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Determinants of inequalities in years with disability: an international-comparative study

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Background: Persons with a lower socioeconomic position spend more years with disability, despite their shorter life expectancy, but it is unknown what the important determinants are. This study aimed to quantify the contribution to educational inequalities in years with disability of eight risk factors: father's manual occupation, low income, few social contacts, smoking, high alcohol consumption, high body-weight, low physical exercise and low fruit and vegetable consumption. **Methods:** We collected register-based mortality and survey-based disability and risk factor data from 15 European countries covering the period 2010–14 for most countries. We calculated years with disability between the ages of 35 and 80 by education and gender using the Sullivan method, and determined the hypothetical effect of changing the prevalence of each risk factor to the prevalence observed among high educated ('upward levelling scenario'), using Population Attributable Fractions. **Results:** Years with disability among low educated were higher than among high educated, with a difference of 4.9 years among men and 5.5 years among women for all countries combined. Most risk factors were more prevalent among low educated. We found the largest contributions to inequalities in years with disability for low income (men: 1.0 year; women: 1.4 year), high body-weight (men: 0.6 year; women: 1.2 year) and father's manual occupation (men: 0.7 year; women: 0.9 year), but contributions differed by country. The contribution of smoking was relatively small. **Conclusions:** Disadvantages in material circumstances (low income), circumstances during childhood (father's manual occupation) and high body-weight contribute to inequalities in years with disability.

Introduction

Persons with low levels of education spend more years with disability despite their shorter life expectancy than persons with higher levels of education.[1,2] This is the net result of two opposing effects: (i) more years with disability at the expense of fewer years free of disability and (ii) fewer years with disability at the expense of years lost to mortality.[3] Years with disability impose an additional societal challenge to aging populations, because persons with disability are hospitalized more often, need more medical and long-term care and participate less in (paid) work.

In an influential article on compression of morbidity, James Fries[4] postulated that avoiding smoking, physically inactivity and an unhealthy diet would reduce the number of years with disability. Most unhealthy behaviours are more frequent among persons with a lower education.[5] Also other factors, including poor housing

conditions, financial difficulty during childhood, financial strain, lack of a social network and adverse working conditions are associated with higher disability and the prevalence of these factors is higher among persons with a lower education.[5]

A recent study examined the contribution of several of these risk factors to educational inequalities in life expectancy, showing the largest contribution of smoking, followed by high body-weight, and low income.[6] It is unclear whether the same factors contribute similarly to inequalities in years with disability, given opposite effects of mortality and disability on this outcome.[7] Prior studies showed that obesity[8,9] and lack of physical activity[10] are associated with more years with disability, but for smoking the results are mixed.[11] No prior study did examine the contribution of risk factors on educational inequalities in years with disability.

This study aims to estimate the contribution of a broad range of risk factors for mortality and disability, which have been shown to be differentially distributed between low and high educated, to inequalities in years with disability in Europe. We will include eight risk factors: father's manual occupation as an indicator of conditions in which persons have grown up,[12,13] low income as an indicator of current material living conditions,[14] few social contacts as an indicator of psychosocial conditions[15] and five behavioural risk factors, namely smoking,[16] high alcohol consumption,[17] high body-weight,[18] low physical activity[19] and low fruit and vegetable consumption.[20] Together, these risk factors cover different but overlapping explanatory perspectives. Behavioural risk factors can be conceptualized as being 'downstream' in the causal pathway between level of education and mortality. Father's manual occupation and low income partly determine that lower and higher educated people have different health-related behaviours, and should therefore be seen as more 'upstream' than health-related behaviours.[21] Father's manual occupation partly determines a person's educational achievement,[22] and should therefore not be seen as a possible mediator but as a factor capturing the persistent effect of childhood conditions on the risks of mortality and disability in later life. For persons aged 35–80 in 15 European countries, we evaluate the hypothetical effect of an 'upward levelling' scenario, where exposure to each of these risk factors in all educational groups is set to the prevalence observed among high educated.

