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6 | Macro-level determinants of post-retirement health and health inequalities: a multilevel analysis of 18 European countries

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Abstract

Objective: Poor health after retirement may have an important economic and societal impact and may be affected by macro-level factors. Our aim was to examine whether macro-level factors are associated with health and educational differences in health in recent retirees.

Methods: We used data covering 18 European countries from the Survey on Health, Ageing and Retirement in Europe (SHARE) and the English Longitudinal Study of Ageing (ELSA) on 8867 respondents who had been retired less than 5 years. We performed multi-level linear regression analyses to examine whether social expenditure in nine policy areas, minimum pension replacement rates, and unemployment replacement rates explained cross-country differences in post-retirement self-rated health (SRH) and educational inequalities in SRH.

Results: In both men and women, a higher total expenditure as well as higher expenditures on health, old age, housing, and 'other social policy areas' (non-categorical cash benefits to low-income households and other social services) were associated with better SRH. Cross-level interactions showed that in the presence of a higher old age expenditure, a higher unemployment expenditure, and a higher total expenditure, the absolute educational inequalities in post-retirement SRH were smaller than with lower expenditures in these areas, in both men and women. We found the same effect in women only for a higher expenditure on health as well as a higher minimum pension replacement rate. A higher expenditure on survivors pensions, a lower expenditure on family, and a higher unemployment replacement rate had this effect in men only.

Conclusion: This study showed that social expenditure and replacement rates were associated with post-retirement health and health inequalities.

Introduction

Much research has focused on cross-country differences in health and in health inequalities in the general population[e.g. 1, 2-4]. Although results are inconsistent, most studies have shown that general population health in Nordic countries is better compared to other OECD countries [2]. Not only do overall levels of health vary between countries, so do health inequalities [2]. Cross-country differences in socioeconomic inequalities in health suggest that macro-level factors affect the relation between socioeconomic position and health. Thus, the issue is to identify factors at the country level that may be causally relevant for population health and health inequalities within populations.

There have been three common approaches to examine health differences between countries: the regime approach, the expenditure approach, and the institutional approach. So far, most researchers took the regime approach [2], which is based on the assumption that countries are clustered within welfare state regimes. The regime clusters that have been investigated most often are those proposed by Esping-Andersen (liberal, conservative and social democratic regimes) [5] and Ferrera (Anglo-Saxon, Bismarckian, Scandinavian, and Southern regimes) [6]. Results so far are inconsistent regarding which regimes are associated with the best general population health and the smallest health inequalities [2]. This approach has received much criticism. When investigating these welfare regimes as a static characteristic, changes in policies over time are not taken into account [7]. Moreover, by using such broad clusters, it is difficult to draw conclusions about the specific mechanisms that may link macro-level characteristics to individual-level health outcomes [7]. Another problem is that different programs and policies are often organized differently across countries, leading to a high degree of variation between countries within one welfare regime [8].

The second approach, the expenditure approach, examines the public spending on social protection and services, like old age pensions, health care, and labour market policies. Studies using the expenditure approach show that countries that are characterized by relatively high social spending on average have smaller absolute and relative health inequalities and better health in the general population [9-12]. This approach has received criticism for its inability to differentiate between effort and need: a large expenditure does not necessarily mean a greater effort, but could also just mean that there is a greater need because, for example, there is more unemployment. A recent study by Dahl and Van der Wel, however, has shown that adjusting for this need had little effect on their results regarding the association between social expenditure and health and health inequalities [9]. Therefore, circular causality may not be an issue.

The third approach, the institutional approach, is a social-rights based approach which uses more direct generosity measures than the expenditure approach which uses indirect

welfare state generosity measures. This approach focuses on specific social policies such as pensions and unemployment benefits [7]. Results from institutional studies on population health are consistent; they show that more generous policies and benefits are associated with better population health. These policies seem to be beneficial for all, not only for those who use them [2]. Ferranini et al. [8], for example, argue that unemployment benefits not only affect those currently making use of them (i.e. the unemployed), but also decrease the negative health effects of job insecurity in the employed. Higher coverage rates (the proportion of the relevant population eligible for benefits) appear to be associated with better health, but do not appear to diminish health inequalities [8]. Higher replacement rates, i.e. the relative amount of benefits received, in isolation are not associated with better health, but interaction effects between coverage and replacement rates have been reported: in countries with high coverage rates, high replacement rates are associated with better health and smaller health inequalities, whereas in countries with low coverage, high replacement rates are associated with worse health [8]. The disadvantage of the institutional approach is that to make cross-country comparisons, model family assumptions are made. For example, the Social Citizenship Indicator Programme, which is a widely used comparative database, assumes that with regards to unemployment replacement rates, a 'standard worker' works in the manufacturing industry, is 30 years old, has worked for ten years and for five years at the present employer [13]. These assumptions are likely to obscure the variety of family backgrounds [14].

In comparison to the broad regime approach, both the expenditure and the institutional approach have advantages when identifying specific potential macro-level determinants of health and health inequalities. There are several ways in which a higher expenditure and higher replacement rates could affect health and health inequalities. From a materialist point of view, social inequalities in health can be explained by differences in access to goods and services and exposure to physical and psychosocial risk factors [15]. If this assumption is true, we would expect that higher social spending and higher replacement rates are associated with better health for all, but that disadvantaged groups, such as the lower educated, may benefit most because they have less resources to begin with and are the most likely to be entitled to receive benefits. The psychosocial approach focuses on how perceptions of inferiority and relative deprivation may lead to more stress, which affects physical and mental health 3. Following this approach, it could also be argued that higher social spending and higher replacement rates ensure a sense of security from which, again, the lower educated might benefit most.

To our knowledge, no studies have examined the role of macro-level factors on health and health inequalities in recent retirees specifically. However, in ageing societies, improving health of retirees makes good sense from a public health perspective. On the one hand, improving their health might prevent future healthcare costs and on the other, healthy

retirees may be better able than their unhealthy peers to participate in society and provide meaningful contributions, like providing informal care and doing volunteer work in the community. Therefore, in many countries healthy retirees may be seen as an important societal resource [16]. Recent retirees specifically are still relatively young and active and health decline in this age group is less steep than in older ages [17]. Also, it has been argued that the retirement transition presents opportunities for interventions and health promotion, because individuals may be making normative lifestyle changes during such life transitions [18-22].

