



HAL
open science

Educational differentials in disability vary across and within welfare regimes: a comparison of 26 European countries in 2009

E Cambois, A Sole-Auro, H Bronnum-Hansen, V Egidi, C Jagger, B Jeune, Wj Nusselder, H van Oyen, C White, Jean-Marie Robine

► **To cite this version:**

E Cambois, A Sole-Auro, H Bronnum-Hansen, V Egidi, C Jagger, et al.. Educational differentials in disability vary across and within welfare regimes: a comparison of 26 European countries in 2009. *Journal of Epidemiology and Community Health*, 2016, 70 (4), pp.331-8. 10.1136/jech-2015-205978 . hal-03479952

HAL Id: hal-03479952

<https://cnrs.hal.science/hal-03479952>

Submitted on 21 Jan 2022

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

Educational differentials in disability vary across and within welfare regimes: a comparison of 26 European countries in 2009

Emmanuelle Cambois, Aïda Solé-Auró, Henrik Brønnum-Hansen, Viviana Egidi, Carol Jagger, Bernard Jeune, Wilma J. Nusselder, Herman Van Oyen, Chris White, Jean-Marie Robine

Corresponding author's affiliation and address:

Dr Emmanuelle Cambois, PhD

Affiliation: Institut National d'Etudes Démographiques (INED), Department of Mortality, Health and Epidemiology

Address: 133 Bd Davout, 75980 Paris Cedex 20 – cambois@ined.fr

Other authors' affiliation(s) and address:

Dr Aïda Solé-Auró, PhD

Affiliation: Institut National d'Etudes Démographiques (INED), Universitat Pompeu Fabra (UPF), Department of political and social science

Address: UPF, c/Ramon Trias Fargas 25-27, 08005 Barcelona

Associate Professor Henrik Brønnum-Hansen, MSc

Affiliation: University of Copenhagen, Faculty of Health Sciences, Department of Public Health.

Address: Øster Farimagsgade 5. 1014 Copenhagen – Denmark

Prof Viviana Egidi, PhD

Affiliation: Sapienza University of Rome, Department of Statistical Science,

Address: Via Filippi, 16 00146 Roma -- Italy

Prof Carol Jagger, PhD

Affiliation: Newcastle University Institute for Ageing and Institute of Health & Society, Campus for Ageing and Vitality,

Address: Newcastle upon Tyne, NE4 5PL, United Kingdom

Associate professor Bernard Jeune, MD

Affiliation: Epidemiology, Institute of Public Health, and Danish Ageing Research Center, University of Southern Denmark

Address: J. B. Winsløw Vej 9B, 5000 Odense C, Denmark

Dr Wilma J. Nusselder, PhD

Affiliation: Department of Public Health, Erasmus MC, University Medical Center Rotterdam,

Address: Rotterdam, Netherlands, P.O. Box 2040, 3000 CA Rotterdam, The Netherlands

Prof Herman Van Oyen, DrPH

Affiliation: Scientific Institute of Public Health, Department of Public Health and Surveillance

Address: J. Wytsmanstraat 14, 1050 Brussels, Belgium

Mr Chris White, Master of Public Health,

Affiliation: Government Statistical Service, Office for National Statistics, Government Buildings,

Address: Cardiff Road, Newport, UK NP10 8XG -- UK

Prof Jean-Marie Robine, DED

Affiliations : Institut National de la Santé et de la Recherche Médicale (INSERM), Ecole Pratique des Hautes Etudes (EPHE) and Institut National d'Etudes Démographiques (INED)

Address: INSERM, Université de Montpellier, U1198 MMDN- bâtiment 24, Place Eugène Bataillon - CC105, 34095 Montpellier Cedex 05

KEY WORDS: Ageing / Disability / Social inequalities / Education / Europe / Welfare regimes

WORD COUNT: 2999

Educational differentials in disability vary across and within welfare regimes: a comparison of 26 European countries in 2009

ABSTRACT

Background. Social differentials in disability prevalence exist in all European countries, but their scale varies markedly. To improve understanding of this variation, the article focuses on each end of the social gradient. It compares the extent of the higher disability prevalence in low-social groups (referred to as *disability disadvantage*) and of the lower prevalence in high-social groups (*disability advantage*); country-specific advantages/disadvantages are discussed regarding the possible influence of welfare regimes.

Methods. Cross-sectional disability prevalence is measured by health-related longstanding activity limitation (AL), in the 2009 European Statistics on Income and Living Conditions (EU-SILC), across 26 countries classified into four welfare regime groups. Logistic models adjusted by country, age and sex (in all 30-79 and in three age-bands) measured the country-specific odds ratios (ORs) across education, representing the AL-disadvantage of low-educated and AL-advantage of high-educated groups relative to middle-educated groups.

Results. The relative AL-disadvantage of the low-educated groups was small in Sweden (e.g. 1.2 [1.0-1.4]) or Finland, Romania, Bulgaria, and in Spain (youngest age-band), but was large in the Czech Republic (e.g. 1.9 [1.7-2.2]), Denmark, Belgium, Italy, and Hungary. The high-educated groups had a small relative AL-advantage in Denmark (e.g. 0.9 [0.8-1.1]), but large in Lithuania (e.g. 0.5 [0.4-0.6]), half of the Baltic and Eastern European countries, Norway and Germany (youngest age-band). There were notable differences within welfare regime groups.

Conclusion The country-specific disability advantages/disadvantages across educational groups identified here could help to identify determining factors and the efficiency of national policies implemented to tackle social differentials in health.

BOX

What is already known and not known on this subject?

- Wide educational disparities in health and disability exist; but their magnitude across countries vary markedly
- To what extent the country contexts and welfare regimes modify the size of the health differentials is not yet fully explained.

What this study adds?

- The variation in the extent of social differentials across countries compared with the European average, in terms of the relative excess/reduced prevalence of disability at each extreme of the educational gradient.
- The results give new insight into the countries where differentials result from the higher social groups being relatively more advantaged compared to the average regarding disability prevalence and the lower social groups being relatively more disadvantaged.
- Departures from the average pattern within welfare regime groups were found in the Nordic countries, suggesting the need for further exploration of the greater protective and hazardous effects of country contexts on disability prevalence across social groups.

INTRODUCTION

While longevity increased in most European countries, a significant part of life is still lived with diseases and disability, with large variations across Europe,^{1 2} and between socioeconomic groups.³⁻⁵ Actions to reduce these disability differentials as a means to increase healthy ageing have become important public health goals.⁶⁻¹⁰

Disability results from health events, such as chronic diseases, which have worsened body functions and hampered the performance of activities, thereby challenging social participation and quality of life.¹¹ Disability arises both from the exposure to health events, and the resources available to individuals to adapt to declining functions (assistive devices, care giving, adapted environment).¹² Therefore, differentials by socioeconomic status (SES) in disability prevalence stem from complex interactions between the individual, their household and country characteristics.^{7 13} Individuals vary in their exposures to harmful life and work conditions or behaviours, their ability to adjust to functional disorders, and their access to environmental adaptations and assistive devices or care. National contexts modify the impact of individual characteristics on disability risks^{7 14} generally through the: 1) availability and quality of care, primary prevention and protection programmes throughout the national territory; 2) social welfare context,^{15 16} defining the level of social transfers, access to education and to care (child, medical, elderly), and the priority given to disability policies to facilitate adjustments.

Comparing disability differentials across countries highlights (un)favourable country contexts. Several studies have discussed the SES differentials in health across Europe based on classifications of welfare regimes:^{4 17-20} they showed large variations in the magnitude of the differentials across countries, but the relationship with welfare regimes was unclear. A high level of social transfers is expected to reduce exposure to deprivation and related disability risks, translating into reductions in the health disadvantage of low-SES groups. However,

whether such regimes consistently result in reducing this disadvantage, and whether other regimes do not, is uncertain. Moreover, to what extent the different regimes benefit high-SES groups is also unknown.²¹ These questions suggest a need to further disentangle how each extreme of the SES scale is affected by country-specific circumstances, for instance by enabling the high-SES groups to gain most and/or the low-SES groups to gain least (than the average SES effect).

Welfare regimes can be defined by the degree to which people rely on the labour market, family support, or social transfers to get resources and cover basic needs.¹⁸ Four aggregated groups of welfare regimes were considered.^{4 19 20} The social democratic regimes of Nordic countries have high levels of social transfers, which should lower health risks associated with deprivation and thereby reduce the disability disadvantage in the low-SES groups. In contrast the Beveridgian and Bismarkian regimes of Western and Southern European countries correspond to a larger dependency on the labour market, with different levels of social transfers and health care systems.²² Low social transfers and uneven care access could exacerbate inequalities in exposures and in ability to afford care; they could increase the disadvantage of low-SES groups and/or the advantage of high-SES groups. Western and Southern European countries are examined separately; the higher reliance on family support in the latter might lower disability disadvantages, if informal care giving compensates for unmet needs. Finally, the move of Eastern European and Baltic countries from centralized state control of production to a market economy has resulted in improving health care systems, but with an increasing share of private expenses;²³ these changes are likely to both increase advantages and disadvantages of high- and low-SES groups, but in what proportions is unclear.

In this context, we analysed the variation across 26 European countries in the extent of excess disability prevalence of low-SES groups (*disability disadvantage*) and reduced disability prevalence of high-SES groups (*disability advantage*). The aim was to identify country-

specific patterns deviating from the average pattern. We refer to the welfare regimes in line with previous studies,^{4 19 20} to highlight similarities and differences.

