Macro-level determinants of young people's subjective health and health inequalities: A multilevel analysis in 27 welfare states

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ABSTRACT

Objectives: Cross-national studies have rarely focused on young people. The aim of this study is to investigate whether macro-level determinants are associated with health and socioeconomic inequalities in young people's health.
Study design: Data were collected from the Health Behaviour in School-aged Children (HBSC) study in 2006, which included 11- to 15-year old adolescents from 27 European and North American countries ($n = 134,632$). This study includes national income, health expenditure, income inequality, and welfare regime dummy-variables as macro-level determinants, using hierarchical regression modelling.
Main outcome measure: Psychosomatic health complaints and socioeconomic inequalities in psychosomatic health complaints.
Results: Adolescents in countries with higher income inequality and with liberal welfare tradition were associated with more health complaints and a stronger relationship between socioeconomic status and macro-level determinants compared to adolescents from countries with lower income inequality or the Social Democratic regime. National income and health expenditure were not related to health complaints. Countries with higher national income, public health expenditure and income inequality showed stronger associations between socioeconomic status and psychosomatic health complaints.
Conclusion: Results showed that macro-level characteristics are relevant determinants of health and health inequalities in adolescence.

1. Introduction

Although life expectancy and quality of life have improved in recent decades in all wealthy countries, socioeconomic inequalities in health are still a persistent feature of modern societies [1]. Health

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and health inequalities are not only determined by individual characteristics such as social and material living conditions, but also by factors at the macro-level, such as welfare state characteristics, national income, income inequality and public health spending [2–10]. Previous studies have shown that mortality and morbidity were lower in the Scandinavian countries compared to the Anglo-Saxon and Eastern European states [4–6,11], as well as in countries with higher national income [8] and lower income inequality [12].

Recent studies have shown that the smallest absolute socioeconomic inequalities in health between high and low affluent groups are not found in egalitarian countries, such as the Scandinavian

Macro-level determinants

National income, health expenditure, income inequality, and type of welfare state regime

Country-Level

2   1

Individual-Level

Micro-level determinants
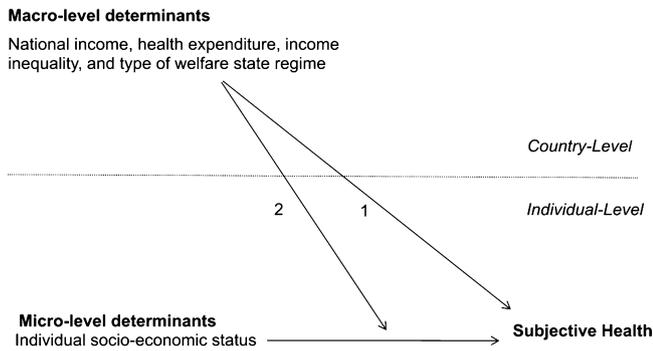Individual socio-economic status

Subjective Health

Fig. 1. Conceptual model. Effect of country-level (arrow 1) and cross-level interaction effects between individual socioeconomic and macro-level determinants (arrow 2) (modified according to Levin et al. [30]).

countries, but rather in Western central and Southern European countries [4–6,13]. Furthermore, previous cross-national studies revealed that macro-level determinants interact with socioeconomic differences in health at the individual level [8,4–6,14]. However, the extent to which health inequalities differ according to the degree of redistributive policies is highly debated [15].

With regard to macro-level determinants, the impact of different social policy arrangements has become central to the understanding of health and health inequalities [13]. During the past two decades, comparative research on welfare states has been influenced by Esping-Andersen's (1990) three "ideal" types of welfare state regimes: The *Social Democratic* (Scandinavian countries), *Conservative* (Germany, Austria and France) and *Liberal* welfare regimes (e.g., USA, UK and Canada). This typology has been expanded to include two further welfare regimes with different ideals: The *Southern European* (Mediterranean states) and *Eastern European* countries [4–6].

Generally, welfare state traditions determine economic and political outcomes such as income inequality or the level of redistribution of welfare provision. Further, they moderate the impact of socioeconomic determinants of health through various policies such as education, taxation, or child and health care [13].

