto a [0–1] scale. Data from Wave 7. (For interpretation of the references to colour in this figure legend, the reader is referred to the Web version of this article.)

using VAS. The analysis based on Wave 6 (Table A6 in appendix) suffers from a severe problem of nearly half the sample missing on the VAS item. Still, we observe the highest gradient with income as the SEP indicator. The much longer scale used for EQ-5D in Table A3 would explain the differences in the magnitude of the coefficients between EQ-5D and VAS.

Table 5 shows similar regression analyses as in Tables 3 and 4, now with regressions on SWB. There is no consistent gradient in education and SWB: only the highest education level showed significantly better SWB than the lowest level. Again, the Income model performs best in terms of R-squared. The mean SWB in the highest income level is 0.157 higher in women, and 0.141 higher in men as compared to the bottom income level (p = 0.090). [The analysis based on Wave 6 (Table A7 in appendix) suggest similar patterns.]

Note that the Occupation indicator is the one where we find the largest discrepancies between men and women: the increased SWB of being at the highest occupation level (as compared to the lowest level) for women is stronger than for men: 0.059 vs 0.037 (p = 0.013).

Table 6 combines the two most widely applied SEP indicators:

education and income, and adjusts for respondents' age. Separate analyses are run for the three measures of health and wellbeing: EQ-5D, VAS, and SWB. We have conducted log-likelihood ratio (LR) tests assuming the model with education alone as a restricted model and the model with both education and household income as an unrestricted or full model. For each of the outcome variables, the test supports that the restricted model is nested in the unrestricted or full model for both female and male (p < 0.001).

The general pattern is that income explains most of the variations. There are significantly positive associations of higher income, on each of the three health and wellbeing measures, in both men and women. As for education, on EQ-5D, only the highest education level is significant. On the VAS, however, there is a consistent education gradient, particularly so among women. On wellbeing, the partial impacts of higher education levels suggest a negative association, particularly so for the second highest education level. Again, the analysis based on Wave 6 (Tables A5-A7 in the appendix) are supportive of similar patterns: income is the most important SEP indicator for explaining inequalities in health and wellbeing.

4. Discussion

The aim of this paper was to compare how three alternative indicators for socio-economic position (education, occupation, income) affect the magnitude of the reported social gradient in three alternative measures of health and wellbeing. First, our results showed a consistent trend in both men and women: each level change on each of the three SEP indicators are associated with better health-related quality of life (HRQoL) (Tables 3 and 4). The gradient proved to be strongest with income, and weakest with education as the SEP indicator. Second, for the social gradient in subjective wellbeing (SWB) (Table 5), the positive trend was consistent in both men and women when using income and occupation as SEP indicators. However, with education, it was only the highest level (four years or more at university) that gives significantly higher SWB (for both men and women). Third, extended regression analyses (Table 6) that combine education and income, confirmed the consistent trend in both education and income: increasing levels are associated with better HRQoL in both sexes. With SWB as the dependent variable, the analysis showed a positive trend for income, but the reverse for education. In other words, it seems like increasing levels of education in itself does not make you happy, but the high income that the education generates, makes you happy.

Our study provides some interesting findings to the question of a diverging gradient depending on whether subjective or objective health measures have been used. The reasoning in this debate appears to go like this: if individuals at the bottom of the social ladder adapt to their misery, and/or those at the top complain when life is not perfect, the magnitudes of the social gradient, when using subjective measures, may