Methods

Data

We used harmonized register-based mortality data by age, gender and education from 15 European countries: Finland, Sweden, Norway, Denmark (in the North of Europe), England and Wales, the Netherlands, Belgium, Austria, Switzerland (in the West of Europe), France, Spain (in the South of Europe), Hungary, Poland, Lithuania and Estonia (in the East of Europe). These data covered complete national populations, except for England and Wales and France (1% representative samples), and the Netherlands (65% of population covered). We used data for the period around 2010–14, except for Sweden (2005–08), Norway (2006–09) and France (2004–07). Most data stemmed from longitudinal mortality follow-up, except for Hungary and Poland where cross-sectional unlinked studies were used. Supplementary appendix S1 provides details about the mortality data sources.

Data on disability and income were obtained from the European Union Statistics on Income and Living Conditions (EU-SILC) survey. Data on other risk factors were obtained from round 7 (2014) of the European Social Survey. This survey was designed to collect harmonized data on inequalities in risk factors, but did not include data on income for all countries.[23] Supplementary appendix S2 gives more information on these surveys. For EU-SILC, we pooled years 2010 and 2014, except for Sweden, Norway and France, where we used 2005 and 2009 to better match with the mortality data. Because EU-SILC is a rotating panel survey, we did not include intermediate

years to avoid including respondents multiple times. To assess disability, we used the Global Activity Limitation Indicator (GALI). GALI is an indicator of participation restriction, which refers to limitation in the performance of roles and social involvement in activities such as work, leisure, parenting, housework and social life.[24] It was based on the question 'For at least the past 6 months, to what extent have you been limited because of a health problem in activities people usually do?' Respondents were classified as having a disability if they responded with 'Yes, severely' or 'Yes, to some extent'. GALI is a validated and relatively accurate indicator to assess disability,[25–29] although there are some variations in wording between countries. More information on the GALI indicators is given in the References.[24,29–31]

We used the following criteria for the selection of risk factors, in addition to whether the prevalence of the risk factor has been reported to differ between educational groups: (i) an estimate of the relative risk of mortality and disability is available in the literature and (ii) estimates of the prevalence of the risk factor by level of education in the 15 countries are available from internationally harmonized surveys. These criteria resulted in the selection of eight risk factors: father's manual occupation, low income, few social contacts, smoking, high alcohol consumption, high body-weight, low physical activity and low fruit and vegetable consumption. We could not include housing and working conditions, because of the absence of relative risks of mortality and disability for these risk factors as measured in the surveys. Supplementary appendix S3 provides more information about the risk factors.

The highest completed level of education was used as indicator of socioeconomic position. Education is usually determined early in life, therefore better avoiding problems of reverse causation than other SEP measures[32] and mortality data by education are available for more countries than data by other SEP-indicators. Level of education was categorized into three levels: low (ISCED 0–2), medium (ISCED 3–4) and high (ISCED 5–6). In the presentation of the results, we focussed on inequalities between low and high education.

Relative risks were preferably based on meta-analyses or reviews, and if not available, we pooled results from individual studies. If more relative risks were presented in the literature, we selected relative risks adjusted for age, gender and other risk factors that were not on the causal pathway between the risk factor and mortality/disability, and for adult socioeconomic position. For the mortality, relative risks were highest for smoking (RR of 2.2), obesity (RR of 1.7) and high alcohol consumption (RR of 1.4). For disability relative risks were highest for obesity (RR of 1.8), low physical activity, low income (both RR of 1.5) and overweight (RR of 1.4). For more information about the relative risks of mortality and disability, see Supplementary appendix S4.

Analyses

For each country, we estimated the contribution of each risk factor to the inequality in years with disability by comparing years with disability in the current situation (baseline scenario) with the counterfactual situation where the prevalence of the risk factor of low educated was set to the observed level of high educated ('upward levelling scenario'). The analyses were conducted for men and women separately and restricted to ages 35–80 years, because mortality data were not available for all countries below age 35 and education becomes less reliable at higher ages.

First, we calculated for each educational group mortality rates, disability prevalence and risk factor prevalence, by age for the baseline scenario (no change). Restricted cubic spline models were used to smooth the age- and education-specific prevalences.

