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The socioeconomic distribution of non-communicable diseases in Europe: findings from the European Social Survey (2014) special module on the social determinants of health

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Background: A range of non-communicable diseases (NCDs) has been found to follow a social pattern whereby socioeconomic status predicts either a higher or lower risk of disease. Comprehensive evidence on the socioeconomic distribution of NCDs across Europe, however, has been limited. **Methods**: Using cross-sectional 2014 European Social Survey data from 20 countries, this paper examines socioeconomic inequalities in 14 self-reported NCDs separately for women and men: heart/circulatory problems, high blood pressure, back pain, arm/hand pain, foot/leg pain, allergies, breathing problems, stomach/digestion problems, skin conditions, diabetes, severe headaches, cancer, obesity and depression. Using education to measure socioeconomic status, age-controlled adjusted risk ratios were calculated and separately compared a lower and medium education group with a high education group. **Results**: At the pooled European level, a social gradient in health was observed for 10 NCDs: depression, diabetes, obesity, heart/circulation problems, hand/arm pain, high blood pressure, breathing problems, severe headaches, foot/leg pain and cancer. An inverse social gradient was observed for allergies. Social gradients were observed among both genders, but a greater number of inequalities were observed among women. Country-specific analyses show that inequalities in NCDs are present everywhere across Europe and that inequalities exist to different extents for each of the conditions. **Conclusion**: This study provides the most up-to-date overview of socioeconomic inequalities for a large number of NCDs across 20 European countries for both women and men. Future investigations should further consider the diseases, and their associated determinants, for which socioeconomic differences are the greatest.

Introduction

The increasing prevalence of non-communicable diseases (NCDs) is now recognized as a global crisis.[1] In Europe, NCDs are the leading cause of mortality and morbidity.[2] These diseases not only cause unnecessary suffering and premature death but also have negative societal and economic impacts.[3]

The World Health Organization defines NCDs as 'diseases of long duration and generally slow progression'.[4] Common NCDs include cardiovascular diseases, cancers, chronic respiratory diseases, arthritis, diabetes, depression and obesity. Four major risk factors are often identified as the primary contributors to the growing prevalence of chronic diseases: tobacco use, unhealthy diets, physical inactivity and the harmful use of alcohol. However, many of these diseases and their associated risk factors are fundamentally, socially driven.[5] In Europe, a range of NCDs has been found to follow a social pattern whereby socioeconomic status (SES) predicts either a higher or lower risk of disease. To date however, comprehensive evidence on the social economic distribution of NCDs across Europe has been limited.

Several studies have examined socioeconomic inequalities in the incidence and prevalence of specific NCDs in Europe. Evidence from longitudinal studies suggests that Europeans with lower SES have a higher incidence of cardiovascular problems, such as heart attack and stroke.[6] Other work indicates that cardiovascular disease mortality, diseases of the nervous system, obesity, diabetes, and arthritis are more common among lower socioeconomic groups.[7–11] Cancer, kidney diseases and skin diseases, by contrast, have shown no association with SES, while allergy and back pain have been found to be more common among those with higher SES.[8] In terms of depression, some studies find an association with low SES,[12] while others do not.[13]

While providing important evidence on the social distribution of NCDs, a main limitation of many of these studies is their reliance on national-level survey data which differ for example, in their sampling frames and questions on disease. Another limitation is that studies often examine inequalities by comparing the health of individuals at the very bottom of the SES hierarchy with those at the very top. This perspective ignores evidence that the association between SES and health follows a social gradient (i.e. that the association between SES and health exists at every level of the SES hierarchy). Examining social gradients in health is important because factors associated with very low SES may not account for differences in health status at higher levels.

To date, Dalstra et al.[8] provide the most comprehensive indication of European socioeconomic inequalities in NCDs. This work, however, relies on data from the 1990s, is pooled from different national surveys, compares only a high and low SES group, and is limited to providing an overview of Western Europe. What is lacking is a more recent, comprehensive study of social gradients and socioeconomic inequalities in NCDs, both at a wider European and individual country level. The objective of this study was to provide such an analysis.