METHODS

DATA

The “European Union Statistics on Income and Living Conditions” (EU-SILC) is a database monitored by the national statistical offices, designed to provide comparable data across the EU. We used the 2009 EU-SILC cross-sectional data. In most countries, data is collected by *ad hoc* interview surveys, providing self-reported health and SES variables. Elsewhere, socio-demographic variables are collected through population registers; self-reported health being collected by a complementary survey, often using telephone interview. We examined sample selection, survey designs, collection mode and question wording to ensure comparability (Box S1, Table S1). Due to varying response rates, we assessed the representativeness of country samples regarding the distributions of age, occupation and education. We subsequently excluded Iceland, Luxembourg, and Malta and recommend caution for a number of other countries (see discussion). We excluded individuals aged 80 years and over due to missing information. Our study comprises 290,521 individuals aged 30-79 from 26 countries (Table 1).

DISABILITY AND EDUCATION MEASUREMENTS

Disability is based on the *Global Activity Limitation Indicator* measuring health related activity limitation (AL) with a single question: “*For at least the past six months, to what extent have you been limited because of a health problem in activities people usually do?*” (*Severely limited; Limited but not severely vs Not limited*). AL is self-reported and so varies across European countries, partly due to varying propensity to report health problems.^{24 25} However, AL is consistently correlated with more detailed measurement instruments for disability,^{24 26 27} it is predictive of mortality,²⁸ and of consumption of care services.²⁹

Education, a common proxy for SES, is strongly related to health and disability risk through a variety of pathways; specifically early life circumstances, household circumstances, job opportunities, and the development of skills to maintain health and adjust to health problems.^{30 31} We considered three groups based on the level of education achieved, using the International Standard Classification of Education¹: low (0-2 primary and lower secondary education), middle (3-4 upper secondary education) and high (5-6 tertiary education).

DATA ANALYSIS

We examined the prevalence of AL by country and education, across the 30-79 age range as a whole and in three age-bands (30-49, 50-64, and 65-79 year-olds) to highlight changes between birth cohorts. Prevalence is standardized to the pooled weighted sample population by the 5-year age group.

The relative AL advantage and disadvantage of the high- and low-educated groups are assessed using logistic regression models, pooling the data from the 26 countries². We estimated odds ratios (ORs) for AL using a *country by education* interaction term, with the middle-educated group as reference. The model is adjusted for age, sex and country (to account for the country variation in the level of AL). From this model, we derived the 26 country-specific predictive margins for the three educational groups, and estimated the (unweighted) predictive margins for the all countries average (Table S2); we obtained the country-specific and all-countries average ORs of AL for the high- and low-educated groups, related to the middle-educated group. The country-specific ORs represent the relative disability advantage of being in a high-educated group and disadvantage of being in a low-educated group in a country, which can then be compared to the average pattern³. The model was run for the 30-79 age range, and then separately for the three age-bands.

¹ <http://www.uis.unesco.org/education/pages/international-standard-classification-of-education.aspx>

² Logistic regression equation (models included EU-SILC baseline weights):

$AL = \beta_1 \text{Country} + \beta_2 \text{Age} \cdot \text{Country} + \beta_3 \text{Sex} \cdot \text{Country} + \beta_4 \text{Education} \cdot \text{Country}$

³ The model was repeated with each of the 26 countries as reference, to test differences between countries (Table S3).

Table 1: Country description: welfare regime, EU-SILC participation rate, sample sizes for ages 30-79 years old, distribution across educational groups, prevalence of activity limitation (AL) and differentials. 2009

Countries		EU-SILC Individual participation rate (all ages)*	Study sample and weighted distribution in the 30-79 years old				Prevalence of AL in the 30-79 years old (weighted)				AL differentials (High – Low)	
			Sample size	% Low-educated	% Middle-educated	% High-educated	All (%)	Low-educated	Middle-educated	High-educated		
Group 1: Nordic Countries												
DK	Denmark	53.5%	4,702	29.6	41.7	28.7	26.2	37.2	22.4	20.3	16.9	
FI	Finland	79.2%	7,651	26.2	39.7	34.0	31.4	43.0	31.1	22.7	20.3	
NO	Norway	60.4%	4,021	22.3	46.4	31.3	17.8	28.7	18.1	9.5	19.2	
SE	Sweden	73.0%	5,661	17.8	50.4	31.8	16.3	24.4	17.2	10.5	13.9	
Group 2: Western European countries												
AT	Austria	71.1%	8,499	21.8	60.2	18.0	29.9	44.9	27.4	20.5	24.4	
BE	Belgium	62.7%	8,796	37.2	30.6	32.1	24.9	37.0	21.4	14.1	22.9	
DE	Germany	76.5%	19,083	17.3	57.8	24.9	35.9	50.6	35.9	25.5	25.1	
FR	France	82.7%	14,925	36.8	40.4	22.8	24.9	36.5	21.0	12.8	23.7	
IE	Ireland	78.9%	7,203	43.2	28.2	28.6	22.0	32.4	17.5	10.8	21.6	
NL	Netherlands	83.4%	8,051	30.3	39.6	30.0	28.9	41.2	26.5	19.7	21.5	
UK	United Kingdom	71.3%	10,937	24.5	46.1	29.5	22.9	36.7	21.0	14.3	22.4	
Group 3: Southern European countries												
CY	Cyprus	89.5%	5,266	34.8	37.4	27.8	19.6	34.0	14.8	8.1	25.9	
ES	Spain	81.0%	21,582	52.7	19.7	27.6	24.0	32.0	18.4	12.7	19.3	
GR	Greece	84.0%	11,065	45.0	33.0	22.0	18.0	29.6	10.2	5.8	23.8	
IT	Italy	83.7%	32,278	54.1	33.6	12.3	25.9	35.1	16.4	11.7	23.4	
PT	Portugal	86.4%	7,266	76.2	12.0	11.8	30.3	34.8	17.4	14.4	20.4	
Group 4: Baltic and Eastern European countries												
CZ	Czech Republic	82.3%	13,416	13.0	74.5	12.6	24.6	44.3	23.3	12.5	31.8	
BG	Bulgaria	77.2%	9,910	29.6	51.4	19.1	17.3	25.9	14.1	12.5	13.4	
EE	Estonia	74.0%	7,736	15.1	53.3	31.5	32.0	56.4	31.8	20.5	35.9	
HU	Hungary	84.5%	15,196	25.1	56.7	18.2	33.2	52.3	29.2	19.1	33.2	
LT	Lithuania	86.9%	8,169	21.0	54.8	24.3	25.5	46.2	23.2	12.9	33.3	
LV	Latvia	78.3%	8,788	19.7	56.3	24.0	34.8	52.5	33.3	23.6	28.9	
PL	Poland	76.3%	21,562	20.0	63.8	16.2	25.9	44.8	23.1	13.4	31.4	
RO	Romania	96.2%	12,421	36.0	53.4	10.6	23.3	34.8	18.2	10.1	24.7	
SI	Slovenia	77.7%	7,069	23.7	56.5	19.8	27.7	41.0	26.0	16.8	24.2	
SK	Slovakia	88.5%	9,268	10.2	72.7	17.1	40.3	69.4	39.3	26.9	42.5	
Total		-	290,521	32.9	44.8	22.3	26.9	37.3	24.7	16.2	21.1	

Source: EU-SILC data (2009)

* Coverage of the individual file compared to the total household file

RESULTS

DISABILITY PREVALENCE ACROSS EDUCATIONAL GROUPS

The age-standardized prevalence of AL varies across the 26 countries, both within the four welfare regime groups (Table 1) and by age-band (Figure 1). In Figure 1, we represented the relative proportion of the educational groups within the populations by the size of the circles. Thus in Nordic and Western countries low-educated groups are generally larger in the oldest age-band than in the youngest one, in contrast to Eastern and Southern countries, justifying the analyses for each age-band.

Low-educated groups consistently show the highest AL prevalence and high-educated groups the lowest prevalence, although the gap differs between countries and age-bands. There is no evidence for a systematic relationship between the relative size of the groups and the size of the differentials. Based on prevalence, no consistent pattern is found within welfare regime groups regarding the magnitude of the advantage/disadvantage across educational groups, partly due to the different levels of AL.

DISABILITY ADVANTAGES AND DISADVANTAGES

Figure 2 shows the country-specific ORs of AL, with their 95% confidence intervals and the average AL advantage/disadvantage plotted in dotted lines (respectively 0.65 and 1.48 in the 30-79 age group). This Figure 2 shows where the AL-advantage/disadvantage is greater or smaller compared to that expected based on the average effect of being in a high- or low-educated group (controlling for country-specific level of AL, age and sex). A number of countries deviated from the average pattern. More specifically two out of the four Nordic countries, Sweden and Finland, showed a significantly smaller AL-disadvantage relative to the average for the low-educated groups, in the 30-79 age-group (and across age-bands although not statistically significant). However the disadvantage was significantly larger in Norway and Denmark compared to Sweden and Finland (Table S3). In addition the relative

AL-advantage for the high-educated groups was smaller in Denmark, but larger than average in Norway and more pronounced than in most other countries (Table S3).

The relative AL-advantage/disadvantage patterns were generally similar across Western and Southern countries, and were close to the average. However there are some exceptions. In the 30-79 age group low-educated Belgians and Italians experience a larger AL-disadvantage compared to the average. In the youngest age group (30-49 years), the youngest low-educated Italians and Spaniards experienced a smaller AL-disadvantage (only significant for Spaniards). High-educated Germans had a larger advantage.

In Baltic and Eastern European countries, a similar advantage/disadvantage pattern is found across half of the countries. There was a larger AL-advantage for the high-educated group in Czech Republic, Estonia, Hungary, Lithuania and Romania; but smaller among oldest Poles. The AL-disadvantage was also larger among low-educated Czechs and Hungarians, but smaller among Romanians and the oldest Bulgarians.