In the current study, we address the following research questions:

1) Is there an association between macro-level factors and post-retirement health? We hypothesize that higher social expenditures and higher minimum replacement rates are associated with better post-retirement health.

2) Do macro-level factors modify the association between education and post-retirement health? Because higher social expenditures and higher minimum replacement rates may lead to a reduction in poverty rates and higher social security levels, we expect that lower educated groups benefit more in terms of health from higher governmental expenditures and more generous policies than higher educated groups.

This study adds to the existing literature on between-country differences in health and health inequalities in that we focus on recent retirees, combine the expenditure and institutional approach, and include not only a total social expenditure measure, but also examine social spending in the specific policy areas of which this widely used total social expenditure measure consists.

Methods

Sample

We analyzed micro-level data from two harmonized longitudinal studies on ageing: the Survey of Health, Ageing and Retirement in Europe (SHARE) and the English Longitudinal Study of Ageing (ELSA). We used wave 6 of SHARE, with data collected in 2015 in Austria, Belgium, Switzerland, Germany, Denmark, Spain, France, Greece, Italy, Sweden, Israel, Czech Republic, Poland, Estonia, Portugal, Slovenia, Luxembourg and Croatia. Because in wave 6 the Netherlands was not included, we used wave 5 (data collected in 2013) to obtain the Dutch data. Israel and Croatia were excluded from the study, because not all macro-level data were available for these countries. We included wave 7 of ELSA,

with data collected in 2014/2015 in England and included respondents from the original samples as well as the refreshment samples. After pooling the datasets, we ended up with 18 countries in total. In each country nationally representative samples of households with individuals aged 50 and older were established. Details on the SHARE and ELSA studies have been described elsewhere [23, 24]. Because we were interested in health in recent retirees, we restricted the sample to those having retired no longer than 5 years ago. Furthermore, we restricted the sample to men and women aged 65 years or younger at retirement, because it is the average state pension age (n=9200). We excluded those with missing data on SRH (n=58), educational level (n=177), and the confounders (n=98), together less than 4% of the sample. This resulted in a sample of 8867 respondents.

For the macro-level factors, we derived data from two datasets that are widely used in comparative research. Data on social expenditure in 2012 (last available complete data) come from the OECD's Social Expenditure Database (SOCX) [25]. Data on the institutional factors in 2010 (last available data) were obtained from the Social Insurance Entitlement Dataset (SIED), a continuation of the Social Citizenship Indicator Program (SCIP), which is a dataset consisting of institutional data for comparative welfare state research with a focus on political factors, provided by the Swedish Institute for Social Research (SOFI) at University of Stockholm [13].

Measures

Outcome

Self-rated health

Self-rated health (SRH) was measured with one question: "Would you say your health is . . . ." . The answer categories were: (1) excellent, (2) very good, (3) good, (4) fair, and (5) poor. This question is widely used as a measure of SRH [26]. For an easier interpretation of the results, scores were recoded so that a higher score reflects better health.

Micro-level independent variable

Education

Educational level was categorized according to the International Standard Classification of Education 2011 (ISCED 2011), which provides a framework to classify diverse educational systems in such a way that they can be compared across countries. Scores range from 0 (no education) to 6 (second stage of tertiary education). Because there was a linear

relation between education and SRH, education was analyzed as a continuous variable, with a higher score reflecting a higher educational level.

Macro-level independent variables

Expenditure variables

SOCX groups the social benefits into nine policy areas:

- Health: spending on in- and out-patient care, medical goods, prevention;

- Old-age: pensions, early retirement pensions, home-help and residential services for the elderly;

- Survivors: survivors pensions and funeral payments;

- Incapacity: incapacity-related benefits – care services, disability benefits, benefits accruing from occupational injury and accident legislation, employee sickness payments;

- Family: child allowances, childcare support, income support during leave, sole parent payments;

- Active labour market policies: employment services, training, employment incentives, integration of the disabled, direct job creation, and start-up incentives;

- Unemployment: unemployment compensation, early retirement for labour market reasons;

- Housing: housing allowances and rent subsidies;

- Other social policy areas: non-categorical cash benefits to low-income households, and other social services.

All expenditure variables consist of the sum of public (social spending with financial flows controlled by General Government) and mandatory private (social support stipulated by legislation but operated through the private sector, e.g. direct sickness payments by employers to their absent employees as legislated by public authorities) expenditure, expressed as percentage of the GDP [27]. In this study we investigated each policy area separately and we also included a total social expenditure variable.

Institutional variables

The minimum unemployment and pension replacement rates (RR) refer to what extent the insurance program replaces the average production worker's wage (APWW) and are calculated as the ratio of the replacement level divided by the APWW [13]. The minimum benefit refers to the floor below which a worker cannot fall. These benefits can be income tested. RR calculations are based on a single standard worker in the manufacturing (metal-) industry with certain characteristics, to make cross-country comparison possible [13]. The unemployment replacement rates are based on a single standard worker who:

- is 30 years of age;

- has worked for ten years;

- worked for five years at the present employer;

- was not unemployed during the last two years;

- is assumed not to be living with their family of origin.

For the pension replacement rates calculations are based on a single standard worker who:

- has made full-time contributions during 35 years;

- is assumed to be living without dependent children.

Confounders

We stratified all analyses by sex, because preliminary tests showed a statistically significant interaction between sex and education on SRH. Additionally, we controlled for age at retirement (in years, continuous), marital status (married or registered partnership, never married, previously married -including separated, divorced, widowed) and time since retirement (in years, continuous). We also controlled for the macro-level factors GDP per capita and general unemployment rates in 2012. Since there is evidence that there is an interaction effect between replacement rates and coverage rates (the proportion of the relevant population eligible for benefits), i.e. the effect of the replacement rates differs between different levels of coverage [8], we tested these interaction terms.