Although socioeconomic differences in health are less apparent in young people than in adults, several studies found significant differences for individual [16,17] as well as country-level measures of socioeconomic position [18]. However, little research on adolescent health has examined the role of welfare regimes and single macro-level determinants of health as well as the associations between macro-level determinants and socioeconomic inequalities in health [19–22]. Further, previous studies have rarely applied multilevel modelling in order to account for the nested data structure (individuals nested in countries). The aim of the present study is, thus, to extend previous regime-oriented studies by looking at additional macro-level determinants that relate to welfare state policy outcomes, such as income inequality, national income and public health expenditure taking into account multilevel modelling techniques. Specifically, we analyze (see Fig. 1) whether macro-level and welfare state determinants are associated with adolescent subjective health (arrow 1), as well as whether these determinants moderate socioeconomic inequalities in health in adolescence (arrow 2)?

2. Materials and methods

Data were obtained from the Health Behaviour in School-aged Children (HBSC) study 2005/2006, a cross-national survey conducted in collaboration with the World Health Organization. The objective of the study was to investigate health, health behaviours and their social determinants among 11-, 13- and 15-year old

adolescents [23]. Research groups in 41 countries in the Europe, North America and Israel took part in the 2005/2006 survey, using a standardized questionnaire and adhering to an internationally agreed protocol [23]. The data were collected by means of standardized questionnaires, administered in school classrooms according to standardized instructions. The response rate at the school level was above 80% in the majority of the countries. Ethical approval was obtained for each national survey according to the national guidance and regulation at the time of data collection. The present analysis was based on 27 out of 41 countries (n = 134,632). England, Wales and Scotland form one country as well as French and Flemish regions of Belgium. Four countries had to be excluded due to the fact that they could not be classified into one of the five welfare regimes (Turkey, Iceland, Israel and Greenland). Another five countries (Denmark, Malta, Portugal, Russia, and Slovakia) were excluded because of a high number of missing values for the individual variables described below (>10%) or missing values in macro-level indicators. Table 1 shows the sample size for each country and type of welfare regime. The sample statistics for the nine excluded countries can be found in the Appendix (see Table A2).

The health outcome used in the analysis was psychosomatic health complaints [20]. Health complaints were measured using the HBSC symptom checklist. Students were asked to indicate how often in the last 6 months they had experienced the following symptoms: headache; stomach ache; backache; feeling low; irritable or bad tempered; feeling nervous; difficulties in getting to sleep; and feeling dizzy. The response options were "almost daily", "several times per week", "almost every week", "about once per month", "rarely or never". A sum index indicating the number of at least weekly health complaints was calculated from the eight items [23] (range: 0–8 health complaints).

Socioeconomic status was measured using the HBSC Family Affluence Scale (FAS), which was developed as an alternative for the measurement of the socioeconomic status [24]. Cross-national studies have shown that the FAS has a good validity, reliability and is easier for children to report accurately [25,26]. The scale consists of four different items: Does your family own a car? (0, 1, 2 or more); How many times did you travel away on holiday with your family during the past 12 months? (0, 1, 2, 3 or more); Do you have your own bedroom for yourself? (no = 0, yes = 1); and How many computers does your family own? (0, 1, 2, 3 or more). A sum score was calculated by summing the responses to these four items ranging from 0 (=low) to 7 (=high). Table 2 shows the country-specific means of the FAS index.

Three macro-level indicators were used in the analysis: national income measured by the Gross National Product (GNP per capita in US dollars), public health expenditure (% of GNP) and income inequality (Gini index) (Table 2). Data on these country characteristics were obtained from the World Bank (http://hdrstats.undp.org/indicators). The Gini index represented income inequality at the societal level, ranging from 0 (no inequality) to 1 (total inequality). All macro-level variables were centred on the grand mean across countries. Further, we included five regime type dummy variables in our models (Social Democratic, Conservative, Liberal, Southern, and Eastern European). The Social Democratic regime was chosen as the reference category.