DISCUSSION

SUMMARY OF FINDINGS AND COMPARISON WITH OTHER STUDIES

Controlling for the variation in the prevalence of AL across countries, our results identified countries where the AL-advantage and disadvantage across educational groups deviate from the average pattern; we found intuitive links to specific welfare regimes, although not systematically.

In line with previous studies, the Nordic countries did not conform to a common pattern with Sweden generally showing small health differentials and Norway large ones.^{4 19 32 33} The small disability differential in Sweden results from an AL-disadvantage of the low-educated group (relative to middle-educated), which is smaller than the average; the same is found in Finland. The larger differential in Norway results from the larger AL-advantage of the high-educated groups and rather large AL-disadvantage of the low-educated. In Denmark, the rather large

AL-disadvantage for the low-educated group combined with an unexpectedly smaller advantage of the high-educated group (relative to the middle-educated group). Beyond the common protective and redistributive policies in these countries, various features of the national contexts (such as health systems, income variation, or health related practices) are likely to affect the level of self-reported AL as well as the protective and hazardous exposures for low-educated and high-educated. Further focus on the specific cases that deviate from the average is justified therefore, in order to better understand how these differentials arise and are maintained. For instance, it would be of interest to explore the reduced relative AL-advantage of the high-educated Danes since this might arise from greater similarity in the health chances of middle- and high-educated groups whilst the low-educated group lag behind, or to a higher level of unfavourable exposures relative to other high-educated Europeans. Interestingly, this could be related to the small difference in tobacco consumption between educational groups (which is linked to disability) in Denmark.^{4 34-36} Additionally, the increased disability advantage of high-educated Norwegians may be related to the larger income inequalities which affect health outcomes in this country³² (relative to other countries) as well as a larger private share of health expenses.²² Regarding disability, the greater advantage of high-educated groups may be related to differences in individual resources for adjusting life and work conditions to mitigate the disabling effects of functional limitations.

Although the patterns were more homogeneous within the three other welfare regime groups, there were again exceptions. Low-educated groups experience rather large relative AL-disadvantage in Belgium, Italy, Czech Republic and Hungary. This pattern may be influenced by a combination of lower social transfers and private grounded health systems which act to increase unmet needs.¹⁸ The high-educated groups experience larger relative disability advantage in half of the Baltic and Eastern European countries and for the youngest age-band in Germany: more selected access to health care, protection and prevention programmes for the better-off groups may be driving this imbalance.²³ In the Czech Republic and Hungary, the educational gradient in disability is stretched at both ends. How this situation arose in

these countries, where the AL prevalence is often high, is important for understanding current (and future) SES health differentials.

Our study showed varying patterns across birth cohorts, in line with earlier findings.^{32 37} The rather small health differentials found in Germany in previous studies^{4 19} could be disproportionately affected by the oldest generations, since in the youngest age group a larger advantage for the high-educated group compared to the average was found. We also found a reduced AL-disadvantage in Spain in the youngest cohorts (almost significant in Italy). It may be that family support and informal care-giving in these countries possibly limit the effects of deprivation and reducing unmet needs. However this pattern was not found in the oldest cohort, which had a higher prevalence of AL and related need for care. Assessing cohort variation is not straightforward, especially when due to mortality selection effects, but our results confirm the need to investigate them further.

The variation in the AL-advantage/disadvantage across educational groups indicates where national contexts differently affect the various SES groups. Whether this variation is due to specific policy actions which result in uneven health returns for the different SES groups is of interest; particularly those policies that reduce SES health gaps (universal policies, proportional universalism, targeted policies).³⁸ Such policies can modify the level of access to care, health related practices or socioeconomic circumstances of low- and high-educated groups, contributing to reducing SES differentials.^{20 32} Socioeconomic variables from EU-SILC (such as income, occupation, or employment status) could be further used to assess their contribution to the AL advantage/disadvantage of educational groups - although their level of comparability is also challenging. In parallel, macroeconomic variables could be considered as possibly modifying the extent of the AL-advantage/disadvantage³³ (economic development, social transfers, health funding systems, and disability policies).

LIMITATIONS OF THE DATA

The EU-SILC dataset provides disability data for a very large sample of European countries. However there are a number of limitations to consider. After stratification by age group and education, a country sample is limited in size and for this reason we did not repeat analyses by sex; this lack of precision limits the scope to detect statistical significance and, therefore, inferential interpretation of country patterns. Furthermore, the large number of estimates implies a risk of type I statistical errors among our results; although part of our findings are consistent with the literature, others need to be explored in new studies and using other datasets, to deepen the explanatory part of the analysis.

The comparability of the datasets is generally an issue in international studies and we addressed this issue. Facing a varying response rates, we highlighted where there was good representativeness of sample, then excluding a number of countries (Box S1, Table S1). We included Slovakia, UK and Sweden despite a slight under-representation of the low-educated in these samples; this carries a risk of underestimation of their AL-disadvantage (poor health being associated with non-participation).³⁹ Regarding comparability of the wording, AL in EU-SILC is harmonized for most countries, however some differences persist (Box S1); for instance the Bulgarian question refers to “activity limitations at work” which might orient the respondent’s answer and induce different patterns compared to other countries.

More generally, AL is self-reported which may result in variations in the propensity to report disability. The wording of the question, the mode of data collection, and the cultural perception of health might affect the reported prevalence. Disability indicators are usually less sensitive to health perception than self-perceived health or diseases, but we cannot distinguish cultural differences although our model adjusts for country levels.^{27 40}

The comparison of health differentials between educational groups requires caution due to the varying meaning (and coding) of educational levels and the changing relative size of the groups (Figure 1). We did not account for the proportion of the groups in the models to

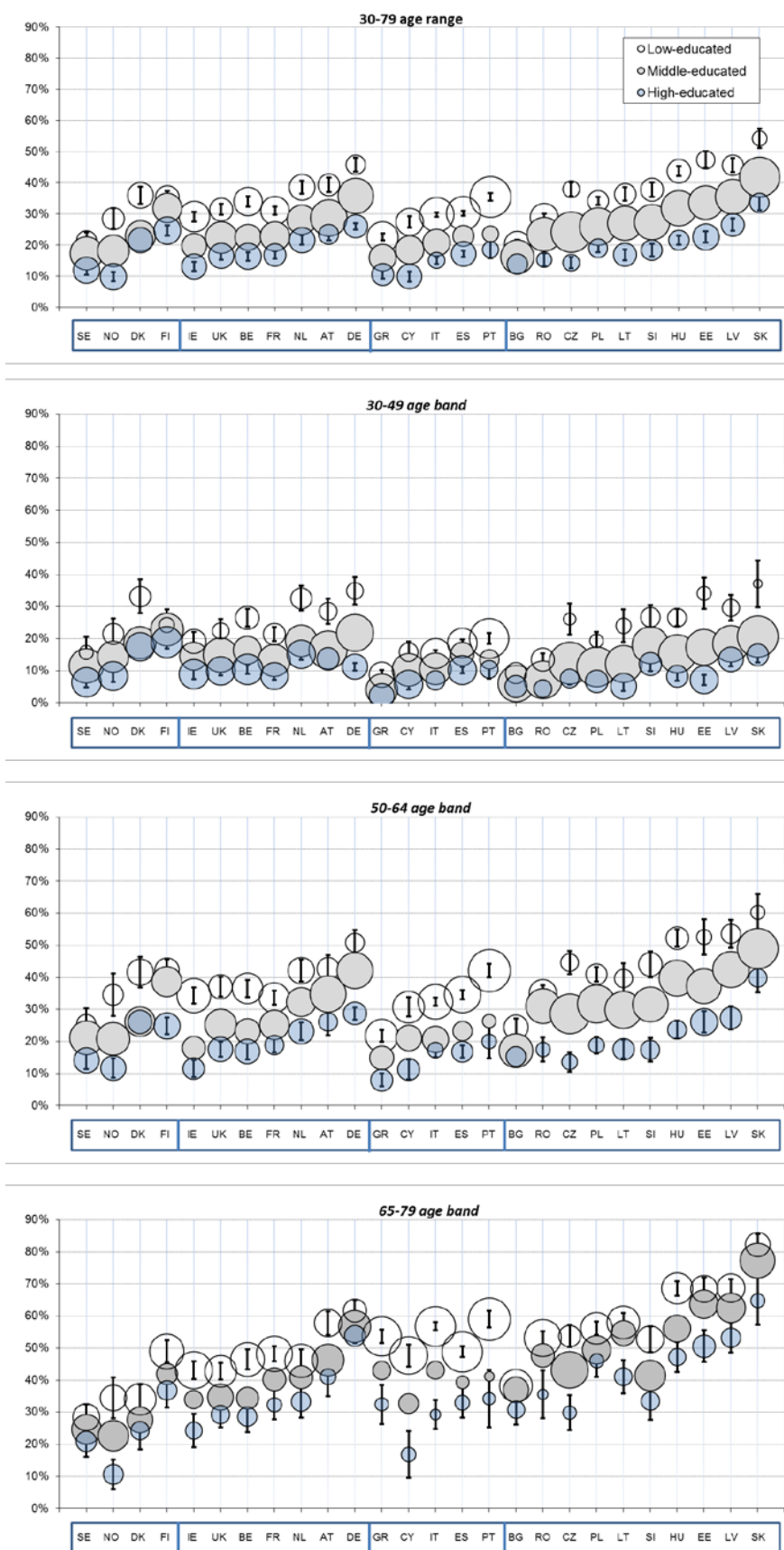
control for possible selection effects (the smaller a group possibly the more selected on health and socioeconomic related characteristics) as there was no obvious systematic pattern between the size of the group and the level of advantage/disadvantage. As suggested earlier, further adjusting for a number of socioeconomic characteristics of the groups might be more effective in explaining the different meaning of educational levels.

