

Explaining socioeconomic differences in adolescent self-rated health: the contribution of material, psychosocial and behavioural factors

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ABSTRACT

Background Efforts to explain social inequalities in health have mainly focused on adults. Few studies have systematically analysed different explanatory pathways in adolescence. This study is among the first to examine the contribution of material, psychosocial and behavioural factors in the explanation of inequalities in adolescent health.

Methods Data were obtained from the German part of the cross-sectional 'Health Behaviour in School-aged Children' Survey in 2006, with a total of 6997 respondents aged 11–15 years (response rate 86%). Socioeconomic position was measured using the Family Affluence Scale. Multistage logistic regression models were used to assess the relative importance of explanatory factors.

Results Compared with adolescents from high affluent backgrounds, the ORs of fair/poor self-rated health increased to 1.53 (95% CI 1.11 to 2.12) in low affluent boys and to 2.08 (95% CI 1.62 to 2.67) in low affluent girls. In the separate analyses, material, psychosocial and behavioural factors attenuated the OR by 30–50%. Together, the three explanatory factors reduced the OR by about 80% in low affluent boys and girls. The combined analyses illustrated that material factors contributed most to the differences in self-rated health because of their direct and indirect effect (through psychosocial and behavioural factors).

Conclusions The findings show that the main explanatory approaches for adults also apply to adolescents. The direct and indirect contribution of material factors for inequalities in self-rated health was stronger than that of behavioural and psychosocial factors. Strategies for reducing health inequalities should primarily focus on improving material circumstances in lower affluent groups.

INTRODUCTION

Previous efforts to explain social inequalities in health have mainly focused on adults. The debate on the explanation of socioeconomic differences in adult health has identified behavioural, psychosocial and material factors as important explanatory approaches.^{1–4} All three approaches postulate that socioeconomic inequalities in health are explained by a differential distribution of health determinants across socioeconomic groups. Behavioural factors include, for example, smoking, a poor diet and lack of physical activity. The psychosocial perspective emphasises the unequal distribution of psychosocial factors such as social support and level of control, while the materialist explanation focuses on the role of structural and material living

circumstances (eg, employment status or housing conditions). Several studies have tried to assess the relationship and the relative contribution of these groups of factors.^{3 5–10} According to these findings, material factors are believed to exert the strongest influence on health as they influence health directly and indirectly via psychosocial factors and health behaviours.^{11–13}

While health inequalities in adolescence are receiving renewed scientific interest,^{14–20} there is little known about potential factors and mechanisms that impact on the relationship between socioeconomic position (SEP) and health in adolescence.^{21–23} Most of the well-known determinants of health inequalities in adulthood had little time to develop its health-damaging effect in adolescence. However, there is some evidence that the explanatory factors outlined above are also relevant for young people's health. For example, already during adolescence, behavioural factors are associated with a variety of undesirable health outcomes.^{24–26} In addition, the family, school and peer group comprise the central socialising contexts in adolescence. Potential psychosocial stressors capable of compromising health and leading to risk behaviour are primarily found in these social contexts. The family also represents the environment that might expose students to material disadvantage. Although there are some findings on the health-damaging consequences of various psychosocial aspects of the school,^{27–29} peer group³⁰ and family,^{31 32} not much is known about their contribution and relative importance to the explanation of socioeconomic differences in health in adolescence.

To our knowledge, no study has combined the three groups of explanatory factors (material, psychosocial and behavioural factors) in an attempt to explain socioeconomic differences in self-rated health among young people. The present study aims to assess the relative contribution of material, psychosocial and behavioural factors and their direct and indirect effects to the explanation of socioeconomic differences in self-rated health in adolescence.