The study utilized multilevel analysis that allows the modelling of hierarchical or nested data structures. The level 1-units in the sample are individual students; the level 2-units are the 27 countries. Multilevel analysis is based on the assumption that both the regression constant (intercept) and the regression coefficients of the individual predictors (slope) may vary for individuals between contexts (here: countries) and may be explained by country-level characteristics [27]. By using health complaints

Table 1
Sample size of countries and welfare regimes.

Welfare regimes	Countries	Boys		Girls		Total	
$N_{individuals}$ (%)	$N_{countries}$ = 27	n	%	n	%	n	%
Social democratic	Finland	2249	47.05	2531	52.95	4780	3.55
n = 13,035 (9.68%)	Norway	2135	50.93	2057	49.07	4192	3.11
	Sweden	2005	49.35	2058	50.65	4063	3.02
Conservative	Austria	2070	48.20	2225	51.80	4295	3.19
n = 33,617 (24.97%)	Belgium	1948	50.37	1919	49.63	3867	2.87
	France	3268	49.13	3384	50.87	6652	4.94
	Germany	3374	50.02	3371	49.98	6745	5.01
	Luxembourg	1892	49.45	1934	50.55	3826	2.84
	Netherlands	1954	49.37	2004	50.63	3958	2.94
	Switzerland	2068	48.39	2206	51.61	4274	3.18
Liberal	Canada	2535	46.94	2865	53.06	5400	4.01
n = 22,827 (16.96%)	UK	6611	48.10	7132	51.90	13.743	10.21
	USA	1743	47.31	1941	51.69	3684	2.74
Southern	Greece	1636	46.76	1863	53.24	3499	2.60
n = 15,400 (11.44%)	Italy	1849	49.69	1872	50.31	3721	2.76
	Spain	3969	48.52	4211	51.48	8180	6.08
Eastern	Bulgaria	2190	48.67	2310	51.33	4500	3.34
n = 49,753 (36.95%)	Croatia	2266	48.41	2415	51.59	4681	3.48
	Czech Republic	2251	49.98	2253	50.02	4504	3.35
	Estonia	2055	48.65	2169	51.35	4224	3.14
	Hungary	1553	47.76	1699	52.24	3252	2.42
	Latvia	1866	47.42	2069	52.58	3935	2.92
	Lithuania	2659	50.77	2578	49.23	5237	3.89
	Macedonia	2460	49.55	2505	50.45	4965	3.69
	Poland	2522	48.07	2725	51.93	5247	3.90
	Slovenia	2326	48.89	2432	51.11	4758	3.53
	Ukraine	2028	45.57	2422	54.43	4450	3.31
Total		65,482	48.64	69,150	51.36	134,632	

Table 2
Means and standard deviations (SD) of individual and macro-level determinants for countries and regimes.