Statistical analysis

We ran multilevel models, because individuals (level 1) in our data were nested in countries (level 2). The analyses were conducted in Stata version 14. We used multilevel linear regression models with REML estimation and the Kenward-Roger adjustment [28, 29]. The Kenward-Roger adjustment takes into account the small level 2 sample size and has been shown to provide fixed effect estimates in linear multilevel regression that are unbiased by this small sample size [30]. Because our outcome, SRH, was distributed symmetrically (skewness: 0.07) we conducted linear regression analyses [31]. However, as SRH is in fact an ordinal variable, we also conducted ordinal regression models as a robustness check.

We stratified all analyses by sex and we centered all macro-level factors around their grand mean for a better interpretation of the regression coefficients in the models with interaction effects. First, an intercept-only model with a random intercept for country (model 1) was compared with the null-model (intercept-only) to examine whether there are cross-country differences in post-retirement health, using a likelihood ratio test. The regression equation for a random intercept model can be written as followed:

$$Y_{ij} = \beta_0 + u_{0j} + e_{ij}$$

In this equation u_{0j} is the between-country variance and e_{ij} is the within-country variance. The intra class correlation (ICC: between-country variance/(between-country variance + within-country variance)) was used to estimate the percentage of the total variance that can be attributed to differences between countries. In model 2a, the crude effect of education on SRH was modelled, and in model 2b this effect was adjusted for the confounders. Next, we added a random slope for education on country level to examine whether there are cross-country differences in the effect of education on post-retirement health, again using a likelihood ratio test.

A random part for the slope is now added to the equation:

$$Y_{ij} = \beta_0 + \beta_1 X_{1ij} + u_{0j} + u_{1j} X_{1ij} + e_{ij}$$

We built separate models for each macro-level factor and adjusted for the confounders (model 3) to answer our first research question: 'Is there an association between macro-level factors and post-retirement health?'. For the replacement rates, we also examined whether there was an interaction with coverage (model 4).

Finally, we added cross-level interactions between education and the macro-level factors to answer our second research question: 'Do macro-level factors modify the association

between education and post-retirement health?'. Adding a cross-level interaction leads to the following regression equation:

$$Y_{ij} = \beta_{0j} + \beta_1 X_{1ij} + \beta_2 X_{2j} + \beta_3 X_{1ij} * X_{2j} + u_{0j} + u_{1j} X_{1ij} + e_{ij}$$

Results

Tables 1 and 2 show individual and macro-level characteristics for the 18 countries included in this study. For both men and women, scores on SRH were highest in Denmark (men: 3.55, women: 3.61) and lowest in Estonia (men: 2.21, women: 2.28). Highest total social expenditure was found in France (31.3) and lowest in Estonia (15.9) and Poland (19.0). Belgium (0.69) had the highest minimum pension replacement rate and the Czech Republic (0.17) the lowest. There were also large cross-country differences in unemployment minimum replacement rates, ranging from 0.12 (England) to 0.92 (Portugal). Correlations between the explanatory macro-level factors ranged between -.530 and .796. The model with a random intercept for country performed better as compared to the null- model (men: $\chi^2(1) = 417.29$, $p<.001$, women: $\chi^2(1) = 411.28$, $p<.001$).

Table 1. Descriptive statistics for men (n=4499) and women (n=4368)

	SRH	Education	Age at retirement (years)	Marital status %			Time since retirement (years)	N
	M(SD)	M(SD)	M(SD)	married	never married	previously married	M(SD)	
Men								
Austria	3.21 (0.98)	3.50 (1.16)	60.77 (2.80)	74.8	7.8	17.5	2.75 (1.40)	206
Belgium	3.09 (0.91)	3.31 (1.53)	61.69 (3.30)	75.9	8.0	16.2	2.38 (1.52)	427
Czech Republic	2.76 (0.99)	2.94 (1.11)	61.84 (2.11)	82.9	2.8	14.3	2.54 (1.48)	286
Denmark	3.55 (1.10)	3.68 (1.19)	63.06 (2.45)	78.8	8.7	12.5	2.56 (1.51)	184
England	3.42 (1.06)	2.84 (1.58)	62.11 (3.15)	78.2	7.7	14.1	2.84 (1.58)	510
Estonia	2.21 (0.73)	3.33 (1.13)	62.00 (2.23)	68.5	12.5	19.1	2.67 (1.46)	241
France	3.02 (0.97)	3.03 (1.53)	60.44 (2.23)	74.2	9.8	16.0	2.26 (1.50)	244
Germany	2.88 (0.96)	3.80 (1.04)	63.17 (2.41)	81.4	4.4	14.2	2.25 (1.47)	296
Greece	3.27 (1.00)	2.83 (1.80)	60.64 (3.94)	89.7	4.0	6.3	2.64 (1.43)	224
Italy	2.96 (1.02)	2.41 (1.32)	60.79 (3.00)	88.2	6.5	5.4	2.72 (1.41)	186
Luxembourg	3.19 (1.02)	2.93 (1.36)	59.55 (2.75)	85.9	3.7	10.4	2.25 (1.40)	135
Netherlands	3.17 (0.96)	3.33 (1.40)	63.54 (2.06)	85.7	3.4	10.9	2.10 (1.27)	293
Poland	2.31 (0.91)	2.81 (1.11)	61.11 (3.46)	84.7	1.4	13.9	2.53 (1.51)	72
Portugal	2.34 (0.80)	2.42 (1.80)	61.06 (3.46)	89.9	3.4	6.7	2.92 (1.46)	89
Slovenia	2.86 (0.96)	3.06 (1.07)	59.75 (2.53)	87.4	5.5	7.1	2.69 (1.35)	326
Spain	3.04 (0.99)	2.13 (1.57)	63.03 (2.43)	87.5	5.0	7.5	2.28 (1.39)	360
Sweden	3.33 (1.05)	3.24 (1.53)	64.31 (1.48)	82.1	5.6	12.4	2.42 (1.54)	251
Switzerland	3.41 (0.94)	3.47 (1.14)	63.66 (2.05)	77.5	7.7	14.8	2.40 (1.46)	169