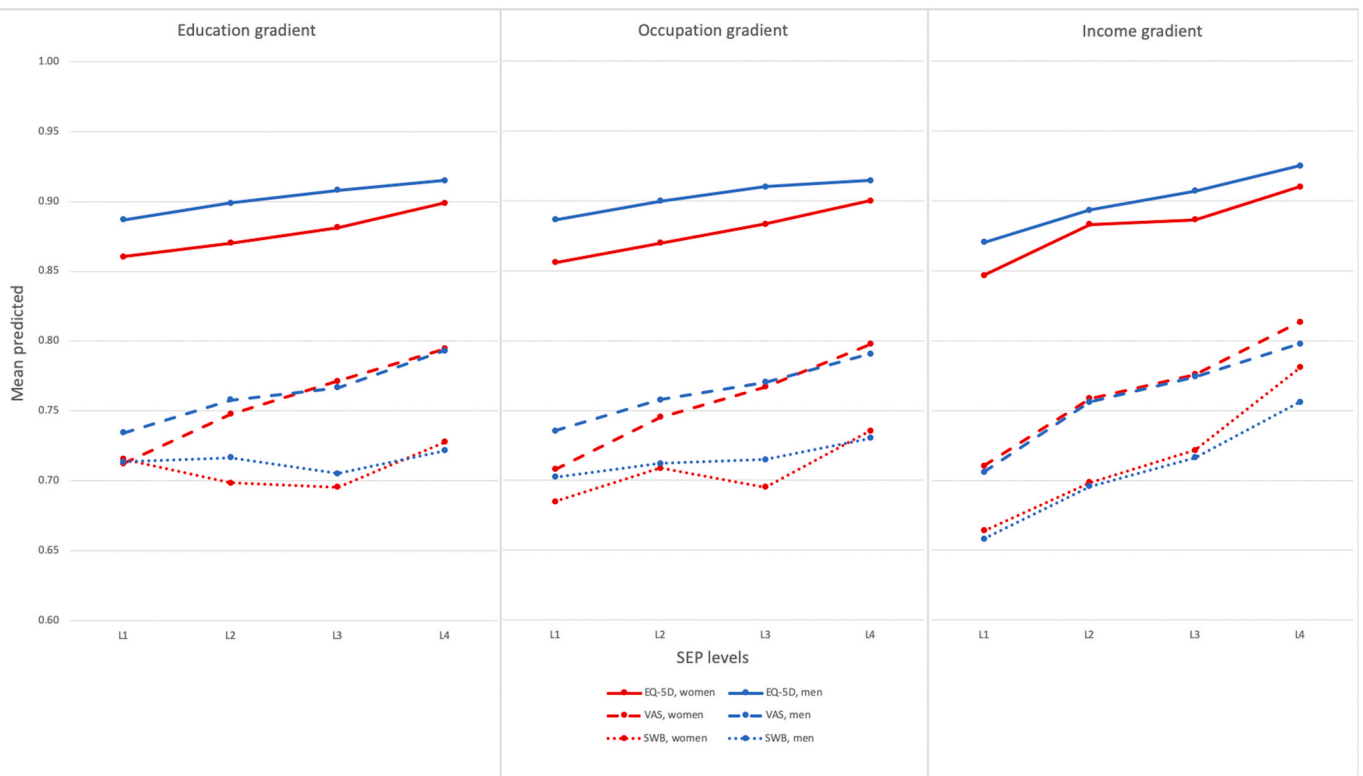


Fig. 2. The age-adjusted social gradient in health and wellbeing along three SEP indicators.

Note: SEP, socioeconomic position. Blue for men, red for women. EQ-5D (solid lines), described by the 5L system, using the WePP, Western Preference Pattern, value set. VAS, visual analogue scale (semi-dashed lines), transformed to [0–1] scale. SWB, subjective wellbeing (dashed lines, based on the first three items of the Satisfaction With Life Scale), converted to a [0–1] scale. Data from Wave 7. (For interpretation of the references to colour in this figure legend, the reader is referred to the Web version of this article.)

underestimate true health inequalities. Conversely, individuals in fortunate socio-economic positions may, in some cultures, tend to overrate their health, implying that subjective health measures would overestimate true health inequalities.

The single-item VAS represents a direct valuation of health, while the multi-dimensional EQ-5D-5L represents an indirect valuation via a generic descriptive system. Our findings show that, for all three SEP indicators used, the gap between the top and the bottom SEP levels was

Table 3
The social gradient in EQ-5D for three SEP indicators, adjusting for age, Wave 7.

	Education model		Occupation model		Income model	
	Female	Male	Female	Male	Female	Male
SEP (Ref. Level 1)						
Level-2	0.0095*** (0.0035)	0.0129*** (0.0032)	0.0135*** (0.0037)	0.0133*** (0.0033)	0.0367*** (0.0034)	0.0265*** (0.0038)
Level-3	0.0211*** (0.0037)	0.0223*** (0.0033)	0.0267*** (0.0042)	0.0234*** (0.0030)	0.0435*** (0.0037)	0.0445*** (0.0040)
Level-4	0.0388*** (0.0034)	0.0295*** (0.0032)	0.0435*** (0.0038)	0.0282*** (0.0026)	0.0682*** (0.0036)	0.0642*** (0.0038)
Age groups (Ref. 40–49)						
50–59	–0.0005 (0.0029)	–0.0012 (0.0027)	–0.0020 (0.0028)	–0.0026 (0.0027)	–0.0012 (0.0028)	–0.0009 (0.0026)
60–69	0.0156*** (0.0029)	0.0057** (0.0028)	0.0122*** (0.0028)	0.0030 (0.0028)	0.0202*** (0.0029)	0.0108*** (0.0028)
70–79	0.0050 (0.0087)	0.0130*** (0.0034)	–0.0008 (0.0042)	0.0088*** (0.0034)	0.0188*** (0.0046)	0.0318*** (0.0037)
80 +	–0.0368*** (0.0087)	–0.0183** (0.0083)	–0.0424*** (0.0084)	–0.0261*** (0.0083)	–0.0264*** (0.0098)	0.0038 (0.0086)
Constant	0.8572*** (0.0036)	0.8837*** (0.0032)	0.8557*** (0.0038)	0.8862*** (0.0026)	0.8388*** (0.0036)	0.8589*** (0.0040)
Observations	10,467	9,473	10,433	9,456	10,049	9,419
R ²	0.0254	0.0138	0.0282	0.0171	0.0483	0.0439
Wald-test: $\chi^2_{(7)} (p < \chi^2)$	28.25 (0.000)		34.00 (0.000)		36.08 (0.000)	

Note: SEP, socioeconomic position. EQ-5D-5L is measured by the Western Preference Pattern (WePP) value set. Robust standard errors in parentheses. Health differences of SEP effects across sex is given by Wald-test.

***p < 0.01, **p < 0.05, *p < 0.1.

Table 4
The social gradient in VAS for three SEP indicators, adjusting for age, Wave 7.