Regimes/Country	Outcome	Socioeconomic position	Macro-level indicators		
(n = 27)	Number of psychosomatic complaints (0–8 complaints at least weekly) Mean (SD)	FAS (0–7) Mean (SD)	GNP 2005/2006 (per capita in USD) Mean (SD)	Health expenditure[#] Mean (SD)	Gini index (in %) Mean (SD)
Social Democratic Regime	1.06 (1.54)	5.49 (1.27)	35,249 (4251)	8.96 (1.24)	25.95 (0.79)
Finland	1.01 (1.51)	5.09 (1.32)	32,153	7.4	26.90
Norway	1.01 (1.47)	5.89 (1.09)	41,420	10.3	25.80
Sweden	1.17 (1.64)	5.53 (1.24)	32,525	9.4	25.00
Conservative Regime	1.03 (1.53)	5.30 (1.37)	35,157 (9199)	9.66 (1.56)	30.54 (2.55)
Austria	0.74 (1.29)	5.13 (1.34)	33,700	7.5	29.10
Belgium	0.91 (1.47)	5.27 (1.35)	32,119	9.4	33.00
France	1.41 (1.67)	5.29 (1.43)	30,386	10.1	32.70
Germany	0.87 (1.43)	5.20 (1.45)	29,461	11.1	28.30
Luxembourg	1.27 (1.75)	5.59 (1.34)	60,228	6.8	26.00
Netherlands	0.83 (1.36)	5.42 (1.27)	32,684	9.8	30.90
Switzerland	1.08 (1.53)	5.29 (1.30)	35,633	11.5	33.70
Liberal Regime	1.20 (1.63)	5.33 (1.41)	34,681 (3202)	9.61 (2.57)	35.97 (2.54)
Canada	1.24 (1.69)	5.41 (1.30)	33,375	9.9	32.60
UK	1.10 (1.56)	5.28 (1.45)	33,238	8.0	36.00
USA	1.52 (1.74)	5.41 (1.43)	41,980	15.2	40.80
Southern Regime	1.40 (1.72)	4.82 (1.46)	26,636 (1850)	8.37 (0.88)	34.88 (0.68)
Greece	1.48 (1.68)	4.51 (1.50)	23,381	9.9	34.10
Italy	1.73 (1.79)	4.73 (1.48)	28,529	8.4	36.00
Spain	1.22 (1.67)	4.99 (1.41)	27,169	7.7	34.70
Eastern Regime	1.25 (1.64)	4.17 (1.66)	13,912 (4809)	7.04 (1.01)	31.99 (4.56)
Bulgaria	1.38 (1.72)	4.08 (1.56)	9032	7.5	29.20
Croatia	1.15 (1.52)	4.30 (1.51)	13,042	7.8	29.00
Czech Republic	1.27 (1.58)	4.32 (1.54)	20,538	7.5	25.40
Estonia	1.22 (1.64)	4.16 (1.66)	13,646	6.4	37.70
Hungary	1.32 (1.71)	4.37 (1.59)	17,887	8.4	26.90
Latvia	1.32 (1.66)	4.26 (1.67)	15,478	5.3	35.80
Lithuania	1.37 (1.81)	3.89 (1.68)	14,494	6.6	36.00
Macedonia	1.17 (1.49)	3.85 (1.71)	7200	7.1	39.00
Poland	1.31 (1.69)	4.24 (1.69)	13,847	6.5	34.50
Slovenia	0.80 (1.37)	5.22 (1.32)	22,273	8.8	28.40
Ukraine	1.50 (1.72)	3.23 (1.56)	6848	5.7	28.10
Overall mean (SD)	1.19 (1.62)	4.85 (1.59)	26,259 (11,381)	8.47 (1.92)	32.05 (4.27)

[#] Per capita in % of GNP.

as the outcome, we examined the extent to which this outcome differed among countries and simultaneously identified macro-level factors that might explain this between-country variation. The intercepts represent average health complaints across all countries for the reference groups, respectively.

The individual- and macro-level determinants were included in the models using a stepwise approach. First, an empty model (model 1) tested the Intraclass Correlation Coefficient (ICC). The ICC represents the proportion of variance on latent country effects, indicating the variance in the outcome attributed to country differences. In model 2, only individual-level variables were entered. Models 3a to 3c included GNP (model 3a), health expenditure (model 3b) and Gini index (model 3c), respectively. Model 3d included the welfare regime dummy variables (the Social Democratic regime defined the reference category). Finally, model 4 included all macro-level indicators. With regard to the second research question, cross-level interaction terms between family affluence and macro-level indicators were entered to models 3a-d and 4 (see Table 1A in the Appendix for the formal writing of models). All models controlled for age (three age groups: 11, 13 and 15; 11 years as the reference category) and gender (boys as the reference category). We calculated the deviance values ($-2x$ log-likelihood) to assess the model which best fit to the data, shown by the lowest deviance value according to the principle of 'the smaller the better'. The statistical analysis was conducted using the software HLM 6.02.

3. Results

Table 3 presents the multilevel results for health complaints across countries. Adolescents reported an average of 1.20 complaints at least once a week (model 1). Girls and older adolescents reported more complaints than boys and 11-years olds respectively, whereas increasing family affluence was negatively associated with health complaints (model 2).