	SRH	Education	Age at retirement (years)	Marital status %			Time since retirement (years)	N
Women								
Austria	3.25 (0.91)	3.22 (1.29)	59.35 (2.59)	61.6	10.6	27.8	2.59 (1.45)	245
Belgium	3.10 (0.85)	3.17 (1.48)	61.89 (3.23)	66.6	2.6	30.8	2.31 (1.56)	380
Czech Republic	2.80 (0.97)	2.68 (1.06)	59.27 (2.11)	63.7	0.9	35.5	2.48 (1.48)	355
Denmark	3.61 (1.11)	3.89 (1.30)	62.48 (2.40)	71.8	5.2	23.0	2.53 (1.55)	213
England	3.42 (1.05)	3.10 (1.53)	60.40 (2.75)	69.6	6.6	23.8	2.88 (1.59)	529
Estonia	2.28 (0.83)	3.34 (1.00)	61.52 (2.22)	61.1	7.0	31.9	2.23 (1.40)	229
France	2.95 (0.99)	2.97 (1.76)	61.10 (2.58)	65.4	7.1	27.5	2.65 (1.55)	298
Germany	2.85 (0.91)	3.55 (1.06)	63.21 (2.27)	76.4	4.2	19.4	2.30 (1.53)	309
Greece	3.29 (0.97)	3.08 (1.92)	58.57 (4.77)	69.0	7.1	23.9	2.73 (1.41)	155
Italy	3.05 (0.97)	2.27 (1.33)	60.82 (2.79)	74.7	5.3	20.0	2.77 (1.46)	150
Luxembourg	3.05 (0.97)	2.57 (1.46)	60.37 (2.73)	80.7	2.3	17.1	2.57 (1.44)	88
Netherlands	3.09 (1.05)	2.99 (1.36)	64.07 (1.96)	77.7	2.2	20.1	2.02 (1.30)	269
Poland	2.55 (0.84)	2.68 (1.15)	59.53 (2.67)	72.7	2.3	25.0	2.29 (1.55)	88
Portugal	2.34 (1.06)	2.66 (1.84)	62.16 (3.38)	74.0	2.0	24.0	2.79 (1.40)	100
Slovenia	2.92 (0.93)	3.08 (1.15)	57.64 (2.33)	80.7	4.1	15.2	2.88 (1.44)	270
Spain	2.86 (0.91)	2.04 (1.55)	63.21 (2.57)	74.8	9.2	16.0	2.35 (1.52)	206
Sweden	3.36 (1.13)	3.38 (1.43)	64.34 (1.34)	74.1	5.1	20.8	2.60 (1.54)	317
Switzerland	3.34 (0.88)	2.99 (1.08)	63.39 (1.44)	67.1	5.4	27.5	2.24 (1.52)	167

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Table 2. Macro-level characteristics per country

Country	GDP per capita (/1000)	Unemployment rate	Expenditure										Replacement Rates		Coverage	
			Health	Old age	Survivors	Incapacity	Labour markets	Family	Housing	Unemployment	Other	Total	Pension RR	Unemployment RR	Pension coverage	Unemployment coverage
Austria	46.5	4.9	6.5	11.9	1.8	3.1	0.7	2.6	0.1	0.9	0.3	28.0	0.45	0.45	0.66	0.68
Belgium	42.6	7.5	7.9	8.3	1.9	2.8	0.8	2.8	0.2	3.4	0.8	29.0	0.69	0.76	0.60	0.66
Czech Republic	29.1	7.0	5.9	8.8	0.7	1.9	0.2	2.2	0.2	0.6	0.3	20.8	0.17	0.60	0.68	0.91
Denmark	44.8	7.5	6.7	10.4	1.3	4.9	1.8	3.7	0.7	n/a	1.2	30.8	0.44	0.58	1.00	0.72
England	37.7	7.9	7.2	7.4	0.1	2.1	0.4	4.0	1.5	0.5	0.5	23.5	0.27	0.12	0.73	0.86
Estonia	26.0	10.0	4.4	6.5	0.1	2.1	0.3	2.0	0.0	0.3	0.1	15.9	0.21	0.47	1.00	0.74
France	37.7	9.4	8.5	12.4	1.8	1.8	0.9	2.9	0.8	1.6	0.6	31.3	0.42	0.69	0.64	0.61
Germany	43.6	5.4	7.8	8.3	1.9	3.3	0.7	2.2	0.6	1.0	0.2	25.9	0.36	0.62	0.66	0.67
Greece	25.3	24.4	6.3	15.1	2.4	1.0	0.3	1.3	0.2	1.0	0.5	28.0	0.36	0.73	0.51	1.00
Italy	35.8	10.7	6.8	13.8	2.6	1.9	0.5	1.4	0.0	1.6	0.2	28.8	0.32	0.69	0.48	0.53
Luxembourg	91.5	5.1	5.5	6.6	1.9	3.6	0.6	3.7	0.3	1.2	0.5	24.0	0.34	0.81	0.64	0.95
Netherlands	46.7	5.8	7.9	6.1	0.2	3.6	0.9	1.4	0.4	1.6	1.1	23.1	0.49	0.66	1.00	0.83
Poland	23.5	10.1	4.3	8.5	1.9	2.2	0.4	1.2	0.1	0.2	0.2	19.0	0.34	0.81	0.59	0.54
Portugal	26.5	15.5	6.1	11.2	1.9	2.0	0.5	1.2	0.0	1.5	0.2	24.8	0.43	0.92	0.60	0.76
Slovenia	28.9	8.8	6.3	9.9	1.6	2.1	0.3	2.1	0.0	0.7	0.6	23.6	0.21	0.47	0.62	0.80
Spain	32.0	24.8	6.5	9.1	2.3	2.5	0.6	1.4	0.1	3.3	0.2	26.1	0.48	0.63	0.42	0.58
Sweden	44.7	8.0	6.5	9.2	0.4	4.6	1.3	3.6	0.5	0.5	0.7	27.1	0.30	0.54	1.00	0.96
Switzerland	57.9	4.5	6.4	10.2	1.2	3.3	0.5	1.5	0.1	0.7	0.6	24.6	0.32	0.71	1.00	0.94

