Int J Public Health (2016) 61:787–795
DOI 10.1007/s00038-016-0837-5

ORIGINAL ARTICLE

Absolute and relative educational inequalities in depression in Europe

Pieter Dudal · Piet Bracke

Received: 22 October 2015 / Revised: 22 April 2016 / Accepted: 11 May 2016 / Published online: 24 May 2016

Abstract
Objectives To investigate (1) the size of absolute and relative educational inequalities in depression, (2) their variation between European countries, and (3) their relationship with underlying prevalence rates.
Methods Analyses are based on the European Social Survey, rounds three and six ($N = 57{,}419$). Depression is measured using the shortened Centre of Epidemiologic Studies Depression Scale. Education is coded by use of the International Standard Classification of Education. Country-specific logistic regressions are applied.
Results Results point to an elevated risk of depressive symptoms among the lower educated. The cross-national patterns differ between absolute and relative measurements. For men, large relative inequalities are found for countries including Denmark and Sweden, but are accompanied by small absolute inequalities. For women, large relative and absolute inequalities are found in Belgium, Bulgaria, and Hungary. Results point to an empirical association between inequalities and the underlying prevalence rates. However, the strength of the association is only moderate.
Discussions This research stresses the importance of including both measurements for comparative research and suggests the inclusion of the level of population health in research into inequalities in health.

Keywords Educational inequalities · Depressive symptoms · Europe · Comparative research

Introduction

Social epidemiologists pay a great deal of attention to educational inequalities in health. Not surprisingly, the positive relationship between education and health is one of the most consistent findings in social epidemiology. Research within this domain shows that higher-educated people are more likely to have lower rates of morbidity and different mortality patterns compared with the lower educated (Eikemo et al. 2008; Huisman et al. 2005; Kunst and Mackenbach 1994; Ladin 2008; Mackenbach et al. 2003; Mirowsky and Ross 2003). In addition to the question of the size of educational health disparities, an equally important question is how to accurately measure these inequalities (Mackenbach and Kunst 1997).

There is ongoing debate about whether researchers should apply an absolute or relative measurement of social inequality (Kelly 2007; Khang et al. 2008; King et al. 2012). Some authors favor the use of absolute measurements, whereas others prefer the relative ones (Harper et al. 2008; Houweling et al. 2007; Low and Low 2006; Messer 2008). It is clear that absolute and relative measurements both have important advantages, and therefore researchers should choose to present inequalities using both (Kelly 2007). Furthermore, this seems a crucial recommendation for comparative research. Several authors point to this issue, as empirical research shows that depending on the choice of measurement, researchers can reach opposite conclusions when analyzing trends and cross-national patterns in health disparities (Vagero and Erikson 1997).

Electronic supplementary material The online version of this article (doi:10.1007/s00038-016-0837-5) contains supplementary material, which is available to authorized users.

P. Dudal (✉) · P. Bracke
Department of Sociology, HeDeRa (Health and Demographic Research), Ghent University, Ghent, Belgium
e-mail: pieter.dudal@ugent.be

In recent years, scholars have added new perspectives to this topic by introducing the overall level of morbidity or mortality into the debate (Houweling et al. 2007; Huijts and Eikemo 2009; Mackenbach 2015; Vagero and Erikson 1997). Based on the findings of Mackenbach and Kunst (1997), it has been argued that high relative inequalities can result from a decline in mortality rates (Vagero and Erikson 1997). In general, it has been proposed that relative inequality measurements tend to be high when the prevalence of the outcome under study is lower (Eikemo et al. 2008; Mackenbach 2012; Scanlan 2006). Additionally, Houweling and colleagues (2007) found an association between an absolute inequality measurement and four different outcomes. Moreover, they oppose the suggestion that relative inequalities are almost inevitably high when the overall prevalence is low, as they found that a *mathematical ceiling* is more problematic—at least with regard to relative inequalities—with high prevalence rates (Houweling et al. 2007). These observations point to the importance of taking the overall prevalence of an outcome into account when studying social inequalities (Eikemo et al. 2009; Houweling et al. 2007; Scanlan 2006).

We agree with this line of reasoning and want to address the issue, not only for methodological reasons but also to link it explicitly to a fundamental discussion in social epidemiology, which concerns whether researchers should focus on improving population health or on tackling social inequalities (Phelan et al. 2010). Despite this discussion, there is a tendency toward a one-sided focus on inequalities (Berkman et al. 2014; Scanlan 2006). Opposing this trend, Phelan and colleagues (2010) argue that it is possible to achieve both goals simultaneously. If this holds true, an important question that arises is how population health and educational inequalities are empirically related to each other. By addressing this question, some new perspectives on the discussion could be suggested.