For GNP and public health expenditure (models 3a and 3b), no significant associations with average health complaints were found, while income inequality was positively related to health complaints. Liberal regime countries showed more health complaints than the Social Democratic regime (model 3d). No differences emerged between the other regime types. In model 4, including all macro level indicators simultaneously, only income inequality showed a significant impact on health complaints, while regime differences were no longer significant. In general, variation in the intercept of health complaints across countries decreased from 2% in model 1 to 1% in model 4.

To examine the association between macro-level determinants and socioeconomic differences in health, we tested multilevel models with cross-level interactions of family affluence with each macro-level indicator (models 3a–4). National income and public health expenditure were not significantly related to with family affluence. However, in countries with higher income inequality a significant stronger association between family affluence and complaints was found (model 3c). The impact of family affluence on health complaints was also stronger in the Liberal regime compared to other regime types (model 3e). In the full model (model 4), including cross-level interaction terms between family affluence and income inequality, the significant effect of income inequality on socioeconomic inequalities in health complaints disappeared. However, by comparing the deviance values across models, the best model fit can be found in the full model as the deviance is the lowest compared to the models with single macro-level indicators and single cross-level interactions.

4. Discussion

This study is among the first to examine whether different macro-level determinants and welfare regimes are associated with individual differences in adolescent subjective health and socioeconomic health inequalities from a cross-national perspective. The findings showed that macro-level determinants had only a partial impact on health complaints compared to individual characteristics, such as age, gender and family affluence. We found that adolescents in countries with higher income inequality revealed more health complaints than in those with lower income inequality. These results support the findings from [20] for mental health of children and income inequality, showing that countries with higher income inequality had worse mental health. Holstein and colleagues found a significant association between health complaints and income inequality [19], but not for national income, using the same survey. In contrast to income inequality, national income and public health expenditure were not significantly related to health complaints in our study. In contrast to our findings, Olsen and Dahl found better subjective health for adults in countries with higher national income (GDP) and public social expenditures [28]. Using the same data set as in the present analyses, several studies investigated the impact of different macro-level determinants on health-related outcomes. For instance, Ottova et al. [29] reported that adolescents living in countries with a higher degree of human development (measured by the Human Development Index) reported a lower magnitude of health complaints.

In terms of welfare regimes, our results showed that adolescents living in Liberal regime countries reported significantly more health complaints. Interestingly, findings from studies in adults have shown that individuals in the Social Democratic and Liberal regimes had a better self-rated health [5]. Richter et al. [21] and Zambon et al. [22] found also more health complaints for adolescents living in Liberal regime countries compared to the Social Democratic regime. However, it should be acknowledged that subjective health might be comprehended differently across European countries and that this might bias our findings.

Regarding the impact of macro-level determinants on socioeconomic inequalities in health complaints, the association with family affluence was significantly stronger in countries with higher income inequality, countries which also belong to the Liberal regime, even though effect sizes were small. In contrast, countries with higher GNP and public health expenditure showed no significant association with health complaints and family affluence, respectively. Another study on macro-level determinants of young people's health has shown that both, low family affluence and high income inequality at the country-level were negatively related to subjective health [18]. Levin et al. [30] showed that national income and income inequality were associated with life satisfaction, and socioeconomic inequalities were greatest in poorer countries and in countries with an unequal income distribution.

Although our study revealed that the macro-level determinants showed moderate associations with psychosomatic health complaints and socioeconomic inequalities, we will attempt to explain these relationships. In our study, the Liberal regime showed higher rates of adverse subjective health. Previous studies explained these regime-specific differences in health by neo-liberal policies, and thus by market-dominated structures of the social security system and low redistributive tendencies. The Liberal welfare states rank among the countries with the highest income inequality and their social policies are characterized by modest welfare benefits, moderate social transfers and the least generous social safety net. Thus, the structural features of the Liberal regime seem to be a detrimental factor not only for health in adulthood, but also for young people's health, indicated by worse health outcomes [21,22].

Table 3

Multilevel models for complaints (0–8 complaints at least weekly) with fixed, random and cross-level interaction effects (n = 134,632).