Table 3. Multilevel models with associations of education with SRH

	Men	Women
	B (95% CI)	B (95% CI)
Model 1		
(intercept-only)		
Between-country variance	.142	.126
Within-country variance	.956	.951
Model 2a		
Education	.118 (.098;.138)**	.142 (.122;.162)**
Between-country variance	.132	.112
Within-country variance	.926	.908
Model 2b		
Education	.116 (.096;.137)**	.143 (.122;.163)**
Marital status		
Married	1.00	1.00
Never married	-.155 (-.273;-.038)**	-.088 (-.175;-.002)*
Previously married	-.060 (-.191;.071)	-.116 (-.183;-.049)**
Age at retirement	-.005 (-.015;.006)	-.002 (-.013;.009)
Time since retirement	-.020 (-.039;-.000)*	-.015 (-.034;.004)
GDP	.014 (.002;.027)*	.010 (-.002;.023)
Unemployment rate	.015 (-.019;.049)	.006 (-.026;.039)
Between-country variance	.109	.102
Within-country variance	.925	.907

† p$\leq$ .10; * p $\leq$ .05; ** p $\leq$ .01

The ICC for men was 0.129 and for women 0.117 (Table 3, model 1), which means that 12.9% and 11.7% , respectively, of the total variance in SRH can be attributed to differences between countries. In model 2a the association between education and SRH was estimated, showing that higher education was associated with better SRH in both men (B=0.118) and women (B=0.142). In model 2b, we adjusted for age at retirement, time since retirement, marital status, GDP per capita and unemployment rate. Adding a random slope for education to the model did not significantly improve the model (men: $\chi^2(2)$= 0.37, p=0.831, women: $\chi^2(2)$= 4.25, p=0.119).

Figure 1 shows the slopes of education in each country, which were derived from separate regression models for each country. Although there were cross-country differences in the slopes, with stronger associations of education with SRH in men and women in Central and Eastern European countries and weaker associations in men and women in Southern European countries, the 95% confidence intervals were wide, especially in countries with small sample sizes such as Poland, and differences between countries were not statistically significant.
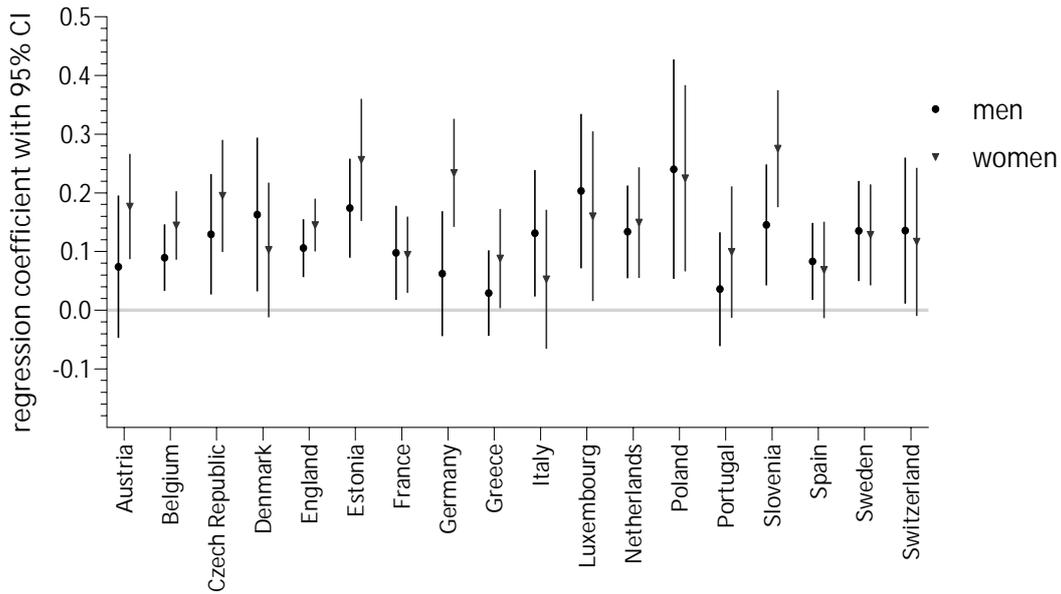
Figure 1. Association between education and SRH per country (adjusted for age at retirement, time since retirement, and marital status) for men and women

In model 3a (Table 4), we examined the effect of each macro-level factor on SRH separately. We found that a higher total expenditure and a higher expenditure on health, housing, and 'other social policy areas' were associated with better SRH. In women, we also found an effect of old age expenditure. Of these macro-level factors, total expenditure explained most of the between-country variance in SRH (men: 36.7%; women: 33.3%). We did not find statistically significant main effects for replacement rates. Interaction terms showed that the association of unemployment replacement rates with SRH became smaller with higher coverage (Table 4, model 3b).

In Table 5, models including the cross-level interactions are presented. As in any simple regression model that includes an interaction term (i.e. $Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_1 * X_2$), the coefficient for β_1 is the effect of X_1 on Y when X_2 equals zero and the coefficient for β_2 is the effect of X_2 on Y when X_1 equals zero. The coefficient of the interaction term is the difference in the effect of X_1 on Y for each one-unit increase in X_2 or vice versa. The interpretation of coefficients is the same for multilevel models, including cross-level interactions. Thus, since the macro-level factors are centered in our regression models, the effect of β_1, i.e. education, is the effect of education on SRH for a country with an average value of the macro-level factor. Education was not centered, so the coefficient of the macro-level factor represents the effect of the macro-level factor on SRH in the lowest educational group. In both men and women, the educational differences in SRH were smaller in countries with higher old age expenditure, higher unemployment expenditure and higher total expenditure. Additionally, we found that these health differences were

also smaller in countries with higher expenditures on health and a higher minimum pension replacement rate in women. In men, we found this effect for a higher expenditure on survivors and higher unemployment replacement rates. In countries with a higher expenditure on family, the association between education and SRH was stronger compared to countries with lower levels of family expenditure, in men only. We also examined three-way interactions (education*replacement rate*coverage), to investigate if the interaction between educational level and replacement rate differed across different levels of coverage, but these interactions were not statistically significant.