Despite some fruitful applications of these recommendations in earlier research (Eikemo et al. 2009; Houweling et al. 2007), their implementation in research on educational inequalities in health remains fairly limited. In this study, we fill this gap by focusing on educational inequalities in depression from a cross-national perspective.

We concentrate on depression for two reasons. First, little is known about cross-national variation in the size of educational inequalities. Ladin (2008) was the first to investigate cross-national differences in educational inequalities in depression. However, their study focuses on late-life depression and contains a specific sample of people between 50 and 104 years of age. Von dem Knesebeck and colleagues (2011) were the first to study this cross-national variation in a European context for the general population, but focused only on relative inequalities. Hence, applying the aforementioned recommendations could further enhance scientific knowledge about educational inequalities and its cross-national variation.

Second, Houweling and colleagues (2007) show that the strength of the association between a social inequality measurement and the underlying prevalence rate seems to be strongly dependent on the outcome in question. Because this has not been investigated for education and depression, answering this question could be a relevant addition to this academic field. Accordingly, we aim to address the following research questions:

1. Are there educational inequalities—absolute as well as relative—in depression, and how do they vary between countries?
2. How are these inequalities related to the underlying prevalence rates?

Methods

Data

Our analyses are based on the European Social Survey (ESS), rounds 3 and 6. Respondents were selected using strict probability samples of the resident national population aged 15 or above, living in private households. Data were gathered via face-to-face interviews. Response rates range from 33.76 % (Germany; ESS 6) to 77.12 % (Portugal; ESS 6). The sample we use is restricted to respondents aged 25–65 years. In order to retain only those who had finished education, respondents who were still studying were removed from the sample. Additionally, respondents with information lacking for the variables used (2469; 4.12 %) were also excluded from the sample. The final sample comprised 57,419 respondents from 27 countries.

Variables

Dependent

Depression was measured using an eight-item version of the Center for Epidemiologic Studies-Depression Scale (CES-D) (Radloff 1977). Respondents were asked to indicate how often in the week before the survey they had felt or behaved in a particular way (felt depressed, felt that everything was an effort, slept badly, felt lonely, felt sad, could not get going, enjoyed life, felt happy). Response categories range from none or almost none of the time (0) to all or almost or all of the time (3). The total CES-D8 score ranges from 0 to 24, with higher values indicating a

greater amount of depressive symptoms. Missing values were handled by respondent mean substitution, on the condition that at least five items of the scale had been answered. Because the presence of depressive complaints is compared between different countries, it is possible that a proportion of the observed cross-national differences stems from measurement errors, as the CES-D8 items can have different cultural meanings across countries. Researchers can control for this bias by testing the measurement equivalence of the variables used. Previous research supports the measurement equivalence of the shortened eight-item CES-D scale among European respondents, which allows us to use this variable in a cross-national design (Van de Velde et al. 2010). The CES-D8 scores were dichotomized with a cutoff point of 10; therefore, scores greater than or equal to this indicate a high frequency of depressive complaints (von dem Knesebeck et al. 2011). Cronbach's alpha for the CES-D8 scale ranges from 0.7 (Denmark) to 0.86 (Bulgaria) for men, and from 0.76 (Denmark) to 0.87 (Poland) for women.

Independent

To enhance the comparability of our results, we use the International Standard Classification of Education 1997 (ISCED-97) (Schneider 2007). This classification differentiates between seven levels of education, ranging from 'pre-primary education' (level 0) to 'second stage of tertiary education' (level 6). For the current research, this variable was dichotomized into the following categories: (1) 'higher secondary or less' (ISCED 0–4) and (2) 'lower tertiary or more' (ISCED 5–6).

Lastly, age, marital status and co-habituation are included as control variables, because previous research indicates an association with depression (Van de Velde et al. 2010).

Analysis procedure

To assess the absolute and relative educational inequalities, we use country-specific logistic regressions. Because we want to compare health disparities between countries, we rely on predicted probabilities (PPs). This is preferable to reporting differences in logistic regression coefficients, because PPs do not require the assumption that the error variance is identical across countries (Beckfield et al. 2013). First, PPs were calculated for the lower and higher educated separately. Subsequently, absolute inequalities were assessed by subtracting the PPs of the higher educated from those of the lower educated (PPD = PPlowereducated–PPhighereducated). Relative disparities were retrieved by calculating the ratio of the PPs (PPR = PPlowereducated/PPhighereducated).

To estimate the association between both inequality measurements and the underlying prevalence rates, we first used scatter plots to provide a graphical representation of the relationship. Subsequently, the best fitting curve and the corresponding R^2 were calculated.

Because previous research indicates higher feelings of depression among women than among men (Van de Velde et al. 2010), and as the size of educational inequalities seems to vary between men and women (Ross and Mirowsky 2006), the analyses were conducted separately by gender.