	Education model		Occupation model		Income model	
	Female	Male	Female	Male	Female	Male
SEP (Ref. Level 1)						
Level 2	0.0315*** (0.0051)	0.0215*** (0.0047)	0.0358*** (0.0055)	0.0216*** (0.0047)	0.0448*** (0.0048)	0.0496*** (0.0055)
Level 3	0.0554*** (0.0055)	0.0296*** (0.0050)	0.0553*** (0.0064)	0.0324*** (0.0047)	0.0640*** (0.0052)	0.0702*** (0.0057)
Level 4	0.0783*** (0.0049)	0.0560*** (0.0047)	0.0851*** (0.0055)	0.0520*** (0.0040)	0.1027*** (0.0050)	0.0950*** (0.0056)
Age groups (Ref. 40–49)						
50–59	0.0093** (0.0041)	0.0076* (0.0040)	0.0062 (0.0041)	0.0041 (0.0039)	0.0070* (0.0041)	0.0059 (0.0039)
60–69	0.0191*** (0.0044)	0.0098** (0.0042)	0.0109** (0.0043)	0.0048 (0.0041)	0.0235*** (0.0044)	0.0157*** (0.0041)
70–79	–0.0086 (0.0060)	–0.0027 (0.0054)	–0.0243*** (0.0058)	–0.0076 (0.0053)	0.0092 (0.0063)	0.0226*** (0.0057)
80 +	–0.0571*** (0.0106)	–0.0538*** (0.0113)	–0.0705*** (0.0102)	–0.0669*** (0.0114)	–0.0525*** (0.0114)	–0.0241** (0.0113)
Constant	0.7107*** (0.0051)	0.7337*** (0.0047)	0.7112*** (0.0055)	0.7379*** (0.0039)	0.7043*** (0.0049)	0.6974*** (0.0056)
N	10,661	9,659	10,615	9,645	10,241	9,610
R ²	0.0418	0.0225	0.0437	0.0268	0.0532	0.0441
Wald-test: $\chi^2_{(7)} (p < \chi^2)$	22.36 (0.002)	18.86 (0.009)	38.74 (0.000)			

Note: SEP, socioeconomic position. VAS (visual analogue scale) is measured on a [0–1] scale. Robust standard errors in parentheses. Health differences of SEP effects across sex is given by Wald-test.

***p < 0.01, **p < 0.05, *p < 0.1.

wider when health was measured by VAS than by EQ-5D (see Table A4). For education, the VAS gap was 0.07, while the EQ-5D gap was 0.04; for occupation the corresponding gaps were 0.06 vs 0.03, and; for income the gaps were 0.09 vs 0.06. Note that the absolute differences between the VAS gaps and the EQ-5D gaps were the same, namely 0.03 on the [0–1] scale. The Wald test generally showed a strong significant difference between VAS and EQ-5D for each of the SEP indicators in both female and male (p < 0.001). For instance, the Wald test for the difference in the highest level of education between VAS and EQ-5D is: $\chi^2_{(1)} = 37.63$ (p < 0.001) for male and $\chi^2_{(1)} = 87.32$ (p < 0.001) for

female. Similar test results were observed for both household income and occupation. The difference in the effects of each SEP indicator is stronger for female as indicated by the high value of Chi-squared, which is more than twice that for male. Thus, the more subjective of the two health measures gives consistently wider socio-economic gaps. Still, we cannot tell which of the two HRQoL measures that would be most aligned with ‘true’ health gaps.

We encourage more research that can compare socioeconomic inequalities in health, depending on whether subjective or objective measures are being applied. Such comparisons require data sets that

Table 5
The social gradient in SWB for three SEP indicators, adjusting for age, Wave 7.

	Education model		Occupation model		Income model	
	Female	Male	Female	Male	Female	Male
SEP (Ref. Level 1)						
Level-2	–0.0046 (0.0060)	0.0158** (0.0062)	0.0257*** (0.0070)	0.0113* (0.0063)	0.0541*** (0.0062)	0.05979*** (0.0071)
Level-3	–0.0060 (0.0072)	0.0071 (0.0066)	0.0159* (0.0083)	0.0187*** (0.0061)	0.0935*** (0.0068)	0.0957*** (0.0075)
Level-4	0.0300*** (0.0064)	0.0270*** (0.0064)	0.0592*** (0.0072)	0.0370*** (0.0053)	0.1574*** (0.0066)	0.1407*** (0.0074)
Age groups (Ref. 40–49)						
50–59	0.0099* (0.0055)	0.0106* (0.0055)	0.0082 (0.0054)	0.0095* (0.0054)	0.0153*** (0.0053)	0.0130** (0.0052)
60–69	0.0304*** (0.0058)	0.0364*** (0.0055)	0.0299*** (0.0057)	0.0345*** (0.0055)	0.0557*** (0.0057)	0.0513*** (0.0055)
70–79	0.0475*** (0.0142)	0.0517*** (0.0068)	0.0476*** (0.0075)	0.0530*** (0.0067)	0.1027*** (0.0081)	0.0990*** (0.0073)
80 +	0.0979*** (0.0142)	0.0856*** (0.0137)	0.1001 (0.0135)	0.0900*** (0.0131)	0.1497*** (0.0155)	0.1492*** (0.0139)
Constant	0.6848*** (0.0068)	0.6804*** (0.0063)	0.6619*** (0.0072)	0.6772*** (0.0528)	0.6053*** (0.0064)	0.5997*** (0.0073)
Observations	10,259	9,416	10,233	9,403	9,887	9,374
R ²	0.0121	0.0119	0.0158	0.0158	0.0647	0.0584
Wald-test: $\chi^2_{(7)} (p < \chi^2)$	13.30 (0.065)		9.45 (0.222)		12.73 (0.079)	

Note: SEP, socioeconomic position. Subjective wellbeing (SWB) is measured by the first three items of the Satisfaction With Life Scale (SWLS), converted to a [0–1] scale. Robust standard errors in parentheses. Well-being differences of SEP effects across sex is given by Wald-test.

***p < 0.01, **p < 0.05, *p < 0.1.

Table 6
Explaining EQ-5D, VAS and SWB by education and income, adjusted for age, Wave 7.