Methods

This study was conducted as part of the NORFACE funded 'HiNews' project (https://www.dur.ac.uk/hinews/). It is based on cross-sectional data from the seventh round of the European Social Survey (ESS) and the rotating module 'Social inequalities in health and their determinants' described in detail by Eikemo et al.[14] This module was fielded in 2014/15, comprising 37 623 respondents in 20 European countries: Austria, Belgium, Czech Republic, Denmark, Estonia, Finland, France, Germany, Hungary, Ireland, Lithuania, Netherlands, Norway, Poland, Portugal, Slovenia, Spain, Sweden, Switzerland and the UK. Data were collected via face-to-face interviews with individuals aged 15 and over living in private households. The average response level for all countries was 51.6%, ranging from 31.4% in Germany to 68.9% in Lithuania. In line with previous studies using earlier ESS rounds, we included only respondents aged 25–75 in this study. We restricted our analyses to this target population since inclusion of all ages would have yielded selectivity problems: people younger than 25 have often not yet completed their education and people over the age of 75 represent a very selective group of relatively healthy individuals.[15] After excluding individuals with missing data on study variables, a total of 25 011 respondents were used for our pooled analysis. Estonia and the Czech Republic are not included in the pooled analysis due to missing data on NCDs. These countries are, however, included in the individual country analyses for the conditions where information was available.

NCDs

Data were analyzed for 14 self-reported NCDs: heart/circulatory problems, high blood pressure, back pain, arm/hand pain, foot/leg pain, allergies, breathing problems, stomach/digestion problems, skin conditions, diabetes, severe headaches, cancer, obesity and depression. Data were collected on the first 11 of these conditions by providing participants with a list of conditions and asking them to indicate which they had experienced in the previous 12 months. Data on cancer was collected by asking respondents whether they have or have ever had cancer affecting any part of the body. For obesity, self-reported height and weight were converted to BMI. Obesity was categorized as a BMI greater than 30. A depression scale was created by using an eight-item version of the Center for Epidemiological Studies Depression Scale (CES-D scale).[16] This scale has been shown to be valid for cross-national research.[17] For this paper, we used a dichotomized measure of depression, as outlined in Huijts et al.[18]

Socioeconomic status

Education was used as the indicator of SES. Seven categories are used by the ESS to measure respondents' highest educational level, reflecting the International Standard Classification of Education (ISCED). A low (ISCED I and II), medium (ISCED II, III and IV) and high (ISCED V) education group were constructed from these categories. This categorization was used because the proportion of respondents with less than secondary education (i.e. ISCED I) is very low, and ISCED I may not fully capture, on its own, the lowest educated groups in these countries.

Analyses

For both a pooled European analysis and country-specific analyses, age-controlled adjusted risk ratios (ARR) were calculated from predicted probabilities generated by means of binary logistic regression.[19] These analyses separately compared the lower education group with the higher education group and the medium education group with the higher education group. We chose to calculate ARRs rather than odds ratios, as the latter are likely to be artificially high for non-rare conditions.[20] Moreover, ARRs are calculated from predicted probabilities, which are a preferred estimation method for cross-national comparisons of health inequalities.[21] This is because they do not rely on the assumption that error variance across countries is the same. Data were weighted using post-stratification population weights for the pooled analysis and design weights for the country specific analysis. These weights are reported in the ESS to correct for different population sizes between countries and use information on age group, gender, education and region to reduce the sampling error and potential non-response bias of the survey. In the pooled analysis, we accounted for the nesting of individuals within countries by estimating clustered standard errors. Country specific prevalences are presented as a supplementary file. STATA 14.1 was used for all analyses.

A social gradient in health was observed when significant differences were observed between both lower education groups and the high education group. When a difference was observed between only one of the lower education groups (i.e. either the lower or medium education group) and the high education group, we deemed this a socioeconomic gap.

Results

Table 1 summarizes the pooled ARRs for the different conditions. When examining men and women together, a social gradient in health was observed for nine NCDs in Europe: heart circulation problems, high blood pressure, breathing problems, hand/arm pain, severe headaches, diabetes, obesity, depression and cancer. However, the CIs for the medium and low education groups overlapped for all these conditions, with the exception of depression. An inverse social gradient (with a step-wise higher prevalence among the medium and high education group) was demonstrated for allergy, although here too the CIs for the medium and low education group overlapped. The largest socioeconomic gaps were observed for diabetes, obesity and depression. The ARRs for these conditions among both the medium and the low education group were, respectively, 1.79 (CI 1.47–2.19) and 2.36 (CI 2.05–2.71) for diabetes, 1.49 (CI 1.28–1.72) and 1.93 (CI 1.54–2.41) for obesity, and 1.91 (CI 1.61–2.27) and 3.12 (CI 2.42–4.03) for depression.