Second, we calculated for each educational group Population Attributable Fractions (PAFs) for mortality and disability, using risk factor prevalence in the ith exposure category (P_i), the prevalence in the same category according to the upward levelling

Table 1 Educational inequalities in years with disability between ages 35 and 80 (in years)

	Years with disability			Inequality[a] between low and high educated (95% CI)	
	Low	Med	High		
Men					
North					
Finland	13.9	12.9	9.9	4.0	(3.0, 5.0)
Sweden	9.5	8.0	4.9	4.6	(3.7, 5.8)
Norway	10.4	7.9	3.8	6.6	(5.3, 7.7)
Denmark	11.4	10.7	9.4	2.0	(1.0, 3.6)
West					
England/Wales	13.0	9.7	7.5	5.5	(4.8, 6.1)
the Netherlands	13.4	11.2	8.9	4.5	(3.3, 5.5)
Belgium	13.6	8.9	6.2	7.3	(6.6, 8.2)
Austria	19.1	14.0	10.9	8.2	(7.0, 9.4)
Switzerland	13.4	10.2	8.1	5.3	(3.4, 7.2)
South					
France	11.2	9.3	6.3	4.9	(4.3, 5.4)
Spain	11.2	9.0	7.0	4.1	(3.9, 4.4)
East					
Hungary	13.8	11.9	8.6	5.2	(4.5, 5.8)
Poland	12.2	10.8	8.0	4.2	(3.5, 5.0)
Lithuania	11.9	9.1	6.9	5.0	(3.4, 6.7)
Estonia	16.2	13.9	12.6	3.7	(2.4, 4.6)
European mean[b]	12.3	9.9	7.4	4.9	(4.7, 5.2)
Women					
North					
Finland	16.2	16.4	13.7	2.5	(1.4, 3.8)
Sweden	14.0	11.3	8.8	5.1	(3.2, 6.6)
Norway	14.8	10.2	7.6	7.2	(5.8, 8.5)
Denmark	13.7	13.1	12.6	1.2	(0.0, 2.9)
West					
England/Wales	14.4	10.5	9.2	5.2	(4.5, 5.8)
the Netherlands	17.5	14.9	11.5	6.0	(5.1, 7.1)
Belgium	16.8	12.0	9.0	7.9	(7.2, 8.7)
Austria	19.3	14.7	12.5	6.8	(6.0, 7.7)
Switzerland	13.8	12.0	12.4	1.4	(0.2, 2.7)
South					
France	13.6	10.8	8.5	5.1	(4.8, 5.7)
Spain	14.5	10.0	8.1	6.4	(6.1, 6.6)
East					
Hungary	18.8	13.3	9.5	9.3	(8.7, 9.9)
Poland	15.2	12.8	10.2	5.1	(4.1, 5.6)
Lithuania	16.6	13.3	7.8	8.8	(6.1, 10.7)
Estonia	20.7	17.6	12.9	7.8	(5.8, 9.0)
European mean[b]	15.0	11.6	9.4	5.5	(5.3, 5.8)

a: Low-high.
b: Population-weighted means of all European countries in the analysis.

scenario (P'_i) and relative risks (RR_i) for mortality and disability, respectively, for each of the n categories of the risk factor.[33]

$$PAF = \frac{\sum_{i=1}^{n} P_i RR_i - \sum_{i=1}^{n} P'_i RR_i}{\sum_{i=1}^{n} P_i RR_i}.$$

Third, we calculated for each educational group mortality rates and disability prevalence by age for the upward levelling scenario by applying the PAFs to the baseline mortality rates and disability prevalence.

Fourth, we calculated for each educational group years with disability for the baseline and upward levelling scenario using the Sullivan method[34] with the age-specific mortality rates and disability prevalence as input. According to this method, person years at each age are split into years with and without disability by using the prevalence of disability.

Finally, we calculated the difference in years with disability between the baseline and upward levelling scenario. Because equalizing

the distribution of risk factors does not affect high educated, the difference for low educated equals the reduction in inequality between low and high educated.

In all graphs and tables, we present a European average, calculated as population-weighted average of the values for each country in our study. All 95% confidence intervals (95% CIs) were determined with bootstrapping (1000 samples), taking into account uncertainty regarding mortality, disability and risk factors.