CONCLUSION

Despite these limitations, this paper brings novel results through exploration of the extent to which disability patterns for low- and high-educated groups vary across countries. We found some unsurprising results: a reduced disability disadvantage of low-educated groups in two Nordic countries, probably benefitting from the protective policies and publically grounded health systems; a larger advantage of high-educated groups in Baltic and Eastern European countries where more privately grounded policies and health systems might translate into a general advantage of the high-educated group. But we also found inconsistency within welfare regime groups. These results confirm the need for refining policy contexts in countries to better understand the role of specific schemes on SES differentials in disability. Repeated with other datasets, and further enriched by qualitative indicators on the country context, our findings could contribute to the debate on which policy responses are needed to reduce disability inequalities. Depending on whether high-educated groups progress faster and/or low-educated groups lag behind, our approach could help policy makers to make decisions on the relative benefits of increasing social and health protection and prevention actions.

FUNDINGS: This research was part of the European Joint-Action on European Health and Life Expectancy Information System (JA-EHLEIS) funded by the Executive Agency for Health and Consumer of the European Commission (Agreement number 2010 23 01).

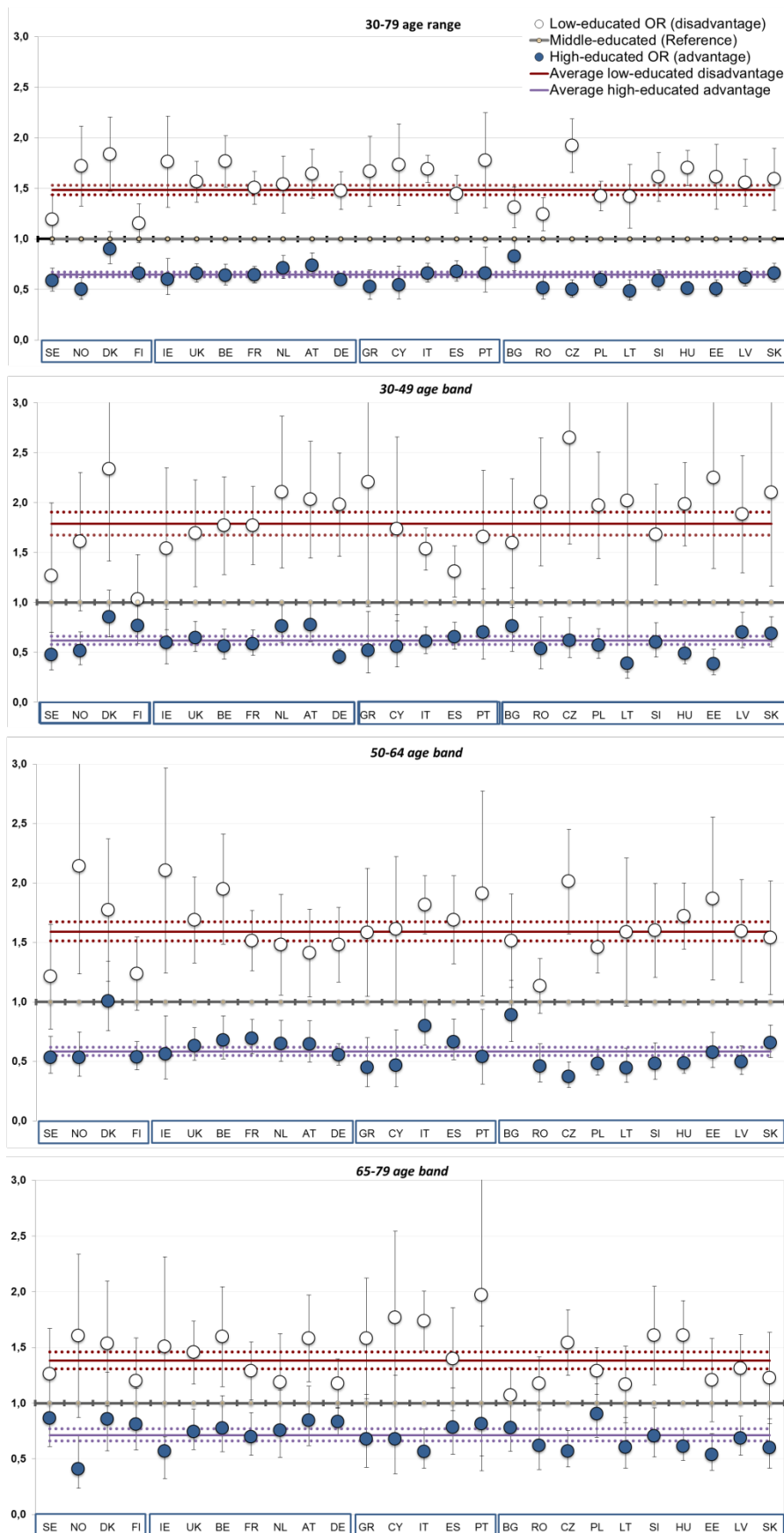
Figure 1: Age-standardized* prevalence of activity limitation in low-, middle-, and high-educated groups and the size of the educational group by age groups (represented by the size of the circles) - 26 European countries by welfare regimes (Nordic, Western, Southern, Eastern and Baltic countries) in 2009, and 95% confidence intervals.



* Standardized by the 5-year age group distribution of the pooled weighted sample, ordered by AL in middle-educated group in the 30-79 age-band

Country labels: Austria (AT), Belgium (BE), Bulgaria (BG), Cyprus (CY), Czech Republic (CZ), Germany (DE), Denmark (DK), Estonia (EE), Finland (FI), France (FR), Greece (GR), Hungary (HU), Ireland (IE), Italy (IT), Latvia (LV), Lithuania (LT), Netherland (NL), Norway (NO), Poland (PL), Portugal (PT), Romania (RO), Slovakia (SK), Slovenia (SI), Spain (ES), Sweden (SE), United Kingdom (UK)

Figure 2: Country-specific and average odds ratios of AL associated to high- and low- educated groups, compared to middle-educated group (after adjustment on country, sex and age)* by age groups and by welfare regimes (Nordic, Western, Southern, Eastern and Baltic countries).



* Note:

- Model: $AL = \beta_{country} * country + \beta_{age\#country} * age\#country + \beta_{sex\#country} * sex\#country + \beta_{LowEd\#country} * LowEd\#country + \beta_{HighEd\#country} * High\#country$

- Average Odds ratios (ORs) using average predicted margins $[p_{high} / (1 - p_{high})] / [p_{middle} / (1 - p_{middle})]$.

95% Confidence intervals were computed based on the variance of the 26 country specific ORs (Supplementary material Table S2).

- Country labels: Austria (AT), Belgium (BE), Bulgaria (BG), Cyprus (CY), Czech Republic (CZ), Germany (DE), Denmark (DK), Estonia (EE), Finland (FI), France (FR), Greece (GR), Hungary (HU), Ireland (IE), Italy (IT), Latvia (LV), Lithuania (LT), Netherland (NL), Norway (NO), Poland (PL), Portugal (PT), Romania (RO), Slovakia (SK), Slovenia (SI), Spain (ES), Sweden (SE), United Kingdom (UK)

FIGURES' LEGEND AND FOOTNOTE:

Figure 1: Age-standardized* prevalence of activity limitation in low-, middle-, and high-educated groups and the size of the educational group by age groups (represented by the size of the circles) - 26 European countries by welfare regimes (Nordic, Western, Southern, Eastern and Baltic countries) in 2009, and 95% confidence intervals.

* Standardized by the 5-year age group distribution of the pooled weighted sample, ordered by AL in middle-educated group in the 30-79 age-band
Note: Country labels: Austria (AT), Belgium (BE), Bulgaria (BG), Cyprus (CY), Czech Republic (CZ), Germany (DE), Denmark (DK), Estonia (EE), Finland (FI), France (FR), Greece (GR), Hungary (HU), Ireland (IE), Italy (IT), Latvia (LV), Lithuania (LT), Netherland (NL), Norway (NO), Poland (PL), Portugal (PT), Romania (RO), Slovakia (SK), Slovenia (SI), Spain (ES), Sweden (SE), United Kingdom (UK)

Figure 2: Country-specific and average odds ratios of AL associated to high- and low- educated groups, compared to middle-educated group (after adjustment on country, sex and age) + by age groups and by welfare regimes (Nordic, Western, Southern, Eastern and Baltic countries).