	EQ-5D		VAS		SWB	
	Female	Male	Female	Male	Female	Male
Education (Ref. Primary)						
Vocational/upper secondary	0.0046 (0.0036)	0.0048 (0.0031)	0.0245*** (0.0053)	0.0096** (0.0047)	-0.0151** (0.0067)	-0.0029 (0.0063)
College/university, < 4 yrs	0.0082** (0.0039)	0.0077** (0.0034)	0.0365*** (0.0058)	0.0085* (0.0051)	-0.0386*** (0.0074)	-0.0291*** (0.0068)
College/university, ≥ 4 yrs	0.0196*** (0.0038)	0.0086*** (0.0033)	0.0498*** (0.0054)	0.0273*** (0.0050)	-0.0201*** (0.0068)	-0.0248*** (0.0068)
Income (Ref. Low income)						
Lower middle income	0.0327*** (0.0035)	0.0247*** (0.0039)	0.0351*** (0.0050)	0.0446*** (0.0056)	0.0585*** (0.0063)	0.0625*** (0.0072)
Upper middle income	0.0388*** (0.0039)	0.0421*** (0.0041)	0.0520*** (0.0054)	0.0634*** (0.0059)	0.0991*** (0.0070)	0.1031*** (0.0077)
High income	0.0595*** (0.0040)	0.0602*** (0.0041)	0.0831*** (0.0056)	0.0833*** (0.0061)	0.1651*** (0.0072)	0.1535*** (0.0080)
Age groups (Ref. 40–49)						
50–59	0.0007 (0.0028)	-0.0007 (0.0026)	0.0116*** (0.0041)	0.0085** (0.0039)	0.0138*** (0.0053)	0.0111** (0.0053)
60–69	0.0230*** (0.0030)	0.0113*** (0.0028)	0.0317*** (0.0044)	0.0178*** (0.0042)	0.0516*** (0.0058)	0.0500*** (0.0055)
70–79	0.0229*** (0.0047)	0.0312*** (0.0037)	0.0207*** (0.0064)	0.0218*** (0.0057)	0.0943*** (0.0084)	0.0990*** (0.0073)
80 +	-0.0184* (0.0100)	0.0036 (0.0090)	-0.0371*** (0.0118)	-0.0197* (0.0118)	0.1422*** (0.0160)	0.1470*** (0.0144)
Constant	0.8317*** (0.0044)	0.8555*** (0.0044)	0.6792*** (0.0059)	0.6908*** (0.0063)	0.6215*** (0.0079)	0.6076*** (0.0082)
Observations	9,973	9,323	10,163	9,505	9,821	9,289
R ²	0.0509	0.0443	0.0621	0.0460	0.0676	0.0616
LR test: $\chi^2_{(3)} (p < \chi^2)$	260 (0.000)	293 (0.000)	238 (0.000)	239 (0.000)	572 (0.000)	483 (0.000)

Note: EQ-5D based on Western Preference Pattern (WePP). VAS, visual analogue scale, is measured on a [0–1] scale. SWB, subjective well-being (measured by the first three items of the Satisfaction With Life Scale (SWLS), converted to a [0–1] scale). LR, log-likelihood ratio test that the restricted model (a model with education alone) is nested in the full model. Robust standard errors in parentheses.***p < 0.01, **p < 0.05, *p < 0.1.

include both a subjective measure of the kind used in the current paper, and a more objective multi-morbidity index (see e.g. Banjare; Pradhan, 2014). As for comparisons between a subjective measure of *quality of life* and an (objective) measure of *quantity of life*, it is hard to find data sets that include both such measures.

Further to the question on which health measure to use is that of which SEP indicator to use. The methodological literature has no answer on which indicator would best reflect individuals' true socio-economic position. The simple reason is that this crucially depends on the institutional context of the country, including its economic development and social security. The empirical literature appears to use whichever SEP indicator(s) that would be available in the data set. Our findings from Norway show that the steepest gradients in health and wellbeing are observed when income is the indicator. However, this does not imply that income be the most 'true' indicator for Norwegians' socio-economic positions. As for the use of household income, it could be argued that this should be adjusted for household size, because household adjusted income would better capture inequalities in individuals' purchasing power. However, as an indicator for socio-economic position, we would argue that the number of household members becomes less relevant, e.g. a lawyer earning NOK 1.5 million would be considered to hold the same status no matter whether she had 1 or 5 children to feed. Furthermore, we acknowledge that the income variable in our dataset is not suitable for this purpose.

Another potential weakness in our data is that both exposure and outcome are self-reported, something which might introduce biases. The outcome variables on health-related quality of life and subjective well-being, are – by their very nature – self-reported. The potential problem, then, is whether respondents have misclassified their education, occupation or household income. While we have no reason to

believe this has been done extensively, a closer comparison with registry data would be required to rule it out. In the context of the current paper, such misclassification would introduce biases only if 'false reporters' (of SEP indicators) were to differ from 'true reporters' in terms of their health and wellbeing.

As for policy implications, this paper has confirmed existing knowledge of a consistent association between individuals' socio-economic position and their health and wellbeing. Given the aim in many countries to reduce social inequalities in health, more research is needed on the causal mechanisms. The fundamental question remains on the extent to which policy interventions should target the unhealthy behaviour among people at the lower end of the socio-economic ladder, or the unhealthy circumstances in their social environment.