Results

### Inequalities in years with disability and prevalence of risk factors

Years with disability between the ages of 35 and 80 vary by country, gender and educational level (table 1 and Supplementary appendix S5). For all countries combined, low educated men spend 12.3 (95% CI 12.1–12.6) years with disability, varying between 9.5 (95% CI 8.3–10.4) years in Sweden and 19.1 (95% CI 17.9–20.2) years in Austria. High educated men spend fewer years with disability, namely 7.4 (95% CI 7.1–7.6) years for the European average and varying between 3.8 (95% CI 3.2–4.5) years in Norway and 12.6 (95% CI 11.8–13.5) years in Estonia. The inequalities in years with disability between low and high educated men are on average 4.9 (95% CI 4.7–5.2) years, varying between 2.0 (95% CI 1.0–3.6) years in Denmark and 8.2 (95% CI 7.0–9.4) years in Austria. For all countries combined, low educated women spend 15.0 (95% CI 14.7–15.2) years with disability, varying between 13.6 (95% CI 13.1–14.0) years in France and 20.7 (95% CI 19.5–22.7) years in Estonia. High educated women spend on average 9.4 years with disability between the ages of 35 and 80 (95% CI 9.2–9.7), ranging between 7.6 (95% CI 6.7–8.5) years in Norway and 13.7 (95% CI 13.1–14.4) years in Finland. The inequality in years with disability between low and high educated women is 5.5 (95% CI 5.3–5.7) years difference in favour of high educated, ranging between 1.2 (95% CI 0.0–2.9) year for Denmark and 9.3 (95% CI 8.7–9.9) years for Hungary.

Educational inequalities in prevalence of the risk factors are shown in figure 1 (more extensive data and figures in colour are shown in Supplementary appendix S6). Most risk factors are more prevalent among low than among high educated, but there are some exceptions, e.g. with small or opposite gradients for high alcohol consumption and low physical activity. The largest inequalities are found for low income (with prevalence ratios often exceeding 3.0) and smoking.

Estimated effect of 'upward levelling'

Table 2 (average of all countries), figure 2 and Supplementary appendix S7 (both by country) present the absolute change in years with disability among low educated obtained through changing their exposure to that of high educated ('upward levelling scenario'). For all countries combined, among men the largest change is seen for low income (1.00 year; 95% CI 0.96–1.05). Upward levelling of low income thus reduces years with disability among low educated men with 1.0 year. It also reduces the inequality between low and high educated men with 1.0 year, because high educated are unaffected by the upward levelling scenario. After income, father's manual occupation (0.70 year; 95% CI 0.68–0.71) and high body-weight (0.64 year; 95% CI 0.44–0.81) contribute most. For women, the largest effect is seen for low income (1.42 year; 95% CI 1.36–1.49), followed by high body-weight (1.19 years; 95% CI 0.83–1.48) and father's manual occupation (0.86 year; 95% CI 0.84–0.88). The effects for the other risk factors are <0.5 year.

For most countries, similar to the European average, upward levelling of low income shows the largest effect. The effects for low income are larger in the East of Europe, particularly for women exceeding 2 years in Hungary and Poland, and smaller in Sweden,
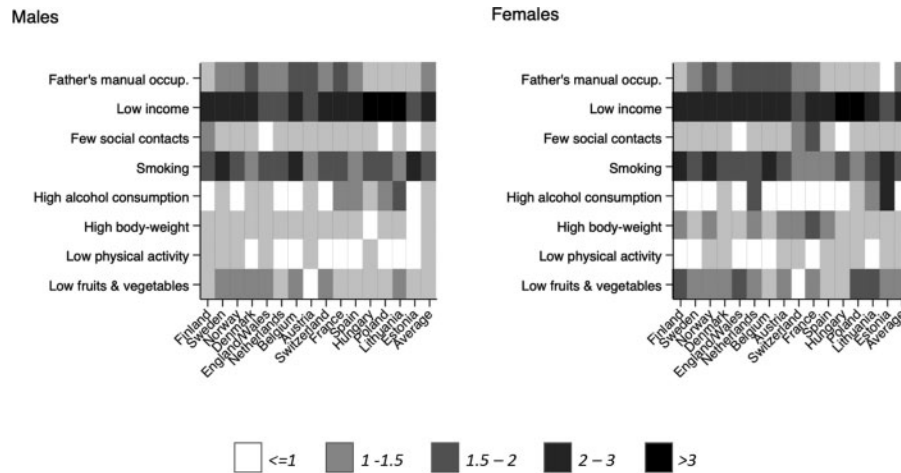
Figure 1 Educational inequalities in risk factors expressed as prevalence ratio, ages 35–79 years, by country and by gender

Note: Prevalence ratio >1 indicates a higher prevalence among low educated. Average = population-weighted average of all European countries in the analysis.