+ Model: $AL = \beta_{country} * country + \beta_{age\#country} * age\#country + \beta_{sex\#country} * sex\#country + \beta_{LowEd\#country} * LowEd\#country + \beta_{HighEd\#country} * High\#country$

Average Odds ratios (OR) using average predicted margins [$p_{high} / (1 - p_{high})$] / [$p_{middle} / (1 - p_{middle})$]. Confidence intervals for the average ORs are computed based on the sum of the country specific variance. Supplementary material Table S2

Note: Country labels: Austria (AT), Belgium (BE), Bulgaria (BG), Cyprus (CY), Czech Republic (CZ), Germany (DE), Denmark (DK), Estonia (EE), Finland (FI), France (FR), Greece (GR), Hungary (HU), Ireland (IE), Italy (IT), Latvia (LV), Lithuania (LT), Netherland (NL), Norway (NO), Poland (PL), Portugal (PT), Romania (RO), Slovakia (SK), Slovenia (SI), Spain (ES), Sweden (SE), United Kingdom (UK)

REFERENCES

- 1 Jagger C, Gillies C, Moscone F, *et al.* Inequalities in Healthy life expectancies in EU25: a cross-national meta-regression analysis. *Lancet* 2008;372:2124-31.
- 2 Solé-Auró A, Crimmins EM. The Oldest Old: Health in Europe and the United States. In: J.-M. Robine, Jagger C, Crimmins EM, eds. *Healthy Longevity, A Global Approach*. Annual Review of Gerontology and Geriatrics, Springer Publishing Company, 2013:3-33.
- 3 Crimmins E, Cambois E. Social inequalities in health expectancy. In: Robine JM, Jagger C, Mathers C, Crimmins E, Suzman R, eds. *Determining health expectancies*. John Wiley & Sons, Ltd:Chichester, 2003:111-26.
- 4 Mackenbach JP, Stirbu I, Roskam AJ, *et al.* Socioeconomic inequalities in health in 22 European countries. *N Engl J Med* 2008;23:2468-81.
- 5 Maki N, Martikainen P, Eikemo T, *et al.* Educational differences in disability-free life expectancy: a comparative study of long-standing activity limitation in eight European countries. *Soc Sci Med* 2013:1-8.
- 6 Jagger C, McKee M, Christensen K, *et al.* Mind the gap--reaching the European target of a 2-year increase in healthy life years in the next decade. *Eur J Public Health* 2013:1-5.
- 7 Marmot M, Friel S, Bell R, Houweling TAJ, Taylor S. Closing the gap in a generation: health equity through action on the social determinants of health. *The Lancet* 2008;372:1661-69.
- 8 Lagiewka K. European innovation partnership on active and healthy ageing: triggers of setting the headline target of 2 additional healthy life years at birth at EU average by 2020. *Archives of Public Health* 2012;1:23.
- 9 Rechel B, Grundy E, Robine JM, *et al.* Ageing in the European Union. *Lancet* 2013;9874:1312-22.
- 10 Robine JM, Cambois E, Nusselder W, Jeune B, Van Oyen H, Jagger C. The joint action on healthy life years (JA: EHLEIS). *Arch Public Health* 2013;1:1-5.
- 11 World Health Organization. *International classification of functioning, disability and health: ICF*. WHO 2001.

- 12 Verbrugge L, Rennert C, Madans J. The great efficacy of personal and equipment assistance in reducing disability. *Am J Public Health* 1997;3:384-92.
- 13 Eikemo TA, Bambra C, Judge K, Ringdal K. Welfare state regimes and differences in self-perceived health in Europe: a multilevel analysis. *Soc Sci Med* 2008;11:2281-95.
- 14 Mackenbach JP, Karanikolos M, McKee M. The unequal health of Europeans: successes and failures of policies. *Lancet* 2013;9872:1125-34.
- 15 Navarro V, Shi L. The political context of social inequalities and health. *Int J Health Serv* 2001;1:1-21.
- 16 Lundberg O, Yngwe MA, Stjarne MK, *et al.* The role of welfare state principles and generosity in social policy programmes for public health: an international comparative study. *Lancet* 2008:1633-40.
- 17 Eikemo TA, Bambra C. The welfare state: a glossary for public health. *J Epidemiol Community Health* 2008;1:3-6.
- 18 Brennenstuhl S, Quesnel-Vallee A, McDonough P. Welfare regimes, population health and health inequalities: a research synthesis. *J Epidemiol Community Health* 2012;5:397-409.
- 19 Eikemo TA, Huisman M, Bambra C, Kunst AE. Health inequalities according to educational level in different welfare regimes: a comparison of 23 European countries. *Sociol Health Illn* 2008;4:565-82.
- 20 Avendano M, Jürges H, Mackenbach JP. Educational level and changes in health across Europe: longitudinal results from SHARE. *Journal of European Social Policy* 2009;4:301-16.
- 21 Huijts T, Eikemo TA. Causality, social selectivity or artefacts? Why socioeconomic inequalities in health are not smallest in the Nordic countries. *Eur J Public Health* 2009;5:452-3.
- 22 OECD. *Health care systems: Getting more value for money* OECD Economics Department Policy Notes, 2, 2010.
- 23 Rechel B, McKee M. Health reform in central and eastern Europe and the former Soviet Union. *Lancet* 2009:1186-95.
- 24 Berger N, Van Oyen H, Cambois E, *et al.* Assessing the validity of the Global Activity Limitation Indicator in fourteen European countries. *BMC Medical Research Methodology* 2015;1.
- 25 Jürges H. True health vs response styles: exploring cross-country differences in self-reported health. *Health Econ* 2007;2:163-78.
- 26 Cabrero-Garcia J, Julia-Sanchis R. The Global Activity Limitation Index mainly measured functional disability, whereas self-rated health measured physical morbidity. *J Clin Epidemiol* 2014;4:468-76.
- 27 Jagger C, Gillies C, Cambois E, Van Oyen H, Nusselder W, Robine J-M. The Global Activity Limitation Indicator (GALI) measured function and disability similarly across European countries. *J Clin Epidemiol* 2010;8:892-99.
- 28 Van der Heyden J, Berger N, Van Oyen H. Comparison of self-rated health and activity limitation as predictors of short term mortality in the older population. *Public Health* 2015.
- 29 Van der Heyden J, Berger N, Yokota R, Van Oyen H. Activity Limitation predict health expenditures in the general population in Belgium. *BMC Public Health* 2015;267.
- 30 Baker D, Leon J, Smith Greenaway E, Collins J, Movit M. The education effect on population health: a reassessment. *Popul Dev Rev* 2011;2:307-32.
- 31 Montez JK, Hayward MD. Cumulative Childhood Adversity, Educational Attainment, and Active Life Expectancy Among U.S. Adults. *Demography* 2014;2:413-35.
- 32 Huijts T, Eikemo TA, Skalicka V. Income-related health inequalities in the Nordic countries: examining the role of education, occupational class, and age. *Soc Sci Med* 2010;11:1964-72.

- 33 Kangas O, Blomgren J. Socio-economic differences in health, income inequality, unequal access to care and spending on health: A country-level comparison of Finland and 16 other European countries. *Research on Finnish Society* 2014;51-63.
- 34 Van Oyen H, Berger N, Nusselder W, *et al.* The effect of smoking on the duration of life with and without disability, Belgium 1997–2011. *BMC Public Health* 2014.
- 35 Brønnum-Hansen H, Juel K. Smoking expands expected lifetime with musculoskeletal disease regardless of educational level. *Eur J Epidemiol* 2004;19:195-96.
- 36 Cavelaars A, Kunst A, Geurts J, *et al.* Educational differences in smoking: international comparison. *British Medical Journal* 2000;7242:1102-07.
- 37 Bambra C, Netuveli G, Eikemo TA. Welfare state regime life courses: the development of western European welfare state regimes and age-related patterns of educational inequalities in self-reported health. *Int J Health Serv* 2010;3:399-420.
- 38 Marmot M. *Fair Society, Healthy Lives: Strategic review of health inequalities in England post-2010: The Marmot Review*, 2010.
- 39 Lorant V, Demarest S, Miermans PJ, Van Oyen H. Survey error in measuring socio-economic risk factors of health status: a comparison of a survey and a census. *Int J Epidemiol* 2007;6:1292-9.
- 40 Tubeuf S, Jusot F, Devaux M, Sermet C. *Social heterogeneity in self-reported health status and measurement of inequalities in health*. IRDES DT, 12, 2008.

**Box S1. International comparability of the 2009 EU-SILC database:
collection mode, samples and questionnaires**

Individual participation rates for the 2009 EU-SILC database are varying across countries, being sometimes very low (Table S1). This is a critical issue because poor health might be a reason for not participating and might differ across SES³⁵.

First, it seems that low participation is associated with the varying administration mode (i.e., telephone interview leading to the lowest participation rates).

Second, in most countries the sample distribution (weighted) remains accurate with regard to age, education and occupation structure, compared with the “gold standard” provided by the Labour Force Survey; except in Iceland, Luxembourg, and Malta which were excluded from this study. However, we recommend caution for countries where low-educated groups are over-represented (Ireland, Belgium, Slovenia, Lithuania, Portugal) or under-represented (United Kingdom, Sweden, Slovakia) (compared to the Labour Force Survey distribution).

Third, regarding the wording of the question on activity limitation, a 2009 Eurostat report showed that 14 out of 26 countries under study used a comparable wording. Among the rest of the 12 countries, 7 referred to limitations in the respondent's activities (which omit activities the respondent never do due to his/her health problem) with possible underestimation of the overall limitations (Belgium, Cyprus, Greece, Lithuania, Latvia, Romania, Slovakia); 5 used different questions either referring to specific rather than general activities (i.e. work) or by using filters before exploring the severity and/or length of limitations (Bulgaria, Germany; Hungary, the Netherlands, United Kingdom). Among these 12 countries, when possible we compared EU-SILC prevalence to other datasets using similar questions (i.e. the Survey on Health, Ageing and Retirement in Europe 2010 or the European Health Interview survey circa 2008). EU-SILC usually provides lower levels of activity limitation (except for Belgium) due to wording and/or survey issues (coverage, response rate...).

We also need to consider possible variation in the self-reported information on educational level. Although we used the international classification, the national educational system and how it changed across generation might be an issue for the comparison.

Table S1: Summary of the 2009 EU-SILC information: collection mode, sample size for the individual information and coverage rates, sub-sample with health information, and reason for attrition from individual sample to the sub-sample with health information. Individuals aged 30-79.