Social gradients were observed among both men and women for heart/circulation problems, high blood pressure, hand/arm pain, diabetes, obesity and depression. Additional social gradients were observed among women for breathing problems, severe headaches and cancer. An inverse social gradient was demonstrated among men for allergy but not among women. The CIs of the medium and the low education group overlapped for all these conditions except for hand/arm pain, diabetes and depression among women. An additional socioeconomic gap was observed among women in the low education group for foot/leg pain. Additional socioeconomic gaps were observed among men in the medium education group for severe headaches, as well as within the low education group for breathing problems. Lower risk was found among women in the medium education group for stomach/digestion problems and among women in the low education group for allergy and skin problems. Lower risk was found among men in the low education group for skin problems.

The size of the socioeconomic gap in NCDs varied among the genders in different ways for different diseases. However, the CIs for men and women overlapped for all of the conditions, with the exception of high blood pressure among the low education group. Here the ARR was notably larger among women with an ARR of 2.17 (CI 1.80–2.61) compared with an ARR of 1.22 (CI 1.01–1.48) among men.

Tables 2 and 3 provide a summary of observed social gradients and health gaps among women and men across individual countries

Table 1 Adjusted rate ratios and 95% CIs (medium vs. high education and low vs. high education) for NCDs in Europe

Chronic disease	Educ.	Women and Men (25–75)			Women (25–75)			Men (25–75)		
Heart/circulation	Med	**1.55**	1.19	2.02	**1.54**	1.23	1.93	**1.60**	1.07	2.39
(*n* = 2382)	Low	**1.67**	1.37	2.03	**1.69**	1.38	2.06	**1.69**	1.29	2.20
High blood pressure	Med	**1.50**	1.38	1.63	**1.75**	1.45	2.11	**1.35**	1.22	1.49
(*n* = 4666)	Low	**1.61**	1.48	1.77	**2.17**	1.80	2.61	**1.22**	1.01	1.48
Breathing problem	Med	**1.19**	1.02	1.39	**1.22**	1.08	1.37	1.18	0.93	1.49
(*n* = 2044)	Low	**1.50**	1.28	1.78	**1.69**	1.35	2.13	**1.32**	1.15	1.52
Allergies	Med	**0.83**	0.76	0.92	0.90	0.79	1.03	**0.76**	0.65	0.89
(*n* = 3050)	Low	**0.68**	0.60	0.78	**0.78**	0.64	0.94	**0.54**	0.44	0.65
Skin	Med	0.89	0.71	1.11	0.87	0.76	1.00	0.92	0.64	1.32
(*n* = 2176)	Low	**0.60**	0.47	0.76	**0.66**	0.55	0.79	**0.51**	0.37	0.70
Back or neck pain	Med	1.14	0.99	1.30	1.13	1.00	1.27	1.15	0.98	1.34
(*n* = 10 307)	Low	0.99	0.85	1.14	0.95	0.84	1.07	1.02	0.85	1.24
Hand or arm pain	Med	**1.33**	1.14	1.56	**1.24**	1.10	1.40	**1.44**	1.16	1.78
(*n* = 5637)	Low	**1.64**	1.47	1.84	**1.67**	1.52	1.84	**1.56**	1.28	1.90
Foot or leg pain	Med	1.11	1.00	1.23	1.08	0.98	1.19	1.12	0.98	1.28
(*n* = 5969)	Low	**1.23**	1.11	1.36	**1.30**	1.18	1.42	1.12	0.94	1.34
Severe headaches	Med	**1.25**	1.03	1.51	**1.25**	1.05	1.49	**1.31**	1.04	1.64
(*n* = 3415)	Low	**1.28**	1.01	1.63	**1.32**	1.05	1.66	1.15	0.89	1.48
Stomach/digestion	Med	**0.88**	0.81	0.95	**0.82**	0.78	0.85	0.97	0.83	1.13
(*n* = 4055)	Low	0.91	0.73	1.14	0.91	0.75	1.10	0.88	0.67	1.16
Diabetes	Med	**1.79**	1.47	2.19	**1.37**	1.17	1.61	**2.22**	1.58	3.14
(*n* = 1332)	Low	**2.36**	2.05	2.71	**2.36**	1.79	3.10	**2.38**	1.52	3.73
Obesity	Med	**1.49**	1.28	1.72	**1.57**	1.19	2.08	**1.42**	1.32	1.52
(*n* = 4148)	Low	**1.93**	1.54	2.41	**2.33**	1.63	3.32	**1.62**	1.28	2.04
Depression	Med	**1.91**	1.61	2.27	**1.86**	1.61	2.15	**2.06**	1.50	2.82
(*n* = 3029)	Low	**3.12**	2.42	4.03	**3.16**	2.49	4.02	**2.88**	2.19	3.79
Cancer	Med	**1.20**	1.07	1.35	**1.17**	1.04	1.32	1.26	1.00	1.58
(*n* = 2691)	Low	**1.23**	1.11	1.38	**1.24**	1.02	1.51	1.19	0.99	1.43