Table 2 Years with disability (YwD) between age 35 and 80 and effects of upward levelling, European average, by gender

European average	Men		Women	
	YwD	95% CI	YwD	95% CI
Low	12.32	(12.05, 12.55)	14.96	(14.73, 15.20)
Medium	9.90	(9.90, 10.11)	11.57	(11.26, 11.74)
High	7.39	(7.12, 7.61)	9.42	(9.15, 9.72)
Differences low–high	4.92	(4.69–5.17)	5.48	(5.30, 5.71)

Upward levelling scenario European average	Change in difference low–high = change in DLE low			
	YwD	95% CI	YwD	95% CI
Father manual occupation	0.70	(0.68, 0.71)	0.86	(0.84, 0.88)
Low income	1.00	(0.96, 1.05)	1.42	(1.36, 1.49)
Few social contacts	0.01	(−0.01, 0.03)	0.04	(0.02, 0.07)
Smoking	0.17	(0.10, 0.21)	0.19	(0.08, 0.31)
High alcohol	−0.01	(−0.02, −0.01)	0.00	(0.00, 0.00)
High body-weight	0.64	(0.44, 0.81)	1.19	(0.83, 1.48)
Low physical activity	0.05	(−0.01, 0.11)	0.10	(−0.11, 0.22)
Low fruit and vegetables	0.25	(0.17, 0.32)	0.45	(0.31, 0.55)

Denmark and Norway (men). In some countries, high body-weight shows larger effects of upward levelling than low income, for instance Sweden, Denmark, Austria (men), France (women), Spain (women) and the Netherlands (women).

Discussion

Between the age of 35 and 80 for all countries combined, low educated men and women spend 4.9 and 5.5 years more with disability than their high educated peers. This study assessed the contribution of 8 risk factors to these inequalities, showing largest contributions for low income (for all countries combined: 1.0 year in men and 1.4 year in women), high body-weight (0.6 and 1.2 years) and father's manual occupation (0.7 and 0.9 years), but contributions differed by country. The effect of smoking is relatively small (0.17 and 0.19).

Risk factors contributing the most to inequalities in years with disability only partly overlap with those contributing the most to inequalities in life expectancy.[6] Smoking was the most important contributor to inequalities in life expectancy, followed by low income and high body-weight. Our study showed that smoking contributed little to inequalities in years with disability. We found larger contributions of father's manual occupation, low income and high

body-weight than for smoking. These factors are more strongly associated with disability than with mortality, as is reflected in the relative risks derived from literature.

For a large contribution to inequalities in years with disability, the prevalence of the risk factor should differ substantially between high and low educated, the risk factor should substantially increase the risk of disability, and this increase should be larger than for mortality. Low income and smoking are both characterized by large inequalities in prevalence between low and high educated. The combination of large inequalities in prevalence and the stronger association with disability than with mortality yields large contributions of low income to inequalities in years with disability. The contributions are particularly large in the East of Europe, where inequalities in prevalence of low income are large (figure 1 and Supplementary table S6). High body-weight and father's manual occupation share these characteristics, but in general to a lesser extent. That smoking contributes little to inequalities in years with disability is mainly because its strong association with mortality. Mortality largely cancels out the opposite effect of increased disability associated with smoking. This strong association with mortality explains the large contribution of smoking to inequalities in life expectancy.