	EU-SILC Collection mode*	EU-SILC individual sample		Sub-Sample (health questions)	Attrition from the total EU-SILC individual sample to sub sample with health information					
		Size (all ages)	Coverage compared to the Total Household file		Size (all ages)	Attrition (%)	Reasons for attrition**			
				Unknown			Proxy	Register data	Non- response to the health questions	Age under 16
AT	F-F / CATI	13610	71.1%	11054	19%	0.0%	0.0%	0.0%	0.0%	18.7%
BE	F-F	14721	62.7%	11651	21%	0.0%	0.0%	0.0%	0.6%	20.2%
BG	F-F	15047	77.2%	13148	13%	0.4%	0.0%	0.0%	0.0%	12.2%
CY	F-F	9283	89.5%	7553	19%	0.0%	0.0%	0.0%	0.0%	18.6%
CZ	F-F	23302	82.3%	16827	28%	0.0%	12.2%	0.0%	0.0%	15.5%
DE	Self-Administered	28368	76.5%	23686	17%	0.5%	0.0%	0.0%	0.4%	15.6%
DK	Register / CATI	15025	53.5%	5866	61%	0.0%	38.6%	0.0%	0.0%	22.4%
EE	F-F	13542	74.0%	11220	17%	0.0%	0.0%	0.0%	0.6%	16.5%
ES	F-F / CATI	36865	81.0%	30418	17%	0.0%	0.0%	0.0%	1.1%	16.4%
FI	Register / CATI	25157	79.2%	9962	60%	0.6%	38.5%	0.0%	0.1%	21.3%
FR	F-F	25611	82.7%	20113	21%	0.0%	0.0%	0.0%	0.4%	21.0%
GR	F-F / CATI	18035	84.0%	15045	17%	0.7%	0.0%	0.0%	0.0%	15.8%
HU	F-F	25053	84.5%	20354	19%	0.3%	0.0%	0.0%	2.1%	16.3%
IE	Register / F-F	12641	78.9%	9900	22%	0.0%	0.0%	0.0%	0.0%	21.7%
IT	F-F	51196	83.7%	42159	18%	0.4%	0.0%	0.0%	1.5%	15.8%
LT	F-F / CATI	12852	86.9%	10700	17%	3.0%	0.0%	0.0%	0.9%	12.8%
LV	Register/ F-F /CATI	14403	78.3%	12066	16%	0.0%	0.0%	0.0%	1.0%	15.3%
NL	Register / CATI	23687	83.4%	9717	59%	0.0%	35.6%	0.0%	0.0%	23.3%
NO	Register / CATI	13855	60.4%	5349	61%	0.0%	35.2%	1.2%	0.6%	24.4%
PL	F-F	38541	76.3%	29228	24%	0.0%	0.0%	0.0%	6.3%	17.9%
PT	F-F	13013	86.4%	11091	15%	0.5%	0.0%	0.0%	0.0%	14.2%
RO	F-F	18703	96.2%	16282	13%	0.3%	0.0%	0.0%	0.0%	12.7%
SE	Register / CATI	18441	73.0%	7540	59%	0.0%	39.3%	0.0%	0.0%	19.8%
SI	Register/ F-F /CATI	29576	77.7%	9276	69%	0.0%	0.0%	53.6%	0.0%	15.0%
SK	F-F	16137	88.5%	13636	15%	0.1%	0.0%	0.0%	1.1%	14.3%
UK	F-F	19380	71.3%	15359	21%	0.0%	0.0%	0.0%	1.3%	19.4%

Source: Eurostat, 2009 comparative EU intermediate quality report, version 3, July 2012.

Country labels: Austria (AT), Belgium (BE), Bulgaria (BG), Cyprus (CY), Czech Republic (CZ), Germany (DE), Denmark (DK), Estonia (EE), Finland (FI), France (FR), Greece (GR), Hungary (HU), Ireland (IE), Italy (IT), Latvia (LV), Lithuania (LT), Netherland (NL), Norway (NO), Poland (PL), Portugal (PT), Romania (RO), Slovakia (SK), Slovenia (SI), Spain (ES), Sweden (SE), United Kingdom (UK).

*Collection modes: Registers; F-F (Paper and pencil or computer assisted interview); CATI= Computer Assisted Telephone Interview; Self-administered

**EU-SILC data collection for household is based on registers in a number of countries. In these countries, specific information on individuals is collected by a separate data collection, mainly processed by telephone and going with low participation. Furthermore, individual information on health is only available for a sub-sample of individuals: this is first due to the age threshold (information collected for the 16 year old and above only), then to country-specific rules for proxies (proxies not allowed in a number of countries for health information), non-response to the health question; use of register data for part of sample in a number of countries, not specified.

Table S2: Predicted probabilities (margins) from logistic regression models for activity limitation in the whole 30-79 age range and in three age-bands for 26 countries, using EU-SILC 2009 (with 95% confidence intervals) – All countries average predicted margin and associated odds ratios*

	In the 30-79 age range			In the 30-49 age band			In the 50-64 age band			In the 64-79 age band		
	Low-educated	Middle-educated	High-educated	Low-educated	Middle-educated	High-educated	Low-educated	Middle-educated	High-educated	Low-educated	Middle-educated	High-educated
AT	39% [36-41]	28% [27-30]	23% [21-25]	28% [24-33]	16% [15-18]	13% [10-15]	42% [37-47]	34% [31-36]	25% [20-29]	57% [53-61]	46% [42-49]	42% [35-49]
BE	33% [32-35]	22% [21-24]	16% [14-17]	26% [22-29]	16% [14-19]	10% [8-12]	37% [34-40]	23% [20-26]	17% [14-20]	45% [42-48]	34% [29-38]	28% [23-33]
BG	19% [18-21]	16% [15-17]	14% [12-15]	9% [7-11]	6% [5-7]	5% [3-6]	22% [19-26]	16% [14-18]	14% [11-18]	38% [35-41]	36% [32-40]	30% [25-36]
CY	28% [25-30]	19% [16-21]	11% [9-14]	16% [11-21]	10% [8-12]	6% [4-8]	30% [26-34]	21% [17-25]	11% [7-15]	47% [44-51]	34% [26-41]	26% [16-36]
CZ	36% [34-39]	24% [23-25]	14% [12-16]	25% [19-32]	11% [10-13]	7% [5-9]	44% [40-49]	28% [27-30]	13% [10-16]	53% [49-57]	42% [40-44]	29% [24-35]
DE	44% [41-46]	35% [34-36]	26% [24-27]	35% [30-40]	21% [20-23]	11% [10-12]	51% [47-55]	41% [39-43]	28% [25-31]	61% [58-65]	57% [55-59]	53% [50-56]
DK	35% [32-39]	23% [21-25]	21% [19-23]	35% [29-41]	19% [16-22]	16% [14-19]	38% [33-44]	26% [22-29]	26% [22-30]	37% [32-42]	27% [23-32]	24% [18-31]
EE	43% [40-46]	33% [32-35]	22% [20-24]	30% [23-36]	16% [14-18]	7% [5-9]	52% [44-59]	36% [33-39]	25% [21-29]	68% [64-73]	64% [60-68]	49% [43-55]
ES	30% [29-31]	23% [22-25]	17% [16-19]	18% [17-20]	15% [13-17]	10% [9-11]	34% [32-36]	23% [20-26]	17% [14-19]	48% [46-50]	40% [33-46]	34% [28-40]
FI	36% [33-38]	33% [31-35]	25% [23-26]	23% [17-29]	23% [20-25]	18% [16-21]	43% [39-47]	38% [34-41]	24% [21-28]	48% [44-52]	44% [38-49]	38% [33-44]
FR	30% [29-31]	23% [21-24]	16% [15-18]	21% [18-23]	13% [12-14]	8% [7-9]	33% [31-36]	25% [23-27]	19% [16-21]	47% [44-49]	40% [37-44]	32% [27-37]
GR	22% [20-23]	15% [14-17]	10% [8-11]	8% [5-10]	4% [3-5]	2% [1-3]	19% [17-22]	13% [10-16]	6% [4-9]	52% [49-55]	41% [34-48]	32% [24-40]
HU	43% [41-44]	32% [31-33]	21% [19-23]	25% [22-28]	14% [13-15]	7% [6-9]	52% [49-55]	38% [37-40]	23% [20-26]	68% [65-71]	57% [54-60]	45% [40-50]
IE	30% [27-32]	20% [17-23]	13% [11-15]	20% [15-24]	14% [10-17]	9% [6-11]	34% [30-38]	19% [15-24]	12% [8-15]	43% [39-48]	33% [25-42]	22% [15-29]
IT	30% [29-30]	21% [20-22]	15% [14-17]	15% [14-16]	10% [9-11]	7% [5-8]	31% [30-33]	20% [18-22]	17% [14-19]	56% [55-58]	43% [39-46]	30% [24-35]
LT	32% [29-36]	26% [24-28]	16% [14-18]	21% [12-29]	11% [9-14]	5% [3-7]	38% [31-45]	28% [25-31]	15% [11-19]	57% [53-61]	53% [48-58]	41% [33-48]
LV	44% [42-47]	35% [34-37]	26% [24-28]	29% [24-34]	18% [16-20]	13% [11-16]	53% [47-58]	41% [38-44]	26% [22-30]	68% [65-72]	62% [59-66]	53% [48-58]
NL	37% [34-40]	28% [26-30]	22% [20-24]	32% [27-38]	19% [16-21]	15% [12-17]	40% [36-45]	31% [28-35]	23% [19-26]	46% [42-50]	42% [35-48]	35% [29-41]
NO	28% [24-31]	18% [17-20]	10% [9-12]	21% [16-26]	14% [12-17]	8% [6-10]	35% [29-42]	20% [17-23]	12% [9-15]	31% [25-37]	22% [18-26]	10% [6-15]
PL	32% [31-34]	26% [25-27]	18% [17-20]	19% [16-23]	11% [10-12]	6% [5-8]	39% [37-42]	31% [29-32]	18% [15-21]	55% [53-58]	49% [46-52]	46% [40-52]
PT	36% [34-37]	25% [21-29]	19% [15-22]	20% [18-22]	13% [9-16]	9% [6-13]	41% [39-44]	27% [20-34]	16% [11-22]	59% [56-62]	43% [29-56]	38% [26-49]
RO	27% [26-29]	24% [22-25]	15% [12-17]	12% [10-14]	6% [5-7]	4% [2-5]	33% [30-36]	30% [28-33]	17% [12-21]	52% [49-54]	48% [44-52]	36% [27-45]
SE	20% [18-23]	18% [16-19]	11% [10-13]	14% [9-19]	11% [9-13]	6% [4-7]	25% [20-30]	21% [19-24]	13% [10-15]	28% [24-33]	24% [20-27]	21% [16-26]
SI	37% [35-40]	27% [26-29]	18% [16-21]	26% [22-31]	18% [15-20]	11% [9-14]	43% [38-47]	32% [29-35]	18% [14-23]	52% [48-57]	41% [37-44]	32% [26-38]
SK	50% [47-54]	41% [40-42]	34% [31-36]	34% [26-42]	20% [18-21]	14% [12-17]	59% [53-65]	48% [46-50]	38% [33-42]	81% [77-85]	78% [75-80]	68% [60-75]
UK	31% [29-32]	22% [21-24]	16% [15-17]	22% [18-26]	14% [13-16]	10% [8-11]	36% [33-40]	25% [23-27]	17% [15-20]	43% [40-46]	34% [31-37]	28% [24-32]
All countries average:												
Predicted margin (p)	33%	25%	18%	22%	14%	9%	39%	28%	19%	52%	44%	36%
Odds ratios	1.48	1.00	0.65	1.79	1.00	0.62	1.59	1.00	0.59	1.38	1.00	0.71