Author statements

Jan Abel Olsen: Conceptualization; Formal analysis; Funding acquisition; Investigation; Methodology; Project administration; Resources; Supervision; Validation; Visualization; Roles/Writing - original draft; Writing - review & editing. Marie H Lindberg: Data curation; Formal analysis; Methodology; Resources; Software; Validation; Visualization; Writing - review & editing. Admassu N Lamu: Data curation; Formal analysis; Methodology; Resources; Software; Validation; Visualization; Writing - review & editing.

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Appendix

Table A1
Sample characteristics, Wave 6

Variables	T6							
	Female			Male			Total	
	N	Mean/%		N	Mean/%	N	Mean/%	
Age, mean (SD)	6,928	57.5 (12.96)		6,053	57.5 (12.31)	12,981	57.5 (12.66)	
Education level								
Primary/lower secondary	2,179	31.9		1,494	25.0	3,673	28.7	
Vocational/upper secondary	2,170	31.8		2,119	35.5	4,289	33.5	
College/university, < 4 yrs	1,020	14.9		1,226	20.5	2,246	17.5	
College/university, ≥ 4 yrs	1,454	21.3		1,136	19.0	2,590	20.2	
Occupation level								
Unskilled	633	13.6		1,627	36.3	2,260	24.8	
Intermediary	1,890	40.7		582	13.0	2,472	27.1	
Lower profession	1,095	23.6		1,046	23.3	2,141	23.5	
Higher profession	1,021	22.0		1,226	27.4	2,247	24.6	
Household income								
Low	1,818	29.4		1,137	19.6	2,955	24.7	
Lower middle	1,948	31.5		1,865	32.2	3,813	31.9	
Upper middle	983	15.9		1,115	19.3	2,098	17.5	
High	1,430	23.1		1,671	28.9	3,101	25.9	
Health; EQ-5D								
Full health (11111)	2,305	38.0		2,871	51.7	5,176	44.6	
Index value, mean (SD)	6,063	0.82 (0.20)		5,550	0.87 (0.17)	11,613	0.84 (0.19)	
VAS, mean (SD)	3,102	0.77 (0.17)		2,853	0.78 (0.15)	5,955	0.77 (0.16)	
Wellbeing; SWLS, mean (SD)	5,560	0.72 (0.21)		5,200	0.73 (0.19)	10,760	0.73 (0.20)	

Note: The Index value is based on the United Kingdom EQ-5D-3L value set; VAS, visual analogue scale; SWB, subjective well-being (based on the first three items of the Satisfaction With Life Scale) converted onto a [0–1] scale; SD, standard deviation in parentheses.

Table A2
Distribution of EQ-5D item scores, using 3L for Wave 6, and 5L for Wave 7

Levels/dimensions [N (%)]	Female					Male					Total				
	MO	SC	UA	PD	AD	MO	SC	UA	PD	AD	MO	SC	UA	PD	AD
Wave 6: EQ-5D-3L															
No problems	5,222 (86.1)	5,911 (97.5)	4,949 (81.6)	2,658 (43.8)	4,757 (78.5)	5,007 (90.2)	5,436 (98)	4,989 (89.9)	3,207 (57.8)	4,826 (87)	10,229 (88.1)	11,347 (97.7)	9,938 (85.6)	5,865 (50.5)	9,583 (82.5)
Some problems	838 (13.8)	148 (2.4)	1,080 (17.8)	3,117 (51.4)	1,269 (20.9)	543 (9.8)	113 (2)	538 (9.7)	2,189 (39.4)	708 (12.8)	1,381 (11.89)	261 (2.2)	1,618 (13.9)	5,306 (45.7)	1,977 (17.0)
Unable/Extreme problems	3 (0.1)	4 (0.1)	34 (0.6)	288 (4.8)	37 (0.6)	0 (0)	1 (0.02)	23 (0.4)	154 (2.8)	16 (0.3)	3 (0.03)	5 (0.04)	57 (0.5)	442 (3.8)	53 (0.5)
Total	6,063 (100)	6,063 (100)	6,063 (100)	6,063 (100)	6,063 (100)	5,550 (100)	5,550 (100)	5,550 (100)	5,550 (100)	5,550 (100)	11,613 (100)	11,613 (100)	11,613 (100)	11,613 (100)	11,613 (100)
Wave 7: EQ-5D-5L															
No problems	8,541 (80.2)	10,183 (95.6)	8,432 (79.2)	3,134 (29.4)	8,024 (75.4)	8,168 (84.8)	9,262 (96.2)	8,430 (87.5)	3,643 (37.8)	7,776 (80.7)	16,709 (82.4)	19,445 (95.9)	16,862 (83.2)	6,777 (33.4)	15,800 (77.9)
Slight problems	1,532 (14.4)	389 (3.7)	1,670 (15.7)	5,337 (50.1)	2,138 (20.1)	1,127 (11.7)	318 (3.3)	920 (9.6)	4,666 (48.5)	1,459 (15.2)	2,659 (13.1)	707 (3.5)	2,590 (12.8)	10,003 (49.3)	3,597 (17.7)
Moderate problems	395 (3.7)	52 (0.5)	397 (3.7)	1,705 (16.0)	383 (3.6)	232 (2.4)	31 (0.3)	200 (2.1)	1,032 (10.7)	326 (3.4)	627 (3.1)	83 (0.4)	597 (2.9)	2,737 (13.5)	709 (3.5)
Severe problems	166 (1.6)	13 (0.1)	123 (1.2)	424 (4.0)	93 (0.9)	89 (0.9)	15 (0.2)	70 (0.7)	268 (2.8)	62 (0.6)	255 (1.3)	28 (0.1)	193 (1.0)	692 (3.4)	155 (0.8)
Unable/Extreme problems	14 (0.1)	11 (0.1)	26 (0.2)	48 (0.5)	10 (0.1)	15 (0.2)	5 (0.1)	11 (0.1)	22 (0.2)	8 (0.1)	29 (0.1)	16 (0.1)	37 (0.2)	70 (0.3)	18 (0.1)
Total	10,648 (100)	10,648 (100)	10,648 (100)	10,648 (100)	10,648 (100)	9,631 (100)	9,631 (100)	9,631 (100)	9,631 (100)	9,631 (100)	20,279 (100)	20,279 (100)	20,279 (100)	20,279 (100)	20,279 (100)