That some risk factors have a larger effect on mortality and others on disability can be largely traced back to different diseases that are
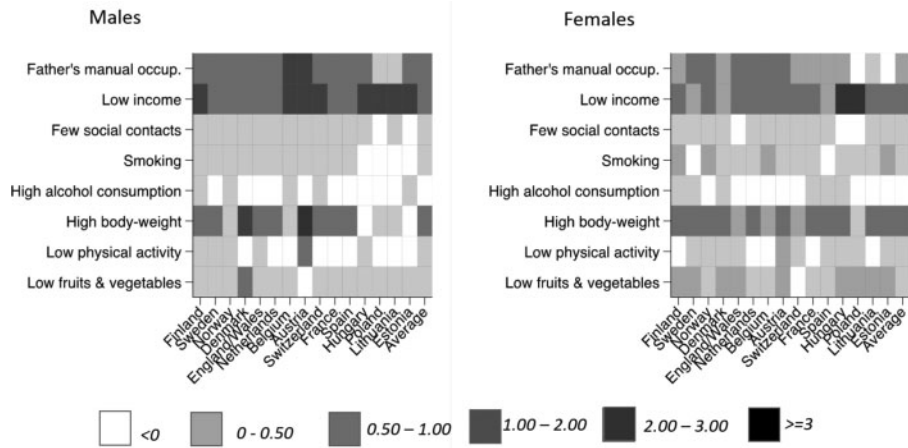
Figure 2 Effect of 'upward levelling' of risk factor prevalence on years with disability between age 35 and 80 years, by country and by gender

associated with the risk factors, as well as their interaction with environmental and personal factors.[35] Smoking is known to increase the risk of several fatal conditions, such as several cancers, e.g. lung cancer, cardiovascular diseases and respiratory diseases. These diseases contribute largely to mortality but less to disability.[36] High body-weight increases the risks of musculoskeletal and mental diseases. Low income increases the risk of mental diseases. These diseases contribute largely to disability but less to mortality.[36] Low income may additionally impact on disability by reducing access to (rehabilitative) care relevant for disability. Depending on the organization of the health care system and health insurance, care related to fatal conditions may require less out-of-pocket payments than care related to disability.

To our knowledge, there are no prior studies that examined the contribution of risk factors to educational differences in years with disability. One study[5] assessed the contribution of several risk factors to inequalities in the prevalence of GALI disability, and showed the important contribution of work-related factors (which could not be included in our study), in addition to behavioural and living conditions. Our study adds that some behavioural factors, such as high body-weight, also contribute to inequalities in years with disability, but the contribution of smoking is small. Whether occupational factors contribute substantially to years with disability needs to be examined in further research that has information on both exposure to these occupational factors and their relative risks of mortality and disability.

Strengths and limitations

The strength of this study is that we include a broad range of risk factors and take into account the effects of risk factors on both disability and mortality to assess their net contribution to inequalities in years with disability. The PAF approach allowed combining risk factor exposure data from harmonized European surveys with relative risks from the literature where possible using meta-analyses or reviews. Obtaining comparable estimates of the contribution to inequalities in years with disability from longitudinal studies for several countries is generally not possible, as they often lack the power to allow stratification by SEP, their follow-up is too short and multi-country cohort studies are scarce. However, the PAF approach has limitations. First, we could not include housing and working conditions because the PAF method requires that risk factor exposure is defined and categorized similar for the relative risks and the prevalence data. Second, for disability we were not able to use relative risks based on reviews or meta-analyses due to unavailability of studies, therefore, we averaged relative risks from individual studies if needed. For mortality, we could generally use relative risks based on reviews or meta-analyses. Third, the relative risks of

disability were based on different disability measures and not on the GALI indicator. Relative risks based on the GALI indicator were not available, which is a limitation. However, prior research showed that the GALI indicator is strongly associated with other disability measures[25,28,31] used in this study. Fourth, we used the same relative risks for all countries, education groups, ages and for both genders. One set of relative risks for all countries may be more problematic for disability than for mortality, as disability arises from the interplay between impaired health and the environment.[35] It may also be more problematic for low income than for behavioural risk factors. We expect that social security systems in different countries buffer the impact of poverty on disability and mortality to a different extend, and less in Eastern Europe. Using the same relative risks for all educational groups ignores that e.g. smoking is associated with higher mortality for lower educated people than for higher educated people.[37] These biases are likely to affect the relative risks of both mortality and disability in the same direction, the net effect on inequalities in years with disability will be partly cancelled out.