* Note:
- Average predicted margin p is the unweighted average of the 26 countries predicted margins, drawn from the logistic regression using 2009 EU-SILC data controlled by age, sex, country and education, by age groups, with 95% confidence intervals.

Equation: $AL = \beta_{country} * country + \beta_{age\#country} * age\#country + \beta_{sex\#country} * sex\#country + \beta_{LowEd\#country} * LowEd\#country + \beta_{HighEd\#country} * High\#country$

- Average Odds ratios (OR) are estimated using the average predicted margins: $OR \text{ for high-educated} = [p_{high} / (1 - p_{high})] / [p_{middle} / (1 - p_{middle})]$

Country labels: Austria (AT), Belgium (BE), Bulgaria (BG), Cyprus (CY), Czech Republic (CZ), Germany (DE), Denmark (DK), Estonia (EE), Finland (FI), France (FR), Greece (GR), Hungary (HU), Ireland (IE), Italy (IT), Latvia (LV), Lithuania (LT), Netherland (NL), Norway (NO), Poland (PL), Portugal (PT), Romania (RO), Slovakia (SK), Slovenia (SI), Spain (ES), Sweden (SE), United Kingdom (UK).

Table S3 (1/4): Larger (+) or smaller (-) AL advantage and disadvantage in high- and low-educated groups (compared with middle-educated) in each country compared to the other countries for the whole 30-79 age range and the three age-bands for 26 countries using EU-SILC 2009 (with level of significance) °

Panel A. Each Nordic country, compared to the other countries

AL disadvantage in low-educated groups

Low-educated	FI	SE	NO	DK	DE	FR	NL	UK	AT	IE	BE	ES	GR	IT	CY	PT	RO	BG	LT	PL	LV	SK	SI	EE	HU	CZ
FI	30-79	x	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***
	30-49	x	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***
	50-64	x	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***
	65-79	x	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***
Low-educated	FI	SE	NO	DK	DE	FR	NL	UK	AT	IE	BE	ES	GR	IT	CY	PT	RO	BG	LT	PL	LV	SK	SI	EE	HU	CZ
SE	30-79	x	**	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
	30-49	x	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
	50-64	x	**	**	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
	65-79	x	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Low-educated	FI	SE	NO	DK	DE	FR	NL	UK	AT	IE	BE	ES	GR	IT	CY	PT	RO	BG	LT	PL	LV	SK	SI	EE	HU	CZ
NO	30-79	***	***	x																						
	30-49	***	***	x																						*
	50-64	***	***	x																						
	65-79	***	***	x																						
Low-educated	FI	SE	NO	DK	DE	FR	NL	UK	AT	IE	BE	ES	GR	IT	CY	PT	RO	BG	LT	PL	LV	SK	SI	EE	HU	CZ
DK	30-79	***	***	***	x	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***
	30-49	***	***	***	x	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***
	50-64	***	***	***	x	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***
	65-79	***	***	***	x	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***

AL advantage in high-educated groups

High-educated	FI	SE	NO	DK	DE	FR	NL	UK	AT	IE	BE	ES	GR	IT	CY	PT	RO	BG	LT	PL	LV	SK	SI	EE	HU	CZ
FI	30-79	x	**	***																						
	30-49	x	**	**																						
	50-64	x		***																						
	65-79	x		**																						
High-educated	FI	SE	NO	DK	DE	FR	NL	UK	AT	IE	BE	ES	GR	IT	CY	PT	RO	BG	LT	PL	LV	SK	SI	EE	HU	CZ
SE	30-79	x		***																						
	30-49	***	x	***																						
	50-64	x		***																						
	65-79	x		**																						
High-educated	FI	SE	NO	DK	DE	FR	NL	UK	AT	IE	BE	ES	GR	IT	CY	PT	RO	BG	LT	PL	LV	SK	SI	EE	HU	CZ
NO	30-79	***		x	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***
	30-49	***		x	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***
	50-64	***		x	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***
	65-79	***	***	x	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***
High-educated	FI	SE	NO	DK	DE	FR	NL	UK	AT	IE	BE	ES	GR	IT	CY	PT	RO	BG	LT	PL	LV	SK	SI	EE	HU	CZ
DK	30-79	***	***	***	x	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***
	30-49	***	***	***	x	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***
	50-64	***	***	***	x	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***
	65-79	***	***	***	x	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***

° drawn from the 26 logistic regressions using 2009 EU-SILC data controlled by country, age, sex, country and education, by age groups:

Equation: $AL = \beta_{country} * country + \beta_{age\#country} * age\#country + \beta_{sex\#country} * sex\#country + \beta_{LowEd\#country} * LowEd\#country + \beta_{HighEd\#country} * High\#country$

- *** $p > 0,01$, ** $p > 0,05$, * $p > 0,10$

Country labels: Austria (AT), Belgium (BE), Bulgaria (BG), Cyprus (CY), Czech Republic (CZ), Germany (DE), Denmark (DK), Estonia (EE), Finland (FI), France (FR), Greece (GR), Hungary (HU), Ireland (IE), Italy (IT), Latvia (LV), Lithuania (LT), Netherland (NL), Norway (NO), Poland (PL), Portugal (PT), Romania (RO), Slovakia (SK), Slovenia (SI), Spain (ES), Sweden (SE), United Kingdom (UK).

Table S3 (2/4): Larger (+) or smaller (-) AL advantage and disadvantage in high- and low-educated groups (compared with middle-educated) in each country compared to the other countries for the whole 30-79 age range and the three age-bands for 26 countries using EU-SILC 2009 (with level of significance) °

Panel B. Each Western European country, compared to the other countries

AL disadvantage in low-educated groups

Low-educated	FI	SE	NO	DK	DE	FR	NL	UK	AT	IE	BE	ES	GR	IT	CY	PT	RO	BG	LT	PL	LV	SK	SI	EE	HU	CZ	
DE	30-79	+++	+		..*	x					..*			..*			+							..*	..***		
	30-49	+++				x							+++	+													
	50-64			..*	x					..**	..*			..*			+								..**		
	65-79				x			..*		..**			..***												..**	..**	
FR	30-79	+++	+++	..*		x				..*			..*				+++							..*	..***		
	30-49	+++				x						+++													..*		
	50-64	+		..*		x				..**	..*			..**			+++								..***		
	65-79				x								..**				+										
NL	30-79	+++	+++				x										+++								..**		
	30-49	+++					x						+++	+													
	50-64			..*			x			..**															..**		
	65-79						x						..*														
UK	30-79	+++	+++					x									+++	+							..**		
	30-49	+						x																	..**		
	50-64	+++	+++														+++										
	65-79							x					..*				+++										
AT	30-79	+++	+++						x								+++	+++		+							
	30-49	+++							x				+++	+++													
	50-64			..**					x	..**	..*		..*													..**	
	65-79				+				x								+	+++									
IE	30-79	+++	+++							x							+++	+++		+				..*	..**		
	30-49									x																	
	50-64	+++	+++		+++	+++	+++	+++	+++	x							+++	+++	+	+++	+	+					
	65-79									x																	
BE	30-79	+++	+++		+	+					x	+++					+++	+++	+	+++						..*	
	30-49	+++									x	+++															
	50-64	+++	+++		+	+			+		x						+++		+								
	65-79				+++						x						+++	+++	+								