Note: MO, mobility/walking; SC, self-care; UA, usual activities; PD, pain/discomfort; AD, anxiety/depression.

Table A3
Health and wellbeing by sex and age, Wave 6

	30–39			40–49			50–59			60–69			70–79			80+		
	Female	Male	Total	Female	Male	Total	Female	Male	Total	Female	Male	Total	Female	Male	Total	Female	Male	Total
Wave 6																		
Full health, %	55.2	60.8	57.6	46.1	57.1	51.2	37.6	51.8	44.4	34.3	50.2	42.2	28.9	44.9	36.7	19.49	39.3	27.7
UK value set	0.87 (0.20)	0.91 (0.13)	0.88 (0.18)	0.85 (0.18)	0.89 (0.17)	0.87 (0.18)	0.82 (0.20)	0.86 (0.19)	0.84 (0.20)	0.81 (0.19)	0.87 (0.17)	0.84 (0.18)	0.77 (0.22)	0.85 (0.17)	0.81 (0.2)	0.70 (0.26)	0.82 (0.20)	0.75 (0.24)
Danish value set	0.88 (0.16)	0.92 (0.11)	0.90 (0.14)	0.87 (0.15)	0.90 (0.13)	0.89 (0.14)	0.84 (0.16)	0.88 (0.15)	0.86 (0.16)	0.84 (0.15)	0.89 (0.14)	0.86 (0.15)	0.81 (0.17)	0.87 (0.14)	0.84 (0.16)	0.75 (0.19)	0.85 (0.16)	0.79 (0.18)
Swedish value set	0.92 (0.11)	0.93 (0.11)	0.92 (0.11)	0.91 (0.13)	0.92 (0.12)	0.91 (0.13)	0.89 (0.16)	0.91 (0.14)	0.90 (0.15)	0.89 (0.14)	0.91 (0.14)	0.90 (0.14)	0.84 (0.22)	0.89 (0.19)	0.86 (0.21)	0.72 (0.33)	0.82 (0.28)	0.76 (0.31)
VAS	0.79 (0.16)	0.81 (0.13)	0.80 (0.15)	0.80 (0.16)	0.80 (0.14)	0.80 (0.15)	0.77 (0.17)	0.78 (0.15)	0.77 (0.16)	0.76 (0.17)	0.77 (0.15)	0.76 (0.16)	0.72 (0.18)	0.76 (0.15)	0.74 (0.17)	0.64 (0.22)	0.69 (0.18)	0.66 (0.20)
SWB	0.72 (0.22)	0.73 (0.19)	0.72 (0.21)	0.73 (0.20)	0.73 (0.18)	0.73 (0.19)	0.72 (0.20)	0.72 (0.19)	0.72 (0.20)	0.73 (0.21)	0.74 (0.19)	0.74 (0.20)	0.70 (0.25)	0.75 (0.21)	0.72 (0.23)	0.66 (0.26)	0.70 (0.24)	0.68 (0.25)

Note: Mean index values based on the United Kingdom EQ-5D-3L value set; Danish EQ-5D-3L value set; Swedish EQ-5D-3L value set. VAS, visual analogue scale; SWB, subjective well-being (based on the first three items of the Satisfaction With Life Scale) and converted onto a [0–1] scale; SD, standard deviation in parentheses.

Table A4
Age-adjusted mean predicted health and wellbeing values by sex across SEP indicators based on Wave 7