Variables	Regression coefficients β^{Sig} (se)	M 1: Empty model	M 2: Individual variables	M 3a: Regimes	M 3b: National income	M 3c: Health Expend.	M 3d: Gini index	M 4: Full model
Fixed effects: individual variables	Intercept (β_0)	1.20 (0.046)***	0.428 (0.053)***	0.392 (0.051)***	0.431 (0.0540)***	0.425 (0.050)***	0.430 (0.052)***	0.427 (0.050)***
	Gender (β_1) (boys, girls)		0.509 (0.030)***	0.509 (0.030)***	0.509 (0.030)***	0.509 (0.030)***	0.509 (0.030)***	0.509 (0.030)***
	Age (β_2) (11-, 13- and 15-years)		0.162 (0.017)***	0.162 (0.017)***	0.162 (0.017)***	0.162 (0.017)***	0.162 (0.017)***	0.162 (0.017)***
	FAS (β_3) (low-high)		−0.068 (0.005)***	−0.064 (0.005)***	−0.068 (0.005)***	−0.067 (0.005)***	−0.068 (0.005)***	−0.068 (0.005)***
Effect of macro-level determinants on intercept	Regime type^{RC}: conservative			0.078 (0.125)				0.005 (0.129)
	Liberal			0.404 (0.112)***				0.238 (0.149)
	Southern			0.274 (0.545)				0.132 (0.165)
	Eastern			0.070 (0.114)				−0.025 (0.141)
	National income (GNP)^c				0.025 (0.036)			0.002 (0.046)
	Public health expenditure^c					0.046 (0.026)		−0.001 (0.027)
	Income inequality (Gini index)^c						0.103*** (0.028)	0.067 (0.029)**
Cross-level interactions	Regime type^{RC}: Conservative			−0.018 (0.015)				−0.010 (0.019)
	Liberal			−0.041 (0.016)*				−0.026 (0.024)
	Southern			−0.019 (0.023)				0.002 (0.026)
	Eastern			0.001 (0.017)				0.023 (0.020)
	National income (GNP)^c				−0.007 (0.005)			0.002 (0.006)
	Public health expenditure^c					−0.005 (0.004)		−0.008 (0.005)
	Income inequality (Gini index)^c						−0.01 (0.005)*	0.006 (0.004)
Random effects: variances	Intercept (u_0)	0.058***	0.064***	0.051***	0.063***	0.055***	0.062***	0.056***
	Gender (u_1)		0.023***	0.023***	0.023***	0.023***	0.023***	0.023***
	Age (u_2)		0.008***	0.008***	0.008***	0.008***	0.008***	0.008***
	FAS (u_3)		0.001***	0.001***	0.001***	0.001***	0.001***	0.001***
Deviance (df)		509.013.47 (2)	503.660.13 (11)	503.661.48 (11)	503.672.23 (11)	503.665.37 (11)	503.672.84 (11)	503.658.64 (11)
ICC		0.022 = 2.2%	0.025 = 2.5%	–	–	–	–	0.012 = 1.2%
N		134,632	134,632	134,632	134,632	134,632	134,632	134,632
Country N		27	27	27	27	27	27	27

se, standard error; RC, Reference Category is the Social Democratic regime; FAS, Family Affluence Scale; c, centred around the grand mean; df, degrees of freedom.

*** $p \leq 0.001$.

** $p \leq 0.01$.

* $p \leq 0.05$.

Our findings suggest that income inequality, which is higher in liberal welfare states, intensifies socioeconomic variations in health complaints. Due to the fact that the impact of macro-level determinants on health inequalities was rarely investigated and the uncertainty of the explanatory approaches in this research area [15], it is only possible to speculate about possible explanations. Stronger socioeconomic differences in adult health in countries with higher income inequality are often explained by social comparison and psychosocial stress mechanisms, but also by an underinvestment in the "material world" in terms of political structures, social expenditures and socioeconomic living conditions [12]. The latter highlights the impact of income inequality on health as a combination of negative exposures and lack of resources held by individuals, along with a systematic underinvestment in the health and social infrastructure of societies [12]. Hence, in line with the psychosocial theory it can be assumed that greater socioeconomic inequalities in countries with higher income inequality may be due to an unequal distribution of psychosocial factors, such as social support and higher psychosocial stress for families with children from lower social status groups. According to the neomaterial approach, greater socioeconomic differences in health in countries with higher income inequality are likely to be mediated via the access and uptake of welfare state benefits for young people with low socioeconomic status. Thus, young people with low socioeconomic background in countries with higher income inequality might be exposed to a decay of public infrastructure and a non-egalitarian access to welfare benefits to a higher degree than in countries with more egalitarian income distributions.