MATERIALS AND METHODS

Study population

Data were obtained from the German part of the 'Health Behaviour in School-aged Children' (HBSC) Study, a multinational study conducted in collaboration with the WHO. The aims of the HBSC Study are to describe young people's health and health behaviour and to analyse how these

outcomes are related to the social context. Cross-sectional surveys are carried out every 4 years in a growing number of countries based on an internationally agreed protocol. The last survey (2005–2006) included a total of 41 countries in Europe and North America and including Israel. A detailed description of the aims and theoretical framework of the study can be found elsewhere.^{33 34}

The German HBSC Study is based on a regional sample of five federal states in Germany: Berlin, Hamburg, Hesse, North Rhine-Westphalia and Saxony.¹⁹ The students were selected using a clustered sampling design. The fieldwork took place between January and July 2006. Schools were sampled randomly from a list of public schools in the five federal states, stratified by the type of school and administrative district. Overall, 1063 schools were contacted by letters to the school principal and the school board. Three hundred and thirty-two schools agreed to participate. The individual response rate was 86% of the pupils formally enrolled in the participating schools. As pupils in Germany are taught in age-homogeneous classes, students from grades 5, 7 and 9 were included representing the age groups 11-, 13- and 15-year-olds, respectively. Data were collected by means of a standardised questionnaire. Those students were included in the study who had volunteered to participate and whose parents had also signed an informed consent. The study was approved by the federal data protection commissioner of each federal state. The total sample included 7274 students.

Self-rated health

Self-rated health of young people was measured through the single item 'Would you say your health is ... (1) Excellent; (2) Good; (3) Fair; (4) Poor'. This is a standardised indicator of self-rated health, which has been used extensively in public health research, in particular with adults. In the current analysis, responses were dichotomised into excellent/good versus fair/poor.

Socioeconomic position

In studies based on self-reports from children and adolescents, many respondents are unable to provide information about parental occupation, education or income, resulting in high levels of missing data.^{35 36} Currie *et al* developed the 'Family Affluence Scale (FAS)' as an alternative measurement of SEP for adolescents, providing an indirect measurement of SEP based on responses to four simple items.³⁷ The validity of FAS has been addressed by several studies.³⁷ Molcho *et al* showed that the FAS revealed a moderate internal reliability, and the FAS scores were significantly associated with reported parental occupation.³⁶ The FAS items include family car (0, 1, 2 or more), own bedroom (no=0, yes=1), family holidays during the past 12 months (0, 1, 2, 3 or more) and family computer (0, 1, 2, 3 or more). For the latter two items, the two highest response categories (2, 3 or more) were combined. A composite FAS score was calculated by summing the responses to these four items and recoded into three groups (low (0–3), medium (4–5) and high (6–7) family affluence).

Material, psychosocial and behavioural factors

Categories are indicated in parentheses. Material factors measuring the structural disadvantage included three indicators: family structure (living with both parents, single parent family, stepfamily, other),^{12 38 39} perceived family wealth (dichotomised: very well off/quite well off and average/not so well off/not at all well off) and (food) poverty (dichotomised: never and always/often/sometimes).⁴⁰

Psychosocial factors included 12 variables from three different social contexts (family, school and peers). Parental support concerning school was measured by five 5-point Likert scaled items. The sum score was recoded into tertiles with 'high', 'medium' and 'low' parental support. To assess the quality of the relationship with parents, the students respond, how easy or how difficult it is to talk to their parents about things that really bother them—separately for mother and father (dichotomised: very easy/easy and difficult/very difficult/don't see/have). Classmate support was measured using a three-item scale (low, medium and high support).⁴¹ The perceived quality of teaching was measured with a five-item scale and recoded into tertiles of 'good', 'medium' and 'low' teaching quality. Other school factors were satisfaction with school (dichotomised: like it a lot/like it a bit and don't like it very much/don't like it at all), academic achievement (dichotomised: very good/good and average/below average) and school-related stress (dichotomised into not at all/a little and some/a lot).^{29 42} The relationship with peers was assessed by asking about the quantity and gender of close friends. Two variables were constructed for the number of friends of the same and the opposite sex (more than two friends vs none/one friend). Pupils were also asked on how many days a week they usually spend time with friends after school (≥ 2 days and < 2 days). Support of the best friend was measured with a question on difficulties to talk to the best friend about things that bother them (dichotomised: very easy/easy and difficult/very difficult/don't have).