Results

Descriptive results

Table 1 shows the descriptive results. The mean age in the total sample is 45.8 and comprises 53.43 % women. The percentage of lower educated varies from 37.28 % (Russia) to 88.78 % (Austria) for men, and from 42.25 % (Denmark) to 93.02 % (Austria) for women. The proportion of respondents who experienced elevated levels of depressive complaints (CES-D8 scores greater than or equal to 10) varies from 4.37 % (Norway) to 31 % (Hungary) for men, and from 6.06 % (Norway) to 34.05 % (Ukraine) for women.

Absolute and relative inequalities

In Table 2, we provide the absolute and relative inequality measurements based on the predicted probabilities. We observe statistically significant associations between education and depression in 17 countries for men and in 19 countries for women. This indicates that, in general, lower-educated people are more likely to experience elevated levels of depressive complaints.

Inequalities appear to be present across Europe, though their extent varies between countries. For men, we see the highest relative inequalities in Switzerland (PPR = 2.67; $p < .01$) and the lowest in Estonia (PPR = 1.22; $p < .05$). The high relative inequalities in the Northern European countries are notable. We see, for example, that the coefficients for Denmark (PPR 2.24; $p < .01$), Finland (PPR = 2.13; $p < .01$), Sweden (PPR = 2.02; $p < .01$), and Ireland (PPR = 1.89; $p < .01$) are among the highest in our sample and are even larger than most of the South and East/Central European countries.

A different pattern emerges when taking into account the absolute levels of inequality. In contrast to the high relative inequalities for the Northern European countries, we see that these, with the exception of Finland, have the lowest absolute inequalities: Denmark (PPD = 0.04; $p < .01$), Ireland (PPD = 0.02; $p < .01$), and Sweden

Table 1 Descriptive results for the 57,419 European study participants of the European Social Survey in Europe (2006 and 2012)

Country	Response rate ESS 3 (%)	Response rate ESS 6 (%)	*N* (before deleting missing cases)	*N* (after deleting missing cases)	Female (%)	Age (mean)	Higher secondary education or less (%)		Depression (scores ≥10; %)	
							Men	Women	Men	Women
Austria	63.96	n.a.	1546	1425	55.72	45.49	86.38	93.02	11.80	11.03
Belgium	61.01	58.74	2344	2310	51.00	45.36	65.46	60.61	9.01	18.00
Bulgaria	64.75	74.74	2398	2276	58.26	47.42	79.04	69.88	24.11	28.62
Switzerland	51.54	51.73	2188	2160	52.73	45.76	62.91	74.44	6.62	10.30
Cyprus	67.32	76.75	1442	1356	57.94	45.50	66.47	67.99	9.12	17.74
Germany	54.5	33.76	3766	3682	50.06	46.35	62.26	76.26	12.15	15.39
Denmark	50.78	49.06	1992	1893	49.76	47.53	53.52	42.25	5.68	8.81
Estonia	65.00	67.83	2336	2253	54.90	46.18	71.75	56.99	18.80	20.05
Spain	65.90	70.28	2520	2429	50.39	44.17	78.36	74.27	13.97	20.78
Finland	64.40	67.27	2579	2572	48.33	46.75	62.98	50.84	6.77	7.64
France	46.00	52.05	2709	2694	53.26	45.99	70.55	67.28	9.43	18.94
UK	54.60	53.06	2959	2852	55.13	45.82	56.94	57.76	12.16	17.80
Hungary	66.10	64.53	2291	2173	56.12	45.67	84.08	77.17	31.00	33.41
Ireland	56.80	67.94	2914	2701	54.09	44.70	68.85	65.68	10.62	10.76
Netherlands	59.80	55.09	2518	2479	52.37	46.19	65.87	69.29	8.54	12.27
Norway	65.50	54.92	2229	2212	46.25	45.66	57.95	48.97	4.37	6.06
Poland	70.20	74.87	2317	2267	51.40	45.14	84.05	78.10	16.12	24.82
Portugal	72.80	77.12	2694	2652	60.94	46.24	88.78	87.26	19.23	27.84
Russian Fed.	69.50	67.01	3206	3016	58.81	44.47	37.28	29.19	21.28	29.17
Sweden	65.90	52.44	2367	2342	49.02	45.98	67.67	57.84	8.04	13.50
Slovakia	73.20	74.09	2490	2217	54.57	44.75	78.53	78.59	21.28	24.28
Slovenia	65.10	57.74	1658	1559	53.94	46.41	85.52	78.24	8.91	13.44
Ukraine	66.40	59.10	2689	2497	59.57	45.38	45.47	39.17	28.51	34.05
Czech Republic	n.a.[a]	68.40	1372	1214	49.45	46.23	81.40	82.12	18.87	26.23
Iceland	n.a.	54.65	431	389	51.15	46.13	61.90	48.37	6.12	8.14
Italy	n.a.	36.04	625	526	50.38	45.73	75.86	76.60	13.41	24.15
Lithuania	n.a.	49.61	1308	1273	57.09	45.47	64.60	54.28	17.54	23.51