In this context, an additional explanation is that the macro-level determinants in our study are not directly associated with adolescent health inequalities, but instead have an indirect impact on health as a stratifying mechanism via other health-relevant determinants, such as health behaviour or parental support [21].

A final explanation for socioeconomic differences in adolescent health in comparison to adults represents the life course approach: as for individual socioeconomic differences in adolescent health we could not observe a clear pattern for the impact of macro-level factors on inequalities in health complaints. Thus, it is very likely that socioeconomic inequalities in subjective health may widen and consolidate over the life course due to structural features of countries that determine material as well as psychosocial living conditions of individuals. In future studies it would be important to (1) replicate and (2) explain these associations between macro-level determinants and inequalities in health complaints among adolescents.

The HBSC study presents an outstanding opportunity to analyze cross-national patterns of health and health inequalities among young people. The strengths of this study include the use of a large cross-national dataset and standardized data collection. However, there were methodological issues that may have influenced our results and should therefore be considered. One possible limitation is the application of self-reported measures of health which may vary by country, cultural interpretation and socio-economic position. It should also be acknowledged that the Family Affluence Scale measures only one dimension of socio-economic position. Previous studies have shown that family affluence can be applied as a proxy for individual SES [19,24]. Although the FAS is not an ideal measurement of SES, its major advantage is a relatively high response rate to the four questions in contrast to other socioeconomic indicators (education or occupation). Further, a previous study showed that the four FAS items completed by 11-years olds corresponded with parents' responses and were correlated with parentsóccupational status [25]. Additionally, FAS was closely related to national income at the aggregated level [26]. Another limitation is the grouping of welfare states into regime types which is a challenge for cross-national studies and has been subject to substantial criticism.

Studies on educational inequalities in health have used different regime typologies and obtained different results [6].

5. Conclusion

The interrelations between different macro-level determinants, such as welfare state arrangements, income inequality, national income, and public health expenditure, subjective health and socio-economic inequalities in health have not been investigated for adults nor for adolescents in a joint analysis so far. Our findings suggest that individual socioeconomic factors are more important determinants of adolescent subjective health than macro-level characteristics. Nevertheless, we also found evidence for a moderate impact of macro-level factors on adolescent health complaints. For health promoting policies, our study suggests that there is a need to address the wider social determinants of health and health inequalities. Thus, multi-sectoral strategies are required that consider the importance of different policy sectors in order to tackle health inequalities among young people.

Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at http://dx.doi.org/10.1016/j.maturitas.2015.01.008.

References

[1] Marmot M, Friel S, Bell R, Houweling TA, Taylor S. Commission on social determinants of health closing the gap in a generation: health equity through action on the social determinants of health. Lancet 2008;372(9650):1661–9.

[2] Beckfield J, Krieger N. Epi + demos + cracy: linking political systems and priorities to the magnitude of health inequities–evidence, gaps, and a research agenda. Epidemiol Rev 2009;31:152–77.

[3] 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.

[4] Eikemo TA, Bambra C, Joyce K, Dahl E. Welfare state regimes and income-related health inequalities: a comparison of 23 European countries. Eur J Public Health 2008;18(6):593–9.

[5] 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;66(11):2281–95.

[6] 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;30(4):565–82.

[7] Hurrelmann K, Rathmann K, Richter M. Health inequalities and welfare state regimes. A research note. J Public Health 2011;19:3–13.

[8] Muntaner C, Borrell C, Ng E, et al. Politics, welfare regimes, and population health: controversies and evidence. Sociol Health Illn 2011;33(6):946–64.