Behavioural factors were measured by information about smoking (dichotomised: at least once a week and less than once a week/never) and alcohol consumption (dichotomised: at least every week and less than every week). Physical activity was assessed with a 60-min Moderate to Vigorous Physical Activity screening measure⁴³ (physically active for at least 60 min on at least 5 days vs fewer days). We also included items on the consumption of fruits, vegetables, sweets and soft drinks (dichotomised into daily vs less than daily) as well as eating breakfast on school days (dichotomised: every school day and less than every school day).

Statistical analyses

To estimate socioeconomic differences in the prevalence of low self-rated health, we fitted separate logistic regression models for girls and boys, adjusted for age. The ORs for family affluence with 95% CIs were calculated. The highest group of family affluence served as the reference category. For all analyses, cases with missing values on family affluence, self-rated health, age and gender were excluded; for the explanatory variables, a missing category was included. 6997 pupils remained in the analyses. Analyses of missing values did not show significant differences according to family affluence or other SEP indicators. In explanatory analyses, we first investigated the association between family affluence and each of the explanatory variables as well as between the latter and self-rated health (SRH). Those explanatory factors with a significant effect for self-rated health and a negative association with family affluence were selected for explanatory analyses. We decided to allow a gender-specific selection of the variables, so that different explanatory factors were included for boys and girls. Drawing upon prior analyses among adults, different models—with identical sample size—were fitted further adjusted for material, psychosocial and behavioural factors, adjusted for combinations of two groups of factors, and finally adjusted for all factors simultaneously.^{3–5 8 11} The reference model (model 1) consists of ORs for self-rated health by family affluence adjusted for age only. The explanatory factors were then added simultaneously as one block to the

models: model 2 (+ material factors), model 3 (+ psychosocial factors), model 4 (+ behavioural factors), model 5 (+ material factors + psychosocial factors), model 6 (+ material factors + behavioural factors), model 7 (+ psychosocial factors + behavioural factors) and model 8 (+ all factors). For each model, we calculated the percentage change in ORs for SRH in the different family affluence groups due to the addition of the correlates $((OR_{(model\ 1)} - OR_{(model\ 2-8)}) / (OR_{(model\ 1)} - 1))100$. By comparing the models, we were able to assess the independent (direct) and indirect contributions (see web appendix 1 for more detailed information). We used SPSS V.17.0 for all analyses.

RESULTS

Table 1 presents the study population by age, family affluence and self-rated health for girls and boys. A total of 6997 students could be taken into account for the logistic regression analysis. About half of the boys and 43% of the girls belonged to the high FAS group, whereas 11% of the boys and 16% of the girls had a low family affluence. Twelve per cent of boys and 16% of girls reported poor/fair self-rated health.

Significant inequalities in self-rated health by family affluence were found for both genders (table 2). Compared with high affluent students, the odds of poor self-rated health increased among girls with a medium family affluence to 1.31 and to 2.08 for low family affluence (boys OR_{med} 1.37, OR_{low} 1.53).

Table 3 presents the association between material, psychosocial and behavioural factors and self-rated health as well as with family affluence. For both genders, all material factors (family structure, perceived family wealth, food poverty) were significantly associated with family affluence and health. From 12 psychosocial determinants, four factors for boys (academic achievement, school support (parents), talk to father/mother) and seven factors for girls (classmate support, going out with friends after school, talk to best friend, close female friends, school support (parents), talk to father/mother) were associated with self-rated health and family affluence and were included in the explanatory models. With regard to behavioural factors, from eight behaviours, only two variables for boys (breakfast, soft drinks consumption) and six variables for girls (smoking, physical activity, breakfast and consumption of fruits, vegetables and soft drinks) meet the requirements for further analysis.

To examine the relative contribution of the explanatory factors, groups of material (model 2), psychosocial (model 3) and behavioural determinants (model 4) were first separately added to the reference model (table 4). Adjustment for each group of factors resulted in a reduction of the OR for low family affluence by 35%, 44%, 44% for girls and 53%, 38% and 23% for boys. The attenuation for the medium affluence group was similar.