Education level	Primary-secondary			Vocational/upper secondary			University low			University high		
	Female	Male	Total	Female	Male	Total	Female	Male	Total	Female	Male	Total
WePP	0.86 (0.00)	0.89 (0.00)	0.87 (0.00)	0.87 (0.00)	0.90 (0.00)	0.88 (0.00)	0.88 (0.00)	0.91 (0.00)	0.90 (0.00)	0.90 (0.00)	0.91 (0.00)	0.91 (0.00)
English values	0.87 (0.00)	0.90 (0.00)	0.88 (0.00)	0.88 (0.00)	0.91 (0.00)	0.90 (0.00)	0.89 (0.00)	0.92 (0.00)	0.91 (0.00)	0.91 (0.00)	0.93 (0.00)	0.92 (0.00)
VAS	0.71 (0.00)	0.73 (0.00)	0.72 (0.00)	0.75 (0.00)	0.76 (0.00)	0.75 (0.00)	0.77 (0.00)	0.77 (0.00)	0.77 (0.00)	0.79 (0.00)	0.79 (0.00)	0.79 (0.00)
SWB	0.72 (0.02)	0.71 (0.02)	0.71 (0.02)	0.70 (0.02)	0.72 (0.02)	0.71 (0.02)	0.70 (0.02)	0.71 (0.02)	0.70 (0.02)	0.73 (0.02)	0.72 (0.02)	0.73 (0.02)
Occupation	Unskilled			Intermediary			Lower profession			Higher profession		
WePP	0.86 (0.00)	0.89 (0.00)	0.88 (0.00)	0.87 (0.00)	0.90 (0.00)	0.88 (0.00)	0.88 (0.00)	0.91 (0.00)	0.90 (0.00)	0.90 (0.00)	0.91 (0.00)	0.91 (0.00)
English values	0.87 (0.00)	0.90 (0.00)	0.89 (0.00)	0.88 (0.00)	0.91 (0.00)	0.89 (0.00)	0.90 (0.00)	0.92 (0.00)	0.91 (0.00)	0.91 (0.00)	0.93 (0.00)	0.92 (0.00)
VAS	0.71 (0.01)	0.74 (0.01)	0.73 (0.01)	0.75 (0.01)	0.76 (0.01)	0.75 (0.01)	0.77 (0.01)	0.77 (0.01)	0.77 (0.01)	0.80 (0.01)	0.79 (0.01)	0.79 (0.01)
SWB	0.68 (0.02)	0.70 (0.02)	0.70 (0.02)	0.71 (0.02)	0.71 (0.02)	0.71 (0.02)	0.70 (0.02)	0.72 (0.02)	0.71 (0.02)	0.74 (0.02)	0.73 (0.02)	0.73 (0.02)
Household income	Low			Lower middle			Upper middle			High		
WePP	0.85 (0.00)	0.87 (0.01)	0.86 (0.01)	0.88 (0.00)	0.89 (0.01)	0.89 (0.01)	0.89 (0.00)	0.91 (0.01)	0.90 (0.01)	0.91 (0.01)	0.91 (0.00)	0.92 (0.01)
English values	0.86 (0.01)	0.88 (0.01)	0.87 (0.01)	0.89 (0.00)	0.91 (0.01)	0.90 (0.01)	0.90 (0.00)	0.92 (0.01)	0.91 (0.01)	0.92 (0.00)	0.94 (0.01)	0.93 (0.01)
VAS	0.71 (0.00)	0.71 (0.01)	0.71 (0.00)	0.76 (0.00)	0.76 (0.01)	0.76 (0.00)	0.78 (0.00)	0.77 (0.00)	0.78 (0.00)	0.81 (0.00)	0.80 (0.00)	0.80 (0.00)
SWB	0.66 (0.04)	0.66 (0.04)	0.66 (0.04)	0.70 (0.04)	0.70 (0.04)	0.70 (0.04)	0.72 (0.03)	0.72 (0.03)	0.72 (0.03)	0.78 (0.03)	0.76 (0.03)	0.77 (0.03)

Note: SEP, socioeconomic position. Health is measured by EQ-5D (Western Preference Pattern, WePP and the English value set), and VAS (visual analogue scale) on a [0–1] scale. SWB (subjective wellbeing) is measured by the first three items of the Satisfaction With Life Scale (SWLS), converted to a [0–1] scale. Standard deviations in parantheses.

Table A5
The social gradient in EQ-5D for three SEP indicators, adjusting for age, Wave 6

	Education model		Occupation model		Income model	
	Female	Male	Female	Male	Female	Male
SEP (Ref. Level 1)						
Level-2	0.0088 (0.0073)	0.0340*** (0.0067)	0.0051 (0.0092)	0.0160* (0.0092)	0.0436*** (0.0078)	0.0432*** (0.0081)
Level-3	0.0559*** (0.0082)	0.0567*** (0.0071)	0.0460*** (0.0095)	0.0577*** (0.0065)	0.0606*** (0.0090)	0.0677*** (0.0089)
Level-4	0.0838*** (0.0073)	0.0785*** (0.0068)	0.0752*** (0.0094)	0.0658*** (0.0062)	0.1085*** (0.0081)	0.1039*** (0.0085)
Age groups (Ref. 30–39)						
40–49	–0.0087 (0.0126)	–0.0146 (0.0104)	–0.0213* (0.0130)	–0.0223** (0.0106)	–0.0191 (0.0123)	–0.0269*** (0.0098)
50–59	–0.0338** (0.0132)	–0.0304*** (0.0111)	–0.0455*** (0.0135)	–0.0418*** (0.0113)	–0.0420*** (0.0129)	–0.0410*** (0.0104)
60–69	–0.0288** (0.0130)	–0.0251** (0.0104)	–0.0509*** (0.0134)	–0.0382*** (0.0105)	–0.0311** (0.0126)	–0.0240*** (0.0098)
70–79	–0.0550*** (0.0146)	–0.0307*** (0.0116)	–0.0758*** (0.0162)	–0.0483*** (0.0127)	–0.0475*** (0.0149)	–0.0101 (0.0116)
80 +	–0.1274*** (0.0215)	–0.0586*** (0.0186)	–0.1416*** (0.0308)	–0.0589*** (0.0208)	–0.1012*** (0.0233)	–0.0244 (0.0174)
Constant	0.8172*** (0.0136)	0.8556*** (0.0110)	0.8508*** (0.0149)	0.8814*** (0.0105)	0.8034*** (0.0132)	0.8400*** (0.0119)
Observations	5,990	5,486	4,246	4,193	5,516	5,333
R ²	0.0557	0.0316	0.0514	0.0390	0.0576	0.0430
Wald-test: $\chi^2_{(7)} (p < \chi^2)$	30.64 (0.000)		16.93 (0.031)		25.92 (0.001)	

Note: SEP, socioeconomic position. The EQ-5D-3L is based on the United Kingdom EQ-5D-3L value set. Health differences of SEP effects across sex is given by Wald-test. Robust standard errors in parentheses.