Table 2 summary table of social gradients and socioeconomic gaps among women

	Heart	HBP	Breathing	Allergies	Skin	Back/Neck	Hand/Arm	Foot/leg	Headaches	Stomach	Diabetes	Obesity	Depression	Cancer
North														
Denmark (n=553)	M	L					X	L		M	L	L	X	
Finland (n=797)			L				L					L	L	
Norway (n=500)		X			L(I)	M	M	M			L	X	L	
Sweden (n=665)							X	X			L		L	
West														
Austria (n=716)												X		
Belgium (n=655)						L	L					L	L	
France (n=744)									X			X	X	
Germany (n=1,120)		X	L			M	L	L		M(I)	L	X	X	
Ireland (n=908)					M(I), L(I)							L	L	X
Netherlands (n=850)		L		X(I)							L	L	L	
Switzerland (n=581)												X	L	L
UK (n=903)		L					L						L	
Central														
Czech (n=881)	L	L		M(I)			L	L					L	
Estonia (n=901)												X	X	
Hungary (n=712)	L	L					L	L	L			L	L	
Lithuania (n=920)	X			L(I)	I(I)	M	X		X			X	X	X
Poland (n=640)	M,L			X(I)	X(I)							L	X	
Slovenia (n=491)		L					X					X	L	
South														
Portugal (n=505)		X			M(I)	L						L	X	
Spain (n=686)		L			L(I)	L(I)				L(I)		L	X	

X, social gradient; (I), inverse gradient; M, socioeconomic gap between the medium and the high education group; L, socioeconomic gap between the low and the high education group. Shading indicates data were not available.

(organized by region). Precise figures can be found in supplementary file 2. Patterns of social gradients and socioeconomic gaps differed across countries by both gender and disease, as well as by region. Across both women and men, the largest inequalities were generally found for heart/circulation problems, high blood pressure, hand/arm pain, diabetes, obesity and depression.

A social gradient was observed among women in most countries for one to three diseases (see tables 2 and 3 for specific diseases), in addition to socioeconomic gaps which were found across all countries. The diseases with the greatest number of countries displaying social gradients or gaps among women were high blood pressure, hand/arm pain, obesity and depression. No social gradients were observed among women in Belgium, Netherlands, Hungary nor the UK. By contrast, social gradients were observed for seven NCDS in Lithuania.

Overall, fewer social gradients and gaps were observed among men across individual countries. A social gradient was observed among