Other limitations are that no statements can be made regarding the duration of exposure, due to the cross-sectional assessment of exposure in the surveys, Also, we could not take into account lag-times before mortality and disability effects can be expected to occur. Also, we analyzed the risk factor contributions one-by-one. Since 'downstream' risk factors (i.e. high body-weight, smoking, physical activity) are determined in part by 'upstream' factors like income, or by other downstream factors (i.e. high body-weight by diet and physical activity,) the contribution of all risk factors together may be less than the sum of the individual contributions, but is expected to be larger than each of the contributions. Finally, cultural differences, differences in reporting behaviour, differences in exact wording of survey questions and differences in survey participation and survey years may hamper comparability between countries. The variation in the results between countries must therefore be interpreted with caution.

The broader perspective applied in this study takes into account effects of risk factors through mortality and disability and adds risk factors beyond the best documented behavioural factors. The contributions of the factors to inequalities in years with disability should be seen as indications of the order of magnitude.

Conclusion and implications

Disadvantages in material circumstances (low income), circumstances in which children grow up (father's manual occupation) and high body-weight contributed to more years with disability among low educated. Smoking hardly contributed to the inequality in years

with disability because higher mortality associated with smoking reduced the time alive with disability.

Our findings suggest that policies with the aim to tackle inequalities in years with disability should focus on reducing inequalities in low income (e.g. through progressive income taxation), in high body-weight (e.g. through health promotion programmes) and in unfavourable circumstances during childhood (e.g. through family support programmes).

Supplementary data

Supplementary data are available at *EURPUB* online.

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Disclaimer

Key points

- Between the age of 35 and 80, on average low educated men and women spend 4.9 and 5.5 years more with disability than their high educated peers.
- The three most important contributors to educational inequalities in years with disability were low income, high body-weight and father's occupation.
- The contribution of smoking was relatively small reflecting high excess mortality associated with smoking.

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Disability, Loneliness and Health in the UK: cross-sectional survey

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Background: Research has suggested that exposure to loneliness can have a powerful detrimental impact on health, including mental health. Addressing socially determined health inequity requires understanding of the situation of marginalized or vulnerable groups. People with disability are increasingly being recognized as one such group. Little population-based research has addressed the association between loneliness and health among working age adults with and without disability. **Methods:** Secondary analysis of data collected in waves 8 and 9 of *Understanding Society*, the UK's main annual household panel study. **Results:** Rates of exposure to substantial loneliness were 25.4% (95%CI 23.5–27.3%) among adults with persistent disability (disability at W8 and W9), 15.4% (13.3–17.5%) among adults with disability onset (disability at W9 only), 12.3% (10.1–14.5%) among adults with disability offset (disability at W8 only), and 6.9% (6.5–7.3%) among adults with no disability. Exposure to loneliness was positively associated with the incidence (GHQ-12) and prevalence (SF-12 Mental) of mental health problems, but not the prevalence of physical health problems (SF-12 Physical). Disability status appeared to moderate the association between loneliness and health, with the difference between the persistent disability and no disability group increasing with exposure to greater levels of loneliness. **Conclusion:** Loneliness may be an important determinant of the poorer mental health of working age adults with disability in the UK. Exposure rates are significantly higher than among the non-disabled population. The strength of association between exposure to loneliness and poorer mental health is greater for people with persistent disability than people with no disability.

Introduction

The degree to which individuals are interconnected and embedded in communities has a powerful impact on their health.[1] Knowledge in this area is based on a range of approaches for conceptualizing and measuring social connections including social network analysis and measuring levels of social support and social isolation.[1,2] More recently, attention has focused on the association between loneliness and health.[3–9] Loneliness has been defined primarily as an emotional state; a 'distressing feeling that accompanies the perception that one's social needs are not being met by the quantity or especially the quality of one's social relationships'.[3] Recent systematic reviews suggest that loneliness predicts future mortality,[5] impaired physical health,[8] coronary heart disease[10] and prognosis of mental health conditions.[6]

Public health interventions addressing socially determined health inequity need to take account of the situation of marginalized or vulnerable groups.[11,12] People with disability are increasingly being recognized as one such group.[12–14] Compared to the general population, people with disability tend to have fewer friends, less social support and be more socially isolated.[14–20] Research we have previously conducted, based on a nationally representative sample of approximately 17 000 'working age' adults in England, found that people with disability were significantly more likely than their non-disabled peers to report loneliness.[21] We also reported that (1) adjusting risk