Weighted data

[a] Not announced

(PPD = 0.04; $p < .01$). For these countries, it is clear that high relative inequalities are accompanied by low absolute inequalities. However, this is not always the case. For example, the Netherlands (PPR = 1.91; PPD = 0.25; $p < .001$) and Lithuania (PPR = 1.82; PPD = 0.22; $p < .01$) have relatively large coefficients on both measurements of inequality.

For women, the largest relative inequalities are observed for Belgium (PPR = 2.66; $p < .001$) and Hungary (PPR = 2.62; $p < .001$). Furthermore, we see relatively large disparities in other Western European countries such as the Netherlands (PPR = 2.13; $p < .001$) and Switzerland (PPR = 1.97; $p < .01$). The size of the inequalities is comparable, or sometimes even larger, than for most of the South and East/Central European countries. However, this pattern changes when focusing on absolute disparities. In contrast to the large relative inequalities for Western European countries, we observe fairly low absolute inequalities for Germany (PPD = 0.06; $p < .001$), Switzerland (PPD = 0.06; $p < .01$), and to some extent the Netherlands (PPD = 0.08; $p < .001$). An important exception in this regard is Belgium, with a PPD of 0.14 ($p < .001$). On the other hand, we see that for some South and East/Central European countries, inequalities—expressed in absolute terms—are still among the largest in our sample, which is perfectly illustrated by the examples of Hungary (PPD = 0.23; $p < .001$) and Lithuania (PPR = 0.11; $p < .001$).

Inequality and prevalence

Figure 1 shows the association between the overall prevalence of depression and both of the inequality

Table 2 Absolute and relative educational inequalities in depression by country and by gender in Europe (European Social Survey 3 and 6; 2006 and 2012)

Country	Absolute inequality in men		Relative inequality in men		Absolute inequality in women		Relative inequality in women	
	PPD	*p* value	PPR	*p* value	PPD	*p* value	PPR	*p* value
Western Europe								
Austria	0.004		1.010		−0.029		0.787	
Belgium	0.204	***	1.816	***	0.141	***	2.663	***
Switzerland	0.078	**	2.670	**	0.056	**	1.974	**
Germany	0.085	**	1.399	**	0.060	***	1.623	***
France	0.050		1.341		0.099	***	1.823	***
Netherlands	0.253	***	1.912	***	0.076	***	2.129	***
Northern Europe								
Denmark	0.038	**	2.244	**	0.021		1.283	
Estonia	0.110	*	1.220	*	0.076	***	1.568	***
Finland	0.130	**	2.127	**	0.023	*	1.519	*
UK	0.023	***	1.849	***	0.085	***	1.705	***
Ireland	0.028	**	1.895	**	0.052	**	1.723	**
Norway	−0.006		0.853		0.008		1.485	
Sweden	0.042	**	2.017	**	0.065	***	1.760	***
Iceland	0.029		5.547		0.004		1.849	
Southern Europe								
Cyprus	0.177	*	1.534	*	0.108	***	2.065	***
Spain	0.110	*	1.501	*	0.071	**	1.455	**
Portugal	0.117	**	2.262	**	0.108	**	1.630	**
Slovenia	0.057		1.786		0.077	**	2.263	**
Italy	0.007		1.059		−0.121		0.635	
Central/Eastern Europe								
Bulgaria	0.119	**	1.706	**	0.149		1.890	
Hungary	0.155	**	1.293	**	0.227	***	2.620	***
Poland	0.026		1.314		0.113	***	1.788	***
Russian Federation	0.077	*	1.261	*	0.064	**	1.256	**
Slovakia	0.001		1.009		0.012		1.054	
Ukraine	−0.006		0.989		0.040		1.120	
Czech Republic	0.020		1.109		0.054		1.262	
Lithuania	0.217	**	1.821	**	0.111	***	1.900	***

PPD predicted probability lower educated–predicted probability higher educated, *PPR* predicted probability lower educated/predicted probability higher educated

Weighted data

* $p < .050$; ** $p < .010$; *** $p < .001$

measurements (different curve estimations can be found in Supplementary material). For men, we do not find an association with absolute inequality. However, when focusing on relative inequalities, we see a statistically significant negative association ($R^2 = 0.183$; $p < .05$), indicating that PPR tends to be higher when the overall prevalence is lower. The extent to which the overall prevalence is a good predictor of variation in relative inequalities, as indicated by R^2, is relatively moderate. This shows that PPR does not *need* to be high when the overall prevalence is low, and vice versa. This is illustrated by the case of Norway, which has the smallest prevalence rates and the lowest, but not statistically significant, PPR (0.85). On the other hand, we observe large relative inequalities for Portugal (PPR = 2.26; $p < .01$) given an overall prevalence level of 19.23 %.