Table 3 Summary table of social gradients and socioeconomic gaps among men

	Heart	HBP	Breathing	Allergies	Skin	Back/Neck	Hand/Arm	Foot/leg	Headaches	Stomach	Diabetes	Obesity	Depression	Cancer
North														
Denmark (n=588)	L	L		L(I)			X					X	L	
Finland (n=802)		X		X(I)	X(I)							X		
Norway (n=597)		M										L	L	
Sweden (n=666)		L	L									X		
West														
Austria (n=681)				M(I)	L(I)		M			M(I)		X		
Belgium (n=667)						M	L		M				L	
France (n=721)		M,L		X(I)	M(I)		X				L	L	X	
Germany (n=1, 237)	M	M				X	M	M			M	M	X	
Ireland (n=761)		L		M(I)					L		L	L	L	L
Netherlands (n=690)	L							L			X		L	
Switzerland (n=586)												X	X	
UK (n=772)	M	L		L(I)		M	X				X		X	
Central														
Czech (n=714)				M(I)					L		M(I)			
Estonia (n=626)													L	
Hungary (n=541)	L		L				L	L					L	
Lithuania (n=568)	L	X		X(I)	M(I)		L	L				X	X	
Poland (n=560)		L		L(I)	L(I)	M(I)				L(I)		L		
Slovenia (n=438)				M(I)	M(I)									
South														
Portugal (n=442)							L		L					
Spain (n=748)				L(I)		L(I)						L	L	

X, social gradient (I), inverse gradient; M, socioeconomic gap between the medium and the high education group; L, socioeconomic gap between the low and the high education group. Shading indicates data were not available.

men in many of the countries for 1–2 diseases, in additional to socioeconomic gaps which were found across all countries (see tables 2 and 3 for specific diseases). The diseases with the greatest number of countries displaying social gradients or gaps among men were hand/arm pain, obesity and depression. No social gradients were observed among men in Norway, Belgium, Ireland, Poland, Slovenia, Hungary, Spain and Portugal. The greatest number of social gradients was observed among men in the UK (for three NCDs).

With regard to regions, a few patterns were discernable although these differed across the genders. Among women, inequalities in heart/circulation problems were especially observed in Central/Eastern countries. Among men, however, heart/circulation problems were observed in at least one country in every region except for the Southern. Additionally, no inequalities in diabetes were observed among women in Central/Eastern nor Southern countries. Among men, inequalities in diabetes were only observed in Western countries, with the exception of the Czech Republic where lower risk was found for diabetes in the medium education group.

Discussion

Our analysis indicates that social gradients and socioeconomic gaps in the prevalence of NCDs are evident across the European population. However, the diseases with substantial inequalities across the education groups are different for men and women and individual countries.

Previous research has reported varying patterns of socioeconomic inequalities for different NCDs. Similar to other studies, in our pooled analysis, we observed among the lower education groups a higher risk for heart/circulation problems,[8,22] high blood pressure,[23] breathing-related problems,[24] joint pain,[22] headaches,[8,22] diabetes,[8,22,25–27] obesity[11] and depression,[12] As in our study, other work has also found higher risks of allergy among the more highly educated.[8]

Some of our results differed from previous research. We found lower risk for back/neck pain among the low educated group, whereas others have found the risk of back pain greater among the lower educated.[22,28] While some studies on migraine/headache, like us, have found greater prevalence among those with lower socioeconomic status,[8,22] others have observed no difference.[29,30] In line with some previous research,[31] we found a greater risk of skin problems among those of higher SES, although others have found no difference.[8,22] We found lower risk of stomach/digestion problems among the medium education group (and no difference in risk among the low education group), while others have reported greater risk among the lower education group.[25,32,33] Finally, previous studies have found conflicting socioeconomic inequalities for asthma and mental disorders, while we found breathing problems and depression to be more prevalent among the lower education groups.[8,13,34–38]

Some of the variation in reported inequalities almost certainly relates to the different criteria used to define the NCDs and measure SES. While our results are limited in that they cannot be directly compared with those of previous studies, the persistent finding of socioeconomic inequalities in NCDs remains a significant concern. Another limitation of this work is that it relies on self-reported data, rather than clinical diagnosis. However, while self-reports may depend on characteristics of respondents other than the clinical presence of a condition, substantial accuracy has been found between physician reported medical histories and self-reports for many conditions.[8] Finally, although the ESS maintains a high standard of data collection, the survey is still prone to differences in response rates and cross-cultural quality of questions. For a further discussion on the strengths and weaknesses of the ESS data, see Eikemo et al.[14]

Our results raise questions about the factors which might explain the differences in social gradients and inequalities in NCDs, as well as the differences found between the genders and individual countries. We would expect that these factors relate to a range of policy differences that shape living and working conditions in different countries. Future work should perform more in-depth analyses towards explaining these differences.