Table 1 Characteristics of the study population (N=6997)

Characteristic	Total (n)	Boys (n=3502) (%)	Girls (n=3495) (%)
Age, years			
11	2130	30.5	30.4
13	2365	34.1	33.5
15	2502	35.4	36.1
Family affluence			
High	3272	50.8	42.7
Medium	2799	38.3	41.7
Low	926	10.9	15.6
Self-rated health			
Excellent/good	6026	88.4	83.9
Fair/poor	971	11.6	16.1

Table 2 ORs and 95% CIs of poor/fair self-rated health by family affluence (FAS) for boys and girls aged 11–15 years (N=6997)*

	Boys		Girls	
	OR (95% CI)	p Value	OR (95% CI)	p Value
Family affluence				
High (ref.)	1.00		1.00	
Medium	1.37 (1.09 to 1.71)	0.006	1.31 (1.07 to 1.61)	0.010
Low	1.53 (1.11 to 2.12)	0.010	2.08 (1.62 to 2.67)	0.000

*Separate logistic regression models, adjusted for age. FAS, Family Affluence Scale.

Via different combinations of these factors (models 5–8), the independent (direct) and indirect effects could be estimated. Simultaneously, adjustment for two groups of factors further reduced the OR for poor self-rated health. Material and psychosocial factors together (model 5) reduced the OR for low family affluence among girls by 62% (68% boys), indicating a 27% (15% boys) additional reduction of the OR compared with the contribution of material determinants only (model 2). This additional reduction can be defined as the direct effect of psychosocial factors (see also table 5). The remaining contribution of psychosocial factors (from model 3) reflects material factors, which goes through psychosocial factors (low affluent girls: 25%, low affluent boys: 23%). The independent contribution of material factors in relation to psychosocial determinants can be calculated congruently (model 5–model 3), representing a direct reduction of 18% for girls with low FAS (boys: 30%).

The independent contribution of behavioural factors can be estimated by the additional percentage reduction in the final model compared with a model including only material and psychosocial factors (model 5). The overall contribution of behavioural factors (model 4) is split into the independent contribution of 22% (girls, boys 12%) and the influence of material and psychosocial factors through health behaviour in the low affluent group (girls 22%, boys 11%).

The final model (table 4, model 8) shows a large explanation of the socioeconomic differences in self-rated health by 64% for medium FAS and 80% for low FAS in boys. For girls, similar findings were found with a 100% reduction for medium FAS and an 84% reduction for low FAS.

DISCUSSION

So far, little research was conducted on the determinants and pathways that explain social inequalities in health in young people. We observed a clear social gradient for family affluence in self-rated health among 11- to 15-year-old adolescents. Altogether, after adjusting for material, psychosocial and behavioural factors, these gradients were reduced about 80% in both genders. Material factors contributed most to the explanation because of their independent (direct) and indirect influence through psychosocial and behavioural factors. Health behaviour had the lowest influence (especially for boys), as its contribution reflects for a large part material and psychosocial factors.

Comparison with previous research

Our findings support previous evidence on socioeconomic differences in self-rated health in adolescence.^{18 19 21 44–47} Unfortunately, there are only very few studies on different explanatory pathways for social inequalities in health among young people, which makes it difficult to compare our results. However, our study supports the findings from Torsheim *et al*, which showed that the relationship between material deprivation and subjective health in 22 countries was significantly

Table 3 ORs for poor/fair self-rated health and prevalence rates by family affluence for material, psychosocial and behavioural factors (N=6997)*