To test the robustness of our linear findings, we also conducted ordinal multilevel analyses. These analyses did not lead to different conclusions.

Table 4. Multilevel models with associations of macro-level factors with SRH (adjusted for education, age at retirement, time since retirement, marital status, GDP per capita and unemployment rates)

| | Model 3a | | | | Model 3b | |
| | Men (n=4499) | | Women (n=4368) | | Men (n=4499) | Women(n=4368) |
	B (95% CI)	Between-country variance	B (95% CI)	Between-country variance	B (95% CI)	B (95% CI)
Expenditure						
Health	.164 (.027;.301)*	.078	.128 (-.016;.271)†	.086		
Old age	.053 (-.023;.128)	.100	.060 (-.011;.131)†	.088		
Survivors	-.067 (-.323;.190)	.115	-.026 (-.276;.225)	.109		
Incapacity	.122 (-.098;.341)	.106	.104 (-.111;.319)	.101		
Labour markets	.317 (-.117;.752)	.099	.277 (-.150;.704)	.096		
Family	.164 (-.041;.368)	.096	.147 (-.053;.348)	.092		
Housing	.444 (.035;.853)*	.082	.375 (-.039;.789)†	.085		
Unemployment	-.009 (-.226;.208)	.117	-.030 (-.240;.179)	.109		
Other	.665 (.181;1.148)*	.070	.596 (.107;1.085)*	.070		
Total	.052 (.015;.089)**	.069	.049 (.012;.086)*	.068		
Replacement Rates						
Pension RR	.483 (-1.007;1.973)	.113	.355 (-1.099;1.810)	.108	.692 (-.848;2.233)	.552 (-.961;2.065)
Unemployment RR	-.356 (-1.317;.625)	.112	-.430 (-1.357;.496)	.102	-.496 (-1.393;.400)	-.549 (-1.470;.373)
Pension coverage					.470 (-.632;1.572)	.316 (-.766;1.398)
Unemployment coverage					.708 (-.456;1.875)	.597 (-.603;1.796)
Pension RR * coverage					.178 (-4.137;14.494)	5.463 (-3.676;14.602)
Unemployment RR * coverage					-5.790 (-11.726;.145)†	-4.249 (-10.339;1.840)

† p≤ .10; * p ≤ .05; ** p ≤ .01

Table 5. Cross-level interactions between education and macro-level factors in their effect on SRH (adjusted for age at retirement, time since retirement, marital status, GDP per capita and unemployment rates)

	Education		Macro-level factor		Education* Macro-level factor	
	Men (n=4499)	Women (n=4368)	Men (n=4499)	Women (n=4368)	Men (n=4499)	Women (n=4368)
	B (95% CI)	B (95% CI)	B (95% CI)	B (95% CI)	B (95% CI)	B (95% CI)
Expenditure (centered)						
Health	.117 (.097;.138)**	.145 (.124;.166)**	.195 (.045;.345)*	.183 (.029;.337)*	-.010 (-.031;.012)	-.018 (-.039;.003)†
Old age	.119 (.098;.139)**	.146 (.125;.167)*	.083 (.004;.162)*	.086 (.011;.160)*	-.010 (-.018;-.002)*	-.009 (-.017;-.001)*
Survivors	.119 (.099;.140)**	.144 (.123;.164)**	.027 (-.238;.291)	.032 (-.227;.291)	-.030 (-.052;-.007)*	-.019 (-.043;.005)
Incapacity	.118 (.097;.138)**	.142 (.122;.163)**	.067 (-.160;.294)	.089 (-.134;.313)	.016 (-.004;.037)	.004 (-.016;.024)
Labour markets	.116 (.096;.137)**	.143 (.123;.164)**	.325 (-.140;.789)	.395 (-.062;.853)†	-.002 (-.056;.052)	-.034 (-.084;.017)
Family	.117 (.097;.138)**	.142 (.122;.163)**	.089 (-.122;.301)	.139 (-.069;.347)	.023 (.003;.044)*	.003 (-.018;.023)
Housing	.116 (.096;.136)**	.143 (.122;.163)**	.336 (-.089;.761)	.411 (-.018;.840)†	.034 (-.008;.075)	-.012 (-.054;.030)
Unemployment	.120 (.010;.141)**	.144 (.123;.164)**	.044 (-.177;.266)	.031 (-.185;.246)	-.017 (-.036;.001)†	-.020 (-.040;.000)†
Other	.116 (.096;.136)**	.142 (.122;.163)**	.606 (.077;1.135)*	.665 (.130;1.200)*	.018 (-.054;.089)	-.021 (-.094;.051)
Total	.119 (.099;.140)**	.149 (.128;.170)**	.071 (.031;.112)**	.077 (.036;.117)**	-.006 (-.012;-.000)*	-.009 (-.015;-.003)**
Replacement Rates (centered)						
Pension RR	.120 (.099;.140)**	.145 (.124;.165)**	.900 (-.647;2.446)	.780 (-.739;2.298)	-.131 (-.275;.013)	-.137 (-.289;.014)†
Unemployment RR	.118 (.098;.138)**	.143 (.122;.163)**	-.036 (-1.038;.966)	-.337 (-1.294;.620)	-.103 (-.196;-.010)*	-.031 (-.124;.061)

† p≤ .10; * p ≤ .05; ** p ≤ .01

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Discussion

In this study we examined health and health inequalities in recent retirees specifically. So far, most research on macro-level determinants of health and health inequalities has focused on the general population. We combined the expenditure approach and the institutional approach by examining social expenditure in various policy areas as well as replacement rates as determinants of health and educational differences in health.