***p < 0.01, **p < 0.05, *p < 0.1.

Table A6
The social gradient in VAS for three SEP indicators, adjusting for age, Wave 6

	Education		Occupation		Income	
	Female	Male	Female	Male	Female	Male
SEP (Ref. Level 1)						
Level 2	0.0352*** (0.0093)	0.0183** (0.0089)	0.0314** (0.0125)	0.0301*** (0.0101)	0.0527*** (0.0099)	0.0523*** (0.0104)
Level 3	0.0773*** (0.0101)	0.0425*** (0.0092)	0.0658*** (0.0125)	0.0445*** (0.0081)	0.0702*** (0.0109)	0.0755*** (0.0110)
Level 4	0.0780*** (0.0093)	0.0549*** (0.0091)	0.0716*** (0.0126)	0.0465*** (0.0078)	0.1084*** (0.0101)	0.0928*** (0.0107)
Age groups (Ref. 30–39)						
40–49	0.0028 (0.0124)	–0.0056 (0.0119)	–0.0001 (0.0128)	–0.0066 (0.0126)	0.0015 (0.0123)	–0.0146 (0.0122)
50–59	–0.0119 (0.0132)	–0.0239* (0.0127)	–0.0186 (0.0136)	–0.0264** (0.0134)	–0.0098 (0.0131)	–0.0307** (0.0129)
60–69	–0.0160 (0.0132)	–0.0344*** (0.0122)	–0.0235* (0.0136)	–0.0396*** (0.0128)	–0.0088 (0.0131)	–0.0317** (0.0125)
70–79	–0.0452*** (0.0153)	–0.0330** (0.0140)	–0.0467*** (0.0175)	–0.0333** (0.0158)	–0.0239 (0.0164)	–0.0077 (0.0148)
80 +	–0.1293*** (0.0267)	–0.1071*** (0.0266)	–0.0723** (0.0353)	–0.0797*** (0.0300)	–0.0836*** (0.0290)	–0.0589** (0.0269)
Constant	0.7356*** (0.0141)	0.7720*** (0.0132)	0.7560*** (0.0165)	0.7836*** (0.0127)	0.7195*** (0.0141)	0.7386*** (0.0148)
N	3,068	2,833	2,351	2,268	2,914	2,778
R ²	0.0686	0.0365	0.0376	0.0351	0.0743	0.0514
Wald-test: $\chi^2_{(7)} (p < \chi^2)$	13.66 (0.091)		15.04 (0.058)		8.77 (0.362)	

Note: SEP, socioeconomic position. VAS (visual analogue scale) is measured on a [0–1] scale. Health differences of SEP effects across sex is given by Wald-test. Robust standard errors in parentheses.

***p < 0.01, **p < 0.05, *p < 0.1.

Table A7
The social gradient in SWB for three SEP indicators, adjusting for age, Wave 6

	Education model		Occupation model		Income model	
	Female	Male	Female	Male	Female	Male
SEP (Ref. Level 1)						
Level-2	0.0061 (0.0082)	0.0198*** (0.0077)	0.0104 (0.0113)	0.0211** (0.0091)	0.0492*** (0.0086)	0.0484*** (0.0091)
Level-3	0.0121 (0.0096)	0.0270*** (0.0082)	0.0263** (0.0117)	0.0215*** (0.0076)	0.0996*** (0.0100)	0.0843*** (0.0098)
Level-4	0.0310*** (0.0087)	0.0426*** (0.0084)	0.0414*** (0.0117)	0.0361*** (0.0073)	0.1387*** (0.0092)	0.1099*** (0.0092)
Age groups (Ref. 30–39)						
40–49	0.0160 (0.0143)	0.0026 (0.0145)	0.0135 (0.0144)	−0.0147 (0.0147)	0.0147 (0.0136)	−0.0003 (0.0142)
50–59	0.0082 (0.0148)	−0.0031 (0.0150)	0.0058 (0.0150)	−0.0201 (0.0152)	0.0131 (0.0141)	−0.0032 (0.0148)
60–69	0.0204 (0.0147)	0.0168 (0.0145)	0.0097 (0.0148)	−0.0063 (0.0147)	0.0490*** (0.0141)	0.0344** (0.0143)
70–79	−0.0092 (0.0175)	0.0261 (0.0162)	0.0014 (0.0205)	0.0039 (0.0174)	0.0520*** (0.0176)	0.0652*** (0.0165)
80 +	−0.0451* (0.0250)	0.7034 (0.0152)	−0.0432 (0.0437)	0.0023 (0.0288)	0.0073 (0.0276)	0.0292 (0.0266)
Constant	0.7008 (0.0154)	0.0026*** (0.0145)	0.7070*** (0.0168)	0.7355*** (0.0147)	0.6281*** (0.0150)	0.6494*** (0.0159)
Observations	5,502	5,152	4,052	4,019	5,163	5,045
R ²	0.0078	0.0080	0.0069	0.0080	0.0551	0.0375
Wald-test: $\chi^2_{(7)}$ ($p < \chi^2$)	12.36 (0.136)		8.71 (0.367)		20.86 (0.008)	

Note: SEP, socioeconomic position. SWB (subjective wellbeing) is measured by the first three items of the Satisfaction With Life Scale (SWLS) and converted onto a [−1] scale. Well-being differences of SEP effects across sex is given by Wald-test. Robust standard errors in parentheses.

***p < 0.01, **p < 0.05, *p < 0.1.

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