In contrast to the results for men, we find a positive statistically significant association with the absolute inequality measurement ($R^2 = 0.164$; $p < .05$) for women. Absolute inequalities tend to be low when the overall prevalence is lower. In general, the association is relatively moderate in size, but if we focus on specific subgroups, we

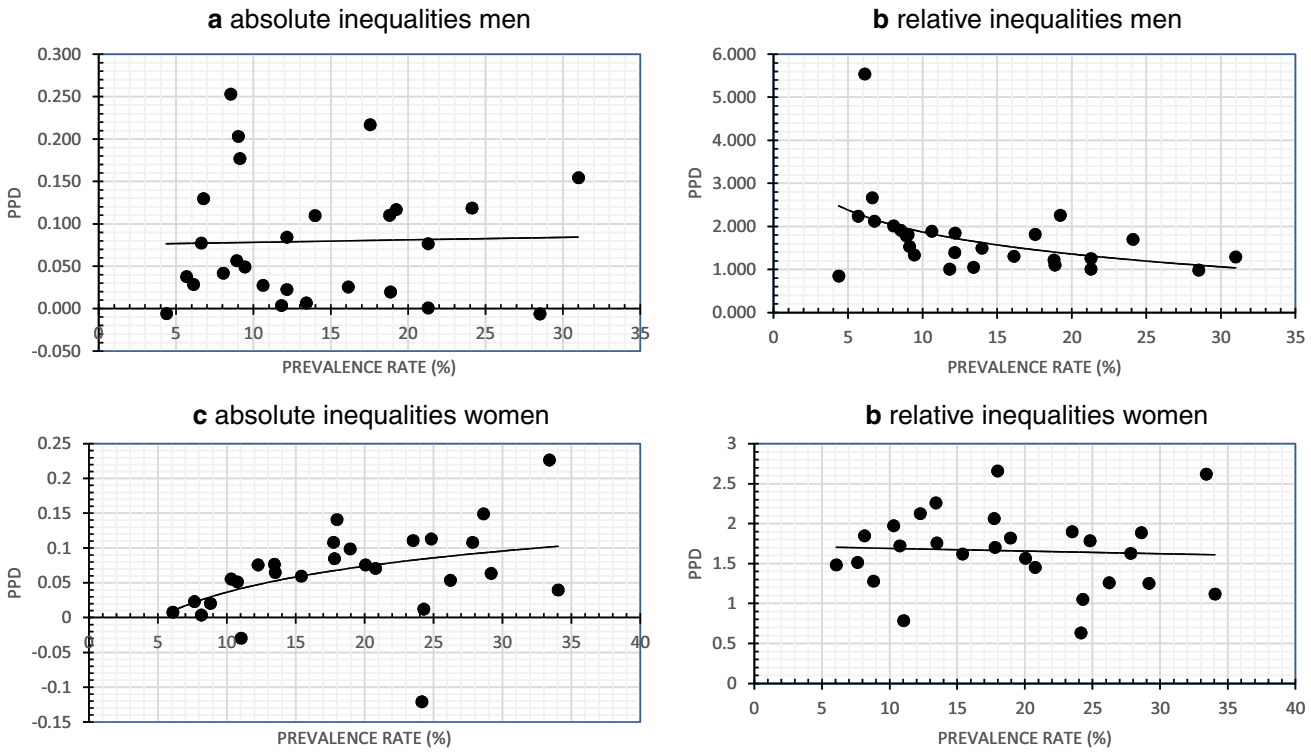

Fig. 1 Educational inequalities in depression by the overall prevalence rate in Europe (European Social Survey 3 and 6; 2006 and 2012). *PPD* predicted probability lower educated—predicted probability higher educated, *PPR* predicted probability lower educated/predicted probability higher educated. Weighted data.

see that the range of the results in the scatter plots is smaller when the overall prevalence is lower. We see more variation in the size of absolute inequalities at higher prevalence rates. For example, Hungary and Russia both have large prevalence rates (respectively, 29.17 and 33.41 %), but differ in the size of absolute inequalities; whereas Hungary has the highest inequalities (PPD = 0.23; $p < .001$), the coefficient for Russia is among the lowest in our sample (PPD = 0.06; $p < .01$).