Our country-level analyses show that inequalities in NCDs are present everywhere across Europe and that health inequalities exist (to different extents) for each of the 14 investigated NCDs. At the European regional level, inequalities in both heart/circulation problems and diabetes seem to follow different patterns across the genders. Moreover, we observed no inequalities in these conditions in Southern countries, despite significant inequalities in other regions. Previous research has also found smaller inequalities in heart disease in Southern countries.[8]

This study provides the most up-to-date overview of the social gradients and socioeconomic gaps for a large number of NCDs across 20 European countries for both men and women. It is the first study to do so in a way in which reliable comparisons between countries can be made. We identified large variations between NCDs with regard to both social gradients and socioeconomic gaps. Future work seeking to explain health inequalities should further consider the diseases, and their associated determinants, for which socioeconomic differences are the greatest.

Supplementary data

Supplementary data are available at *EURPUB* online.

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References

1 Beaglehole R, Bonita R, Alleyne G, et al. UN high-level meeting on non-communicable diseases: addressing four questions. *The Lancet* 2011;378:449–55.

2 Busse R. Tackling Chronic Disease in Europe: Strategies, Interventions and Challenges. WHO Regional Office Europe; 2010.

3 Suhrcke M, Fahey D, McKee M. Economic aspects of chronic disease and chronic disease management. In: Nolte E, McKee M, editors. *Caring for People with Chronic Conditions: A Health System Perspective*. Maidenhead, England: Open University Press, 2008.

4 World Health Organization. 10 facts on noncommunicable diseases [Internet]. WHO2016 [cited 2016 Mar 20]. Available at: http://www.who.int/features/factfiles/noncommunicable_diseases/en/.

5 Glasgow S, Schrecker T. The double burden of neoliberalism? Noncommunicable disease policies and the global political economy of risk. *Health Place* 2015;34:279–86.

6 Kok R, Avendano M, Mackenbach JP. The association between socioeconomic status and changes in health in Europe [Internet]. In: Borsch-Supan A, Brugiavini A, Jürges H, Kapteyn A, Mackenbach JP, Siegrist J, et al., editors. First Results From the Survey of Health, Ageing and Retirement in Europe (2004–2007): Starting the Longitudinal Dimension. Mannheim, Germany: Mannheim Research Institute for the Economics of Aging (MEA); 2008: 125–30 [cited 2015 Oct 2]. Available at: http://www.share-project.org.

7 Avendano M, Kunst AE, Huisman M, et al. Socioeconomic status and ischaemic heart disease mortality in 10 western European populations during the 1990s. *Heart* 2006;92:461–7.

8 Dalstra JAA, Kunst AE, Borrell C, et al. Socioeconomic differences in the prevalence of common chronic diseases: an overview of eight European countries. *Int J Epidemiol* 2005;34:316–26.

9 Espelt A, Arriola L, Borrell C, et al. Socioeconomic position and type 2 diabetes mellitus in Europe 1999–2009: a Panorama of inequalities. *Curr Diabetes Rev* 2011;7:148–58.

10 Mackenbach JP, Cavelaars AE, Kunst AE, Groenhof F. Socioeconomic inequalities in cardiovascular disease mortality; an international study. *Eur Heart J* 2000;21:1141–51.

11 Department of Health Public Health Research Consortium, Law C, Power C, Graham H, Merrick D. Obesity and health inequalities. *Obes Rev* 2007;8:19–22.

12 Lorant V, Deliège D, Eaton W, et al. Socioeconomic inequalities in depression: a meta-analysis. *Am J Epidemiol* 2003;157:98–112.

13 Laaksonen E, Martikainen P, Lahelma E, et al. Socioeconomic circumstances and common mental disorders among Finnish and British public sector employees: evidence from the Helsinki Health Study and the Whitehall II Study. *Int J Epidemiol* 2007;36:776–86.

14 Eikemo TA, Bambra C, Huijts T, Fitzgerald R. The First Pan-European Sociological Health Inequalities Survey of the General Population: The European Social Survey Rotating Module on the Social Determinants of Health. *Eur Sociol Rev [Internet]* 2016 [cited 2016 Jun 5]. Available at: http://esr.oxfordjournals.org/content/early/2016/05/16/esr.jcw019.

15 Huijts T, Monden CWS, Kraaykamp G. Education, educational heterogamy, and self-assessed health in Europe: a multilevel study of spousal effects in 29 European countries. *Eur Sociol Rev* 2010;26:261–76.