	Boys					Girls				
	OR (95% CI)	Family affluence			p Value	OR (95% CI)	Family affluence			p Value
		Low	Medium	High			Low	Medium	High	
Material factors										
Family structure										
Both parents (ref.)	1.00	60.5	71.5	77.8	0.000	1.00	62.3	70.2	786.8	0.000
Single parent family	1.66 (1.28 to 2.16)	28.3	17.8	10.6		1.76 (1.40 to 2.25)	26.8	15.9	10.1	
Stepfamily	1.48 (1.04 to 2.11)	5.8	7.4	8.9		1.82 (1.39 to 2.38)	7.7	11.3	10.9	
Perceived family wealth										
Very/quite well off (ref.)	1.00	47.4	53.6	71.8	0.000	1.00	45.8	50.7	67.8	0.000
Average/not so/not at all well off	1.79 (1.45 to 2.21)	50.0	45.0	26.7		1.71 (1.42 to 2.06)	53.3	48.0	30.8	
(Food) poverty										
Never (ref.)	1.00	83.0	84.9	88.2	0.006	1.00	81.6	85.7	90.9	0.000
Sometimes/often/always	1.90 (1.45 to 2.48)	15.7	14.6	11.0		2.73 (2.17 to 3.45)	17.8	14.2	8.9	
Psychosocial factors										
Talk to mother										
Easy (ref.)	1.00	77.0	77.1	80.9	0.044	1.00	73.5	78.1	79.6	0.018
Difficult	1.77 (1.39 to 2.26)	20.7	19.5	16.8		2.52 (2.06 to 3.10)	23.7	18.4	17.1	
Talk to father										
Easy (ref.)	1.00	53.4	64.2	72.4	0.000	1.00	35.5	47.7	55.3	0.000
Difficult	1.76 (1.42 to 2.18)	43.5	34.0	25.9		2.25 (1.85 to 2.75)	63.1	50.2	42.3	
School support (parents)										
High (ref.)	1.00	30.1	29.0	36.0	0.000	1.00	28.1	33.8	38.2	0.000
Middle	1.15 (0.85 to 1.54)	26.4	31.0	29.2		0.90 (0.77 to 1.28)	26.3	29.2	31.2	
Low	2.10 (1.61 to 2.72)	41.4	38.5	33.3		2.07 (1.66 to 2.58)	43.9	35.4	29.6	
Close female friends										
≥2 (ref.)	1.00	47.6	47.5	52.7	0.010	1.00	89.9	93.1	94.9	0.001
<2	0.92 (0.74 to 1.14)	47.6	48.2	42.0		1.75 (1.25 to 2.45)	8.3	6.2	4.3	
Close male friends										
≥2 (ref.)	1.00	91.6	92.9	94.3	0.117	1.00	52.2	55.7	54.3	0.041
<2	1.90 (1.30 to 2.77)	7.1	6.0	4.4		0.78 (0.64 to 0.94)	41.7	40.4	42.5	
Going out with friends after school										
≥2 days (ref.)	1.00	78.8	81.4	83.9	0.079	1.00	75.0	79.0	81.9	0.002
<2 days	1.26 (0.96 to 1.66)	18.6	16.2	13.5		1.71 (1.34 to 2.13)	22.8	18.1	15.2	
Talk to best friend										
Easy (ref.)	1.00	68.3	74.5	76.5	0.004	1.00	82.0	86.8	88.7	0.002
Difficult	1.14 (0.89 to 1.47)	24.9	21.8	19.8		1.78 (1.35 to 2.34)	14.7	10.2	9.1	
Classmate support										
High (ref.)	1.00	27.2	26.6	28.7	0.110	1.00	29.6	33.3	33.6	0.000
Middle	1.53 (1.13 to 2.06)	41.6	42.2	44.9		1.43 (1.13 to 1.82)	39.9	39.9	45.3	
Low	2.95 (2.19 to 3.98)	29.6	29.6	24.9		2.59 (2.02 to 3.30)	28.1	25.1	19.8	
Satisfaction with school										
Like it a lot (ref.)	1.00	78.8	82.3	82.6	0.361	1.00	82.0	83.8	85.9	0.132
Don't like it	2.50 (1.97 to 3.17)	20.9	17.2	17.0		3.09 (2.49 to 3.83)	17.6	15.5	13.4	
Teaching quality										
High (ref.)	1.00	25.7	29.5	29.8	0.440	1.00	25.9	28.0	30.1	0.298
Middle	2.10 (1.55 to 2.85)	41.6	41.3	40.7		1.95 (1.48 to 2.58)	41.4	40.3	40.6	
Low	3.40 (2.47 to 4.66)	31.4	28.7	28.5		3.28 (2.47 to 4.37)	31.4	30.9	28.1	
Academic achievement										
Very good/good (ref.)	1.00	47.9	44.9	50.3	0.044	1.00	45.2	49.8	52.3	0.079
Average/below average	1.49 (1.20 to 1.84)	50.6	53.7	48.1		2.09 (1.72 to 2.54)	53.1	48.5	46.1	
School-related stress										
Not at all/a little (ref.)	1.00	73.0	73.9	77.4	0.102	1.00	72.2	74.0	76.9	0.165
Some/a lot	1.63 (1.30 to 2.04)	23.3	25.1	21.5		1.89 (1.56 to 2.30)	26.5	24.9	21.8	
Behavioural factors										
Smoking										
Infrequent/non-smoking (ref.)	1.00	90.3	91.4	92.1	0.428	1.00	86.9	87.5	91.8	0.000
Regular	2.57 (1.87 to 3.54)	9.7	8.1	7.5		2.67 (2.08 to 3.45)	13.1	12.1	8.0	
Alcohol consumption										
Less than every week (ref.)	1.00	89.8	86.0	84.4	0.019	1.00	92.5	90.5	90.9	0.450
Daily or at least every week	1.69 (1.22 to 2.29)	7.1	9.9	12.2		1.93 (1.41 to 2.64)	5.7	7.2	6.3	