As can be seen from Fig. 1, we did not find a statistically significant association ($R^2 = 0.01$; $p > .05$) for the relative inequalities of women. However, additional analyses (results not shown) reveal that after removing four outliers (Belgium, Hungary, Austria, and Italy) there is a statistically significant association ($R^2 = 0.53$; $p < .05$) which shows a reversed U-curved pattern. Initially, PPR tends to be lower when the overall prevalence is lowest. Subsequently, these coefficients tend to increase at moderate sizes of inequalities. Finally, they start to decrease at the highest overall prevalence levels.

Discussion

The central aim of this research was to enhance the scientific knowledge about cross-national variation in educational inequalities in depression by applying two recent recommendations for comparative research: (1) relative measurements of inequality should be presented together with absolute levels of disparities and (2) the overall prevalence of an outcome should be taken into account.

In general, we found educational inequalities in the majority of the countries studied. This makes it clear that people who complete tertiary education can translate this into better life outcomes, of which depression is an important one. Our findings are in line with research focusing on other health outcomes (Bjelland et al. 2008; Huisman et al. 2005). Additionally, educational inequalities in depression are not invariant, as the size of the disparities varies considerably between countries. Moreover, despite the fact that we found the existence of inequalities in the majority of the countries, it should not be ignored that this association is absent in nine countries for men and seven for women.

The main finding in this research, however, is that the cross-national pattern in the size of educational inequalities in depression depends on the choice of measurement. For example, if we were to focus only on relative measurements, we would conclude that, at least for men, countries such as Denmark and the Netherlands have very large educational health disparities. However, when taking into account the absolute measurement, we can nuance this conclusion, as we find very small disparities for Denmark,

whereas those for the Netherlands remain among the largest in the sample. Despite a different operationalization of the 'higher-educated' group, the general pattern for the relative inequalities is to some extent similar to the findings of Von dem Knesebeck and colleagues (2011). Their results point, for example, to large relative disparities in countries like the UK and Sweden (for men). While we can confirm these findings, we should partially supplement these as we found very small disparities for these countries when focusing on absolute inequality measures. Based on these findings, we think that this study further enhances the scientific knowledge about educational inequalities in depression.

A second notable finding is that we are able to show the importance of including prevalence rates when discussing inequalities in depression. For example, we observe large relative inequalities for men in countries such as Switzerland, Denmark, Finland, and Sweden. These coefficients are among the highest in our sample, but are accompanied by the lowest absolute inequalities—with the exception of Finland—and the smallest prevalence rates of depression. On the other hand, countries such as Lithuania and Portugal show large inequalities, but these go hand in hand with higher prevalence rates. This makes it clear that inequalities in depression occur in different contexts. Hence, we believe it useful to contextualize these inequalities, as this opens up new discussions or adds new perspectives to existing ones. Our research shows that achieving both previously mentioned goals, tackling social inequalities and improving general population health, is empirically possible. When focusing on absolute and relative inequalities for women, our results show this possibility, as we see that low prevalence rates can go hand in hand with low inequalities. On the other hand, the results concerning relative inequalities for men show that low prevalence rates are accompanied by relatively high inequalities. However, this does not necessarily mean that achieving low relative inequalities is not possible when the outcome is scarce, as Houweling and colleagues (2007) show that mathematical ceilings are more problematic at higher prevalence levels. We did not test this proposition, but if we assume that this holds true for educational inequalities in depression, it might imply that policy measures *can* intervene to achieve low relative inequalities alongside low prevalence rates. Future research could focus on strategies to achieve this. Some first theoretical steps have already been taken (Phelan et al. 2010). However, an important task remains for future comparative research, as it will be necessary to widen the one-sided focus on inequalities to a more complex understanding of the between- and within-country differences in social inequalities, prevalence rates, and the interplay between them.

As mentioned earlier, we find cross-national variation in the size of educational inequalities in depression. This opens up the question of which macro-societal factors have an influence on this variation (Beckfield et al. 2013). Possible directions for future research could be found in the increasing body of literature that focuses on how the expansion of tertiary education is related to the structure of the labor market, and how this influences the relationship between education and (mental) health (Bracke et al. 2014; Mirowsky and Ross 2008). It has been proposed that the expansion of tertiary education has not necessarily led to an occupational upgrade in the labor market (Meyer 1977). Consequently, this can involve processes in which higher-educated people end up in labor market segments that are not in accord with their educational level. This phenomenon, referred to as *overeducation*, can limit the mental health benefits of education (Bracke et al. 2013, 2014). In our analyses, we did not find a statistically significant association in countries such as Norway and Denmark (for women) and France (for men). Previous research shows that these countries are characterized by relatively low economic returns on education, which has been shown to restrict mental health benefits for the higher educated (Bracke et al. 2014). Additional analyses (results not shown) reveal that after controlling for some labor market-related factors (equivalent household income, labor market position, and job security), the relationship between education and depression declines or even completely disappears in a substantial number of countries. This indicates that labor market processes have an important influence on the way people can benefit from additional education. This is in line with earlier research and has already been proposed as an important explanation for the link between education and (mental) health (Ross and Mirowsky 2006). Moreover, these perspectives can easily be linked to important etiological theories on depression (e.g., diathesis–stress model), as both education and labor market can be seen as important institutions which give people the resources to cope with stress (Mirowsky and Ross 2003). Hence, we think that the aforementioned theoretical perspectives can offer good opportunities for additional research.