Our hypothesis that higher social expenditure and higher replacement rates would be associated with better post-retirement health was partly supported. We found that a higher total expenditure as well as a higher expenditure on health, housing, and 'other social policy areas' (non-categorical cash benefits to low-income households and other social services) was associated with better SRH in men and women. In women, we also found evidence of an effect of old age expenditure on post-retirement SRH. Higher social expenditure may lead to better health through several pathways. Not only through a material pathway, with higher spending leading to better access to goods and services, but more generous policies can also give a sense of security, which is beneficial in terms of health [3, 15]. The lack of effect of incapacity and labour market expenditure is probably due to our specific sample: retirees. For them, these expenditures are less applicable. We also did not find main effects for minimum replacement rates. This may be because the calculations of replacement rates are based on average workers and therefore do not reflect the diversity of workers included in our sample. This is a known disadvantage of the institutional approach [14].

Our second hypothesis was that macro-level factors modify the association between education and post-retirement health. In line with our hypothesis, we found that in countries with a higher old age expenditure, a higher unemployment expenditure and a higher total expenditure, the educational differences in SRH were smaller than in countries with lower expenditures in these areas, in men and women. In women, we also found this modifying effect for a higher expenditure on health and a higher minimum pension replacement rate. In men, we also found this effect for a higher expenditure on survivors and a higher unemployment replacement rate. Those with a lower education might benefit more from these social policies, because they are likely to have the least individual resources and are therefore more dependent on collective resources. In contrast, we found that in countries with a higher expenditure on family, educational differences in SRH in men were larger than in countries with lower family expenditure. While retirees generally do not have any children in the preschool age, their grandchildren usually are still young and dependent on child care. Lower educated grandparents more often take care of their grandchildren

compared to higher educated grandparents. The latter may therefore rely more on child care benefits [32].

In interpreting our findings it should be kept in mind that we focused on recent retirees who exited the labour market before or at the statutory retirement age. Workers who work beyond the statutory retirement age are generally healthier compared to workers exiting the workforce before or at the statutory retirement age, which is known as the healthy worker effect [33]. They are also more often higher educated [34, 35]. By excluding these workers our effects may be attenuated. Future research investigating the effects of macro-level factors on health and health inequalities in this specific group of retirees may complement our findings.

Our study has some limitations. We included only 18 countries in our multilevel analyses and within several countries, sample sizes were also not very large, which had consequences for our models: we could not fit full models to examine the effects of multiple macro-level determinants on SRH as well as expenditure squared. Of all macro-level factors included in our study, total expenditure explained most (36.7%) but not all of the between-country variance. Thus, additional macro-level factors, as well as micro-level and meso-level factors that may differ across countries, should be included in future research to try to explain the between-country variance that was not explained by the macro-level factors investigated in the current study.

We used SRH as our health measure. Because of high percentages of missing values on more objective health measures, we were restricted to the use of SRH. Although SRH has been shown to be associated with objective health [e.g. 36, 37-39], it may have a different meaning across cultures and educational levels [40, 41], so direct cross-country comparisons on SRH and educational inequalities in SRH should be made with caution. However, Avendano et al., conclude that SRH is a reliable measure of the presence and direction of the socioeconomic gradient in health, because of the consistency of associations between socioeconomic status and SRH across countries [42].

This study also has important strengths. We are among the first to focus on recent retirees, which so far has been largely neglected in welfare state research. Poor health following retirement may have an important economic and societal impact. Also, while most studies on cross-country differences in health have focused either on welfare state regimes, on expenditure or on institutional factors, we used a combination of the expenditure and institutional approach. In total we included 12 macro-level determinants in an attempt to be more specific as to which macro-level determinants do and which do not affect health and educational differences in health. Our results show the added value of

examining expenditure in specific policy areas in addition to using a total social expenditure measure. Correlations between the macro-level factors show that a higher spending in one policy area does not necessarily mean a higher spending in another policy area. Different countries have different priorities when it comes to social expenditure.

This study shows that social expenditure and replacement rates affect post-retirement health and educational differences in post-retirement health. Research using the welfare state regime approach is left with a 'black box' [43], i.e. it remains unknown which specific aspects of a welfare state regime can account for the between-regime differences. However, with our combined expenditure and institutional approach we were able to identify which specific macro-level factors underlie country differences in health and educational differences in health in recent retirees.