Continued

Table 3 Continued

	Boys					Girls				
	OR (95% CI)	Family affluence			p Value	OR (95% CI)	Family affluence			p Value
Low		Medium	High	Low			Medium	High		
Physical activity										
On 6 or 7 days (ref.)	1.00	28.0	28.7	31.5	0.081	1.00	19.1	19.3	23.8	0.006
<6 days	1.23 (0.97 to 1.56)	69.6	69.3	67.4		1.40 (1.09 to 1.78)	77.9	78.5	74.7	
Breakfast consumption										
Daily (ref.)	1.00	54.7	64.6	72.1	0.000	1.00	44.9	57.5	65.6	0.000
Less than daily	1.38 (1.11 to 1.71)	42.7	34.2	26.6		2.17 (1.80 to 2.62)	52.4	41.3	33.3	
Fruits consumption										
Daily (ref.)	1.00	28.3	27.7	31.6	0.174	1.00	36.6	40.2	43.3	0.023
Less than daily	1.42 (1.12 to 1.81)	70.4	71.3	67.4		1.32 (1.09 to 1.60)	61.4	58.7	55.8	
Vegetable consumption										
Daily (ref.)	1.00	17.8	16.7	19.6	0.322	1.00	25.2	28.4	30.6	0.024
Less than daily	1.16 (0.88 to 1.54)	80.6	82.0	79.2		1.29 (1.04 to 1.59)	72.8	70.5	68.6	
Sweets consumption										
Less than daily (ref.)	1.00	75.7	73.4	72.4	0.750	1.00	28.3	26.3	27.5	0.083
Daily	0.96 (0.76 to 1.22)	23.3	25.2	26.3		1.05 (0.86 to 1.29)	69.9	72.9	71.9	
Soft drinks consumption										
Less than daily (ref.)	1.00	71.5	75.4	79.2	0.008	1.00	26.8	16.9	11.9	0.000
Daily	1.53 (1.21 to 1.92)	27.2	23.2	19.8		1.66 (1.33 to 2.07)	71.5	82.3	87.2	

Bold=significant ORs (95% CI does not include 1).

*Separate logistic regression models for boys and girls, adjusted for age.

reduced after taking into account perceived affluence, parental support and health behaviour.⁴⁸ Furthermore, Richter *et al* could show for 33 European and North American countries that behavioural factors in adolescence partly account for the association between SEP and self-rated health, even though the strength of this contribution varies across countries.²⁶

Our results are in line with findings from comparable studies among adults suggesting similar explanatory patterns for both age groups. The separate analyses in our study illustrate that behavioural and psychosocial factors explain a substantial proportion of the socioeconomic differences in health. Once the overlap between these determinants and material factors was considered, it became apparent that a substantial part of the contribution of psychosocial and behavioural factors is shared with material conditions. Thus, our findings support other studies showing that material circumstances are likely to be the most powerful explanatory approach for socioeconomic differences in health.^{3 5-8 10 11}

Methodological considerations

The strengths of this study include the use of a large national dataset and the availability of multiple measures of explanatory factors relevant for adolescents. The large sample size also

allowed separate analyses for girls and boys. However, as the HBSC Study has a cross-sectional design, it is limited in terms of the potential to establish causal relationships. In our study, we assumed that material, psychosocial and behavioural factors mediate the relationship between family affluence and self-rated health. The associations between explanatory variables and SRH may well be operating inversely: low SRH, as a possible component of self-esteem, may lead to reduced levels of several of the explanatory variables and their social patterning, for example, satisfaction with school, academic achievement or risk behaviour. In order to discriminate among these alternative hypotheses, longitudinal studies including information about the proceeding years of adolescence are needed.