In addition to some new insights, this research also has some shortcomings. First, the cross-sectional design of the study limits the interpretation of the findings in terms of causality, as we cannot ignore the fact that part of our findings might result from selection effects. Mental health outcomes for adults could be related both to education and to their mental health status in adolescence and young adulthood (Fergusson and Woodward 2002). Existing studies nevertheless show that although causation and selection processes go hand in hand, the former are more important than the latter (Chevalier and Feinstein 2006).

Second, despite an average response rate of 61.43 %, we cannot ignore the fact that in some countries the response

rate is relatively low. Earlier research on the presence and size of non-response bias in the ESS shows that the likelihood of it occurring is relatively small and more profound in the fields of media use, political interest, attitudes toward immigrants, and religion (Stoop et al. 2008). Nevertheless, we should take into account that our results might be partially influenced by non-response bias.

Third, educational level is operationalized as a dichotomous variable. Comparing a greater number of educational levels would allow more detailed insight into educational inequalities in depression. However, the primary focus of this research is on the importance of including both absolute and relative inequalities. We therefore decided to use only two categories to reduce complications. Some countries also did not have sufficient cases in each educational category. Hence, dichotomizing this variable provided enough statistical power for our analyses.

Lastly, the quality of higher education systems seems to be variable in the European context (Kis 2005; Schneider 2007). A tertiary education degree in one country does not require the same intellectual demands as in other countries. Hence, the set of cognitive skills and attitudes resulting from tertiary education varies between European countries. Because these skills and attitudes partially explain the association between education and mental health, the presented inequalities in depression could be partially explained by these differences.

Compliance with ethical standards

Conflict of interest On behalf of all authors, the corresponding author confirms that there are no conflicts of interest.

References

Beckfield J, Olafsdottir S, Bakhtiari E (2013) Health inequalities in global context. Am Behav Sci 57:1014–1039. doi:10.1177/0002764213487343

Berkman LF, Kawachi I, Glymour MM (2014) Social epidemiology. Oxford University Press, Oxford

Bjelland I, Krokstad S, Mykletun A, Dahl AA, Tell GS, Tambs K (2008) Does a higher educational level protect against anxiety and depression? The HUNT study. Soc Sci Med 66:1334–1345. doi:10.1016/j.socscimed.2007.12.019

Bracke P, Pattyn E, von dem Knesebeck O (2013) Overeducation and depressive symptoms: diminishing mental health returns to education. Soc Health Ill 35:1242–1259. doi:10.1111/1467-9566.12039

Bracke P, van de Straat V, Missinne S (2014) Education, mental health, and education-labor market misfit. J Health Soc Behav 55:442–459. doi:10.1177/0022146514557332

Chevalier A, Feinstein L (2006) Sheepskin or Prozac: the causal effect of education on mental health. Centre for the Economics of Education, London School of Economics and Political Science, London

Eikemo TA, Huisman M, Bambra C, Kunst AE (2008) Health inequalities according to educational level in different welfare regimes: a comparison of 23 European countries. Soc Health Ill 30:565–582. doi:10.1111/j.1467-9566.2007.01073.x

Eikemo TA, Skalicka V, Avendano M (2009) Variations in relative health inequalities: are they a mathematical artefact? Int J Equity Health. doi:10.1186/1475-9276-8-32

Fergusson DM, Woodward LJ (2002) Mental health, educational, and social role outcomes of adolescents with depression. Arch Gen Psychiatry 59:225–231. doi:10.1001/archpsyc.59.3.225

Harper S, Lynch J, Meersman SC, Breen N, Davis WW, Reichman ME et al (2008) Harper et al. respond to "Measuring Social Disparities in Health". Am J Epidemiol 167:905–907. doi:10.1093/aje/kwn015

Houweling TA, Kunst AE, Huisman M, Mackenbach JP (2007) Using relative and absolute measures for monitoring health inequalities: experiences from cross-national analyses on maternal and child health. Int J Equity Health 19:15. doi:10.1186/1475-9276-6-15