16 Radloff LS. The CES-D Scale: a self-report depression scale for research in the general population. *Appl Psychol Meas* 1977;1:385–401.

17 Van de Velde S, Bracke P, Levecque K. Gender differences in depression in 23 European countries. Cross-national variation in the gender gap in depression. *Soc Sci Med* 2010;71:305–13.

18 Huijts T, Stornes P, Eikemo TA, Bambra C. HiNews Consortium. Prevalence of physical and mental non-communicable diseases in Europe: findings from the European social survey (2014) special module on the social determinants of health. *Eur J Public Health*.

19 Norton EC, Miller MM, Kleinman LC. Computing adjusted risk ratios and risk differences in Stata. *Stata J* 2013;13:492–509.

20 Tajeu GS, Sen B, Allison DB, Menachemi N. Misuse of odds ratios in obesity literature: an empirical analysis of published studies. *Obesity* 2012;20:1726–31.

21 Beckfield J, Olafsdottir S, Bakhtiari E. Health inequalities in global context. *Am Behav Sci* 2013;57:1014–39.

22 Volkers AC, Westert GP, Schellevis FG. Health disparities by occupation, modified by education: a cross-sectional population study. *BMC Public Health* 2007;7: 196.

23 Colhoun HM, Hemingway H, Poulter NR. Socio-economic status and blood pressure: an overview analysis. *J Hum Hypertens* 1998;12:91–110.

24 Gershon AS, Dolmage TE, Stephenson A, Jackson B. Chronic obstructive pulmonary disease and socioeconomic status: a systematic review. *COPD* 2012;9:216–26.

25 Levenstein S, Kaplan GA, Smith M. Sociodemographic characteristics, life stressors, and peptic ulcer. A prospective study. *J Clin Gastroenterol* 1995;21:185–92.

26 Connolly V, Unwin N, Sherriff P, et al. Diabetes prevalence and socioeconomic status: a population based study showing increased prevalence of type 2 diabetes mellitus in deprived areas. *J Epidemiol Community Health* 2000;54:173–7.

27 Agardh E, Allebeck P, Hallqvist J, et al. Type 2 diabetes incidence and socio-economic position: a systematic review and meta-analysis. *Int J Epidemiol* 2011; 40:804–18.

28 Dionne CE, Von Korff M, Koepsell TD, et al. Formal education and back pain: a review. *J Epidemiol Community Health* 2001;55:455–68.

29 Launer LJ, Terwindt GM, Ferrari MD. The prevalence and characteristics of migraine in a population-based cohort The GEM Study. *Neurology* 1999;53:537–542.

30 Kececi H, Dener S. Epidemiological and clinical characteristics of migraine in Sivas, Turkey. *Headache* 2002;42:275–80.

31 McNally NJ, Phillips DR, Williams HC. The problem of atopic eczema: aetiological clues from the environment and lifestyles. *Soc Sci Med* 1998;46:729–41.

32 Bytzer P, Howell S, Leemon M, et al. Low socioeconomic class is a risk factor for upper and lower gastrointestinal symptoms: a population based study in 15 000 Australian adults. *Gut* 2001;49:66–72.

33 Mugie SM, Benninga MA, Di Lorenzo C. Epidemiology of constipation in children and adults: a systematic review. *Best Pract Res Clin Gastroenterol* 2011;25:3–18.

34 Lewis SA, Weiss ST, Platts-Mills TA, et al. Association of specific allergen sensitization with socioeconomic factors and allergic disease in a population of Boston women. *J Allergy Clin Immunol* 2001;107:615–22.

35 Volmer T. The socio-economics of asthma. *Pulm Pharmacol Ther* 2001;14:55–60.

36 Littlejohns P, Macdonald LD. The relationship between severe asthma and social class. *Respir Med* 1993;87:139–43.

37 Almqvist C, Pershagen G, Wickman M. Low socioeconomic status as a risk factor for asthma, rhinitis and sensitization at 4 years in a birth cohort. *Clin Exp Allergy* 2005;35:612–8.

38 Bråbäck L, Hjern A, Rasmussen F. Social class in asthma and allergic rhinitis: a national cohort study over three decades. *Eur Respir J* 2005;26:1064–8.