References

1. Beckfield J, Bambra C, Eikemo TA, Huijts T, McNamara C, Wendt C. An institutional theory of welfare state effects on the distribution of population health. Social Theory & Health. 2015;13(3):227-44.
2. Bergqvist K, Yngwe MÅ, Lundberg O. Understanding the role of welfare state characteristics for health and inequalities – an analytical review. BMC Public Health. 2013;13(1):1234.
3. Bambra C. Health inequalities and welfare state regimes: theoretical insights on a public health 'puzzle'. J Epidemiol Community Health. 2011;65(9):740-5.
4. Huisman M, Kunst AE, Mackenbach JP. Socioeconomic inequalities in morbidity among the elderly; a European overview. Soc Sci Med. 2003;57.
5. Esping-Andersen G. The three worlds of welfare capitalism. London: Polity. 1990.
6. Ferrera M. The 'Southern Model' of Welfare in Social Europe. Journal of European Social Policy. 1996;6(1):17-37.
7. Lundberg O, Yngwe MÅ, Bergqvist K, Sjöberg O. Welfare States and Health Inequalities. Canadian Public Policy. 2015;41(Supplement 2):S26-S33.
8. Ferrarini T, Nelson K, Sjöberg O. Decomposing the effect of social policies on population health and inequalities: an empirical example of unemployment benefits. Scand J Public Health. 2014;42(7):635-42.
9. Dahl E, van der Wel KA. Educational inequalities in health in European welfare states: a social expenditure approach. Soc Sci Med. 2013;81:60-9.
10. van der Wel KA, Dahl E, Thielen K. Social inequalities in 'sickness': European welfare states and non-employment among the chronically ill. Soc Sci Med. 2011;73(11):1608-17.
11. Gesthuizen M, Huijts T, Kraaykamp G. Explaining health marginalisation of the lower educated: the role of cross-national variations in health expenditure and labour market conditions. Sociol Health Illn. 2012;34(4):591-607.
12. Alvarez-Galvez J, Jaime-Castillo AM. The impact of social expenditure on health inequalities in Europe. Soc Sci Med. 2018;200:9-18.
13. Korpi W, Palme J. The Social Citizenship Indicator Program (SCIP). Stockholm: Swedish Institute for Social Research (SOFI), University of Stockholm; 2007.
14. Ferrarini T, Nelson K, Korpi W, Palme J. Social citizenship rights and social insurance replacement rate validity: pitfalls and possibilities. Journal of European Public Policy. 2013;20(9):1251-66.
15. Bartley M. Health Inequality: An Introduction to Concepts, Theories and Methods. 2 ed. Cambridge: Polity Press; 2004.
16. Oxley H. Policies for Healthy Ageing: An Overview, OECD Health Working Papers. Paris: OECD Publishing. 2009.
17. Diehr PH, Thielke SM, Newman AB, Hirsch C, Tracy R. Decline in health for older adults: five-year change in 13 key measures of standardized health. J Gerontol A Biol Sci Med Sci. 2013;68(9):1059-67.
18. Heaven B, Brown LJE, White Mn, Errington L, Mathers JC, Moffatt S. Supporting well-being in retirement through meaningful social roles: systematic review of intervention studies. The Milbank quarterly. 2013;91(2):222-87.
19. Heaven B, O'Brien N, Evans EH, White M, Meyer TD, Mathers JC, et al. Mobilizing Resources for Well-being: Implications for Developing Interventions in the Retirement Transition. Gerontologist. 2016;56(4):615-29.
20. Schäfer M, Jaeger-Erben M, Bamberg S. Life Events as Windows of Opportunity for Changing Towards Sustainable Consumption Patterns? J of Consumer Policy. 2011;35(1): 65-84.
21. Wilson DM, Palha P. A Systematic Review of Published Research Articles on Health

Promotion at Retirement. Journal of Nursing Scholarship. 2007;39(4):330-7.

22. Koeneman MA, Chinapaw MJM, Verheijden MW, van Tilburg TG, Visser M, Deeg DJH, et al. Do major life events influence physical activity among older adults: the Longitudinal Aging Study Amsterdam. International Journal of Behavioral Nutrition and Physical Activity. 2012;9(1):147.

23. Börsch-Supan A, Brandt M, Hunkler C, Kneip T, Korbmacher J, Malter F, et al. Data Resource Profile: the Survey of Health, Ageing and Retirement in Europe (SHARE). Int J Epidemiol. 2013;42(4):992-1001.

24. Steptoe A, Breeze E, Banks J, Nazroo J. Cohort profile: the English longitudinal study of ageing. Int J Epidemiol. 2013;42(6):1640-8.

25. OECD. Social Expenditure: Aggregated data. OECD Social Expenditure Statistics. 2018.

26. Jylhä M. What is self-rated health and why does it predict mortality? Towards a unified conceptual model. Soc Sci Med. 2009;69(3):307-16.

27. OECD. The Social Expenditure database: An Interpretive Guide: SOCX 1980-2003. 2007.

28. Kenward MG, Roger JH. Small Sample Inference for Fixed Effects from Restricted Maximum Likelihood. Biometrics. 1997;53(3):983-97.

29. Kenward MG, Roger JH. An improved approximation to the precision of fixed effects from restricted maximum likelihood. Computational Statistics & Data Analysis. 2009;53(7):2583-95.

30. McNeish DM, Stapleton LM. The Effect of Small Sample Size on Two-Level Model Estimates: A Review and Illustration. Educational Psychology Review. 2016;28(2):295-314.

31. Rhemtulla M, Brosseau-Liard PE, Savalei V. When can categorical variables be treated as continuous? A comparison of robust continuous and categorical SEM estimation methods under suboptimal conditions. Psychol Methods. 2012;17(3):354-73.

32. Wang Y, Marcotte DE. Golden Years? The Labor Market Effects of Caring for Grandchildren. Journal of Marriage and Family. 2007;69(5):1283-96.

33. Li CY, Sung FC. A review of the healthy worker effect in occupational epidemiology. Occup Med. 1999, 49: 225-229.

34. Haider SJ, Loughran DS. Elderly Labor Supply: Work or Play? SSRN. 2002.

35. Hofacker D, Naumann E. The emerging trend of work beyond retirement age in Germany. Increasing social inequality? Z Gerontol Geriatr. 2015;48(5):473-9.

36. Wu S, Wang R, Zhao Y, Ma X, Wu M, Yan X, et al. The relationship between self-rated health and objective health status: a population-based study. BMC Public Health. 2013;13:320-.

37. Idler EL, Benyamini Y. Self-Rated Health and Mortality: A Review of Twenty-Seven Community Studies. Journal of Health and Social Behavior. 1997;38(1):21-37.

38. Ocampo JM. Self-rated health: Importance of use in elderly adults. Colombia Médica. 2010;41:275-89.

39. Galenkamp H, Braam AW, Huisman M, Deeg DJH. Somatic Multimorbidity and Self-rated Health in the Older Population. The Journals of Gerontology Series B: Psychological Sciences and Social Sciences. 2011;66B(3):380-6.

40. Bago d'Uva T, O'Donnell O, van Doorslaer E. Differential health reporting by education level and its impact on the measurement of health inequalities among older Europeans. Int J Epidemiol. 2008;37(6):1375-83.

41. Dowd JB. Whiners, deniers, and self-rated health: what are the implications for measuring health inequalities? A commentary on Layes, et al. Soc Sci Med. 2012;75(1):10-3.

42. Avendano M, Huijts T, Subramanian SV. Re: "Are Americans feeling less healthy? The puzzle of trends in self-rated health". Am J Epidemiol. 2009;170(12):1581-2

43. Brennenstuhl S, Quesnel-Vallee A, McDonough P. Welfare regimes, population health and health inequalities: a research synthesis. J Epidemiol Community Health. 2012;66(5):397-409.