AL advantage in high-educated groups

High-educated	FI	SE	NO	DK	DE	FR	NL	UK	AT	IE	BE	ES	GR	IT	CY	PT	RO	BG	LT	PL	LV	SK	SI	EE	HU	CZ
DE	30-79				+++	x		+	+++									+++	..*					..*	..**	..*
	30-49	+++			+++	x	+++	+++	+++				+++	+++					+++			+++	+++	+		+
	50-64				+++	x								+++					+++				+			..**
	65-79		..**			x							..**							..*			..**	..**	..*	..**
FR	30-79		..**	+++		x												..*	+++	..**				..**	..**	..**
	30-49	+		+++	..**	x			+															..**	..**	..**
	50-64	..*		+++		x												..**	..**	..**	..*		..**	..**	..**	..**
	65-79					x																			..**	..**
NL	30-79		..**	+++	..*	..*	x						..*					..**	..**	..*				..**	..**	..**
	30-49	..**	..*		..**	..**	x			+									..**					..**	..**	..**
	50-64				+++		x			+++															..*	..**
	65-79		..*				x																			
UK	30-79		..**	+++				x										..*	+	..**				..**	..**	..**
	30-49			+++	..**	..**		x											..*					..**	..**	..**
	50-64			+++						+++								..*							..**	..**
	65-79		..**					x																	..**	..**
AT	30-79	..*	..**	+++	..*	..**			x				..**	..*				..**	..**	..*				..*	..**	..**
	30-49	..**	..**		..**	..**	..*		x				..**	..*					..**	..**	..*			..**	..**	..**
	50-64				+++				x																..*	..**
	65-79		..**						x															..*	..*	..*
IE	30-79				+++					x									+						..*	
	30-49									x															..*	
	50-64				+++					x																
	65-79									x																
BE	30-79	..*	+++		+++						x								+++	..**				..**	..**	..**
	30-49	+			+++						x			+										..**	..**	..**
	50-64	+++	+++		+	+			+		x							+++		..*	..*	..*	..*	..**	..**	..**
	65-79				+++						x							+++	+++	+						

° drawn from the 26 logistic regressions using 2009 EU-SILC data controlled by country, age, sex, country and education, by age groups:

Equation: $AL = \beta_{country} * country + \beta_{age\#country} * age\#country + \beta_{sex\#country} * sex\#country + \beta_{LowEd\#country} * LowEd\#country + \beta_{HighEd\#country} * High\#country$

..*** $p > 0.01$, ** $p > 0.05$, * $p > 0.10$

Country labels: Austria (AT), Belgium (BE), Bulgaria (BG), Cyprus (CY), Czech Republic (CZ), Germany (DE), Denmark (DK), Estonia (EE), Finland (FI), France (FR), Greece (GR), Hungary (HU), Ireland (IE), Italy (IT), Latvia (LV), Lithuania (LT), Netherland (NL), Norway (NO), Poland (PL), Portugal (PT), Romania (RO), Slovakia (SK), Slovenia (SI), Spain (ES), Sweden (SE), United Kingdom (UK).

Table S3 (4/4): Larger (+) or smaller (-) AL advantage and disadvantage in high- and low-educated groups (compared with middle-educated) in each country compared to the other countries for the whole 30-79 age range and the three age-bands for 26 countries using EU-SILC 2009 (with level of significance) °**Panel D. Each Southern European country, compared to the other countries****AL disadvantage in low-educated groups**

Low-educated	FI	SE	NO	DK	DE	FR	NL	UK	AT	IE	BE	ES	GR	IT	CY	PT	RO	BG	LT	PL	LV	SK	SI	EE	HU	CZ
RO				-***	-***	-*	-**	-**	-***	-***	-***	-**	-**	-***	-***	-***	x			-*	-**	-**	-***	-**	-***	-***
30-79				-***	-***	-*	-**	-**	-***	-***	-***	-**	-**	-***	-***	-***	x			-*	-**	-**	-***	-**	-***	-***
30-49	+***										+***						x									
50-64				-***	-***	-*	-**	-**	-***	-***	-***	-**	-**	-***	-***	x	-**		-**	-**	-**	-**	-**	-***	-***	-***
65-79				-*					-*	-**				-***	-**	x									-**	-**
BG				-**	-***			-*	-**	-**	-***		-**	-***	-**	-**	x			-*	-*	-**	-*	-***	-***	-***
30-79				-**	-***			-*	-**	-**	-***		-**	-***	-**	-**	x			-*	-*	-**	-*	-***	-***	-***
30-49																	x								-*	
50-64	+*										-*					+**	x								-*	
65-79				-**		-*	-**	-**		-***	-**	-***	-**	-**	-**	x							-**	-***	-***	-***
LT					-*						-*						x								-**	
30-79					-*						-*						x								-**	
30-49	+*																x									
50-64																	x									
65-79																	x									
PL	+***	+*		-**				-*	-*	-**			-***	-*	-*	+*	x				x				-**	-***
30-79	+***	+*		-**				-*	-*	-**			-***	-*	-*	+*	x				x				-**	-***
30-49	+***										+***						x				x					
50-64	+***			-**				-**	-*				-**		+**		x				x				-***	-***
65-79											-***				-***		x				x				-**	
LV	+***	+**															+**	+*			x				-**	
30-79	+***	+**															+**	+*			x				-**	
30-49	+***										+**						x				x					
50-64	+*									-*						+*					x				-*	
65-79										-**							x				x					
SK	+***	+**											+**	+*			+**	+*			x				-*	
30-79	+***	+**											+**	+*			+**	+*			x				-*	
30-49	+***	+*									+***	+*					x				x				-**	
50-64										-*							x				x				-**	
65-79										-*							x				x				-**	
SI	+***	+**															+***	+**			x				-*	
30-79	+***	+**															+***	+**			x				-*	
30-49	+***																x				x				-**	
50-64	+***																+***				x					
65-79																	+**				x					
EE	+***	+**											+**	+**	+**		+**	+*			x					
30-79	+***	+**											+**	+**	+**		+**	+*			x					
30-49	+***	+*							+*	+***	+**		+**	+**	+**		+***				x					
50-64	+***												+**	+**	+**		+**				x					
65-79										-**							x				x					
HU	+***	+***			+*	+*					+**		+***	+***		+**	+***	+**			x					
30-79	+***	+***			+*	+*					+**		+***	+***		+**	+***	+**			x					
30-49	+***	+*									+***		+***	+**		+**	+**				x					
50-64	+***	+*									+***		+***	+*	+**	+*	+**	+**			x				-*	
65-79	+*					+**					+**	+***	+**	+**			+**	+**			x					
CZ	+***	+***			+***	+***	+**	+**		+***	+*		+***	+***	+**	+***	+**	+**	+*		x					
30-79	+***	+***			+***	+***	+**	+**		+***	+*		+***	+***	+**	+***	+**	+**	+*		x					
30-49	+***	+**	+*			+*	+**	+**		+**	+*		+**	+**	+*		+**				x					
50-64	+***	+***			+**	+***	+**	+**		+***	+*		+***	+**	+**	+**	+**	+**	+*		x					
65-79					+*	+***	+**	+**			+**	+**	+**	+**	+**	+**	+**	+**	+**	+*	x					

AL advantage in high-educated groups

High-educated	FI	SE	NO	DK	DE	FR	NL	UK	AT	IE	BE	ES	GR	IT	CY	PT	RO	BG	LT	PL	LV	SK	SI	EE	HU	CZ
RO				+*		+***	+*	+**	+*	+***			+**	+*			x	+***					+*			
30-79				+*		+***	+*	+**	+*	+***			+**	+*			x	+***					+*			
30-49																	x									
50-64				+***	+**	+*				+*	+**	+***				x	+***						+**			
65-79																	x									
BG				-*	-**	-***	-***	-**	-*	-*	-**	-**	-***	-*	-**	-**	-**	x	-***	-***	-**	-*	-***	-***	-***	-***
30-79				-*	-**	-***	-***	-**	-*	-*	-**	-**	-***	-*	-**	-**	-**	x	-***	-***	-**	-*	-***	-***	-***	-***
30-49				-**	-**	-**	-***										x	-**						-***	-**	
50-64	-***	-**	-**	-**													x	-***	-***	-***	-***	-***	-***	-***	-***	-***
65-79				-*													x									
LT	+***			+***	+*	+**	+***	+**	+***	+***	+**	+***	+**	+**	+*	+**	+***	x	+*	+**		+**	+**			
30-79	+***			+***	+*	+**	+***	+**	+***	+***	+**	+***	+**	+**	+*	+**	+***	x	+*	+**		+**	+**			
30-49	+***										+**	+*	+**	+**	+*	+**	x									
50-64				+***	+**						+*	+**	+***			+**	x									
65-79				+*													x	+*								
PL				+***		+*	+**										+***	-*	x						-**	
30-79				+***		+*	+**										+***	-*	x						-**	
30-49	+*			+**					+*								x									
50-64				+***	+**								+*	+**	+***		+***		x	+**						
65-79				-**										-**			x			-*	x		-**	-**	-**	-**
LV	+***			+***													+**	-*	x				-*	-**	-*	-*
30-79	+***			+***													+**	-*	x				-*	-**	-*	-*
30-49				-***							x						-**	-**	x					-***	-**	
50-64				+***	+*						+*	+**	+***				+***		x	+**						
65-79				+*													x									
SK				-**	+***												-*	+*	-**		x			-**	-***	-**
30-79				-**	+***												-*	+*	-**		x			-**	-***	-**
30-49				-***							+***	+*					-**	-**		x				-***	-**	
50-64	-**			+*	-**												-**	-**	-**	-**	x	-**		-***	-***	-***
65-79				+**							+*						+**			+**	x					
SI				+***													+***				x					
30-79				+***													+***				x					
30-49				+*	-*												x				x				-**	
50-64				+***	+**								+*	+**	+***		+***				+**	x				
65-79				-*													x				x					
EE	+***			+***	+*	+**	+***	+**	+***	+***	+**	+***	+**	+**	+**		+***		+*	+**		x				
30-79	+***			+***	+*	+**	+***	+**	+***	+***	+**	+***	+**	+**	+**		+***		+*	+**		x				
30-49	+***			+***																						