[9] Raphael D. Social determinants of health: present status, unanswered questions, and future directions. Int J Health Serv 2006;36(4):651–77.

[10] Raphael D. Adolescence as a gateway to adult health outcomes. Maturitas 2013;75(2):137–41.

[11] Bambra C. Health inequalities and welfare state regimes: theoretical insights on a public health 'puzzle'. J Epidemiol Community Health 2011;65(9):740–5.

[12] Lynch JW, Davey Smith G, Kaplan GA, House JS. Income inequality and mortality: importance to health of individual income, psychosocial environment, or material conditions. BMJ 2000;320(7243):1200–4.

[13] Lundberg O, Yngwe M.Å., Kölegård Stjarne M, et al. The role of welfare state principles and generosity in social policy programmes for public health: an international comparative study. Lancet 2008;372(9650):1633–40.

[14] 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.

[15] Mackenbach JP. The persistence of health inequalities in modern welfare states: the explanation of a paradox. Soc Sci Med 2012;75(4):761–9.

[16] Starfield B, Riley AW, Witt WP, Robertson J. Social class gradients in health during adolescence. J Epidemiol Community Health 2002;56(5):354–61.

[17] Starfield B, Robertson J, Riley AW. Social class gradients and health in childhood. Ambul Pediatr 2002;2(4):238–46.

[18] Torsheim T, Currie C, Boyce WT, Samdal O. Country material distribution and adolescents' perceived health: multilevel study of adolescents in 27 countries. J Epidemiol Community Health 2006;60(2):156–61.

[19] Holstein BE, Currie C, Boyce WT, et al. Socio-economic inequality in multiple health complaints among adolescents: international comparative study in 37 countries. Indian J Public Health 2009;54:260–70.

[20] Ravens-Sieberer U, Erhart M, Torsheim T, et al. An international scoring system for self-reported health complaints in adolescents. Eur J Public Health 2008;18(3):294–9.

[21] Richter M, Rathmann K, Nic Gabhainn S, Zambon A, Boyce WT, Hurrelmann K. Welfare state regimes, health and health inequalities in adolescence: a multilevel study in 32 countries. Sociol Health Illn 2012;34(6):858–79.

[22] Zambon A, Boyce WT, Cois E, et al. Do welfare regimes mediate the effect of socioeconomic position on health in adolescence? A Cross-national comparison in Europe, North America, and Israel. Int J Health Serv 2006;36(2):309–29.

[23] Currie C, Nic Gabhainn S, Godeau E, Roberts C. Inequalities in Young People's Health. HBSC International Report from the 2005/2006 Survey. Copenhagen: World Health Organization (WHO); 2008.

[24] Currie C, Molcho M, Boyce WT, Holstein B, Torsheim T, Richter M. Researching health inequalities in adolescents: the development of the Health Behaviour in School-Aged Children (HBSC) family affluence scale. Soc Sci Med 2008;66(6):1429–36.

[25] Andersen AN, Krølner R, Currie C, et al. High agreement on family affluence between children's and parents' reports: international study of 11-year-old children. J Epidemiol Community Health 2008;62(12):1092–4.

[26] Boyce WT, Torsheim T, Currie C, Zambon A. The family affluence scale as a measure of national wealth: validation of an adolescent self-report measure. Soc Indic Res 2006;78(3):473–87.

[27] Rabe-Hesketh S, Skrondal A. Multilevel and longitudinal modeling using stata. College Station: Stata Press; 2012.

[28] Olsen KM, Dahl S. Health differences between European countries. Soc Sci Med 2007;64(8):1665–78.

[29] Ottova V, Erhart M, Vollebergh W, et al. The role of individual- and macro-level social determinants on young adolescents' psychosomatic complaints. J Early Adolesc 2012;32(1):126–58.

[30] Levin KA, Torsheim T, Vollebergh W, et al. National income and income inequality, family affluence and life satisfaction among 13 year old boys and girls: a multilevel study in 35 countries. Soc Indic Res 2011;104(2):179–94.