Furthermore, it should be acknowledged that the FAS is only a proxy for adolescents' SEP. In contrast to parental education and occupation, family affluence is much more related to material wealth, which might have influenced our findings on the relative contribution of material factors. In order to evaluate a potential bias, we re-ran the analyses with parental social class based on occupation instead of family affluence. The comparison between the results revealed similar but weaker findings on the relative contribution of material, psychosocial and behavioural factors (see web appendix 2). Thus, we do not expect our results

Table 4 ORs and 95% CIs of poor/fair self-rated health by family affluence, crude and adjusted for material, psychosocial and behavioural explanatory factors among 11- to 15-year-olds (N=6997)

Model	Girls				Boys			
	Medium family affluence		Low family affluence		Medium family affluence		Low family affluence	
	OR (95% CI)	% Change	OR (95% CI)	% Change	OR (95% CI)	% Change	OR (95% CI)	% Change
1. Age adjusted	1.31 (1.07 to 1.61)		2.08 (1.62 to 2.67)		1.36 (1.09 to 1.67)		1.53 (1.10 to 2.12)	
2. Material	1.14 (0.92 to 1.41)	55	1.70 (1.30 to 2.20)	35	1.20 (0.95 to 1.51)	44	1.25 (0.89 to 1.75)	53
3. Psychosocial	1.19 (0.96 to 1.47)	39	1.60 (1.23 to 2.08)	44	1.25 (1.00 to 1.57)	31	1.33 (0.95 to 1.85)	38
4. Behavioural	1.15 (0.93 to 1.42)	52	1.60 (1.23 to 2.08)	44	1.32 (1.06 to 1.65)	11	1.41 (1.01 to 1.96)	23
5. Material + psychosocial	1.07 (0.86 to 1.33)	77	1.41 (1.08 to 1.85)	62	1.15 (0.91 to 1.45)	58	1.17 (0.83 to 1.65)	68
6. Material + behavioural	1.02 (0.82 to 1.27)	94	1.36 (1.04 to 1.79)	67	1.17 (0.93 to 1.48)	53	1.17 (0.83 to 1.65)	68
7. Psychosocial + behavioural	1.08 (0.87 to 1.34)	74	1.30 (0.99 to 1.70)	72	1.23 (0.98 to 1.54)	36	1.25 (0.90 to 1.75)	53
8. All factors	0.98 (0.79 to 1.23)	100	1.17 (0.88 to 1.55)	84	1.13 (0.90 to 1.43)	64	1.11 (0.79 to 1.57)	80

Bold=significant ORs (95% CI does not include 1).

Table 5 Independent and indirect effects of material, psychosocial and behavioural factors to inequalities in self-rated health (N=6997)

Independent and indirect effects	Girls		Boys	
	Medium family affluence (%)	Low family affluence (%)	Medium family affluence (%)	Low family affluence (%)
Material factors independent	38	18	27	30
Psychosocial factors independent	22	27	14	15
Material factors through psychosocial	17	25	17	23
Behavioural factors independent	23	22	6	12
Material and psychosocial factors through behavioural factors	29	22	5	11

to be severely biased due to the use of family affluence as a measure of SEP. Future studies should replicate our analysis using different indicators of SEP in adolescence.

The results on the relative importance of different explanatory approaches depend on the pathways and the variables included in the analysis. We selected the key approaches (material, psychosocial and behavioural) currently discussed on the explanation of health inequalities in adulthood. The inclusion of other explanatory pathways like healthcare, genetic/ biomedical factors or community