Huijts T, Eikemo TA (2009) Causality, social selectivity or artefacts? Why socioeconomic inequalities in health are not smallest in the Nordic countries. Eur J Public Health 19:452–453. doi:10.1093/eurpub/ckp103

Huisman M et al (2005) Educational inequalities in cause-specific mortality in middle-aged and older men and women in eight western European populations. Lancet 365:493–500

Kelly MP (2007) The social determinants of health developing an evidence base for political action. National Institute for Health and Clinical Excellence, United Kingdom

Khang YH, Yun SC, Lynch JW (2008) Monitoring trends in socioeconomic health inequalities: it matters how you measure. Bmc Public Health 8:6. doi:10.1186/1471-2458-8-66

King NB, Harper S, Young ME (2012) Use of relative and absolute effect measures in reporting health inequalities: structured review. Br Med J 345:8. doi:10.1136/bmj.e5774

Kis V (2005) Quality assurance in tertiary education: current practices in OECD countries and a literature review on potential effects. Tertiary review: a contribution to the OECD thematic review of tertiary education, vol 14. OECD, France

Kunst AE, Mackenbach JP (1994) The size of mortality differences associated with educational-level in 9 industrialized countries. Am J Public Health 84:932–937. doi:10.2105/Ajph.84.6.932

Ladin K (2008) Risk of late-life depression across 10 European Union countries—deconstructing the education effect. J Aging Health 20:653–670. doi:10.1177/0898264308321002

Low A, Low A (2006) Health economics—importance of relative measures in policy on health inequalities. Br Med J 332:967–969. doi:10.1136/bmj.332.7547.967

Mackenbach JP (2012) The persistence of health inequalities in modern welfare states: the explanation of a paradox. Soc Sci Med 75:761–769. doi:10.1016/j.socscimed.2012.02.031

Mackenbach JP (2015) Should we aim to reduce relative or absolute inequalities in mortality? Eur J Public Health 25:185. doi:10.1093/eurpub/cku217

Mackenbach JP, Kunst AE (1997) Measuring the magnitude of socio-economic inequalities in health: an overview of available measures illustrated with two examples from Europe. Soc Sci Med 44:757–771. doi:10.1016/S0277-9536(96)00073-1

Mackenbach JP et al (2003) Widening socioeconomic inequalities in mortality in six Western European countries. Int J Epidemiol 32:830–837. doi:10.1093/ije/dyg209

Messer LC (2008) Invited commentary: measuring social disparities in health—what was the question again? Am J Epidemiol 167:900–904. doi:10.1093/aje/kwn019

Meyer JW (1977) The effects of education as an institution. Am J Soc 83:22. doi:10.1177/014662167700100306

Mirowsky J, Ross CE (2003) Education, social status, and health. Aldine de Gruyter, New York

Mirowsky J, Ross CE (2008) Education and self-rated health—cumulative advantage and its rising importance. Res Aging 30:93–122. doi:10.1177/0164027507309646

Phelan JC, Link BG, Tehranifar P (2010) Social conditions as fundamental causes of health inequalities: theory, evidence, and policy implications. J Health Soc Behav 51:S28–S40. doi:10.1177/0022146510383498

Radloff LS (1977) The CES-D scale: a self-report depression scale for research in the general population. Appl Psychol Meas 1:16. doi:10.1177/014662167700100306

Ross CE, Mirowsky J (2006) Sex differences in the effect of education on depression: resource multiplication or resource substitution? Soc Sci Med 63:1400–1413. doi:10.1016/j.socscimed.2006.03.013

Scanlan JP (2006) Guest editorial: can we actually measure health disparities? Chance 19:4. doi:10.1080/09332480.2006.10722787

Schneider SL (2007) Measuring educational attainment in cross-national surveys: the case of the European Social Survey. In: Paper presented at the EDUC Research Group, Workshop of the EQUALSOC Network, Dijon

Stoop I, Koch A, Billiet J (2008) Response rates and nonresponse bias in the ESS Eight lessons from the first three rounds. In: Paper presented at the international conference on survey methods in multinational, multiregional, and multicultural contexts (3MC), Berlin, Germany

Vagero D, Erikson R (1997) Correspondence: socioeconomic inequalities in morbidity and mortality in western Europe. Lancet 350:1. doi:10.1016/S0140-6736(97)26033-2

Van de Velde S, Bracke P, Levecque K, Meuleman B (2010) Gender differences in depression in 25 European countries after eliminating measurement bias in the CES-D 8. Soc Sci Res 39:396–404. doi:10.1016/j.ssresearch.2010.01.002

von dem Knesebeck O, Pattyn E, Bracke P (2011) Education and depressive symptoms in 22 European countries. Int J Public Health 56:107–110. doi:10.1007/s00038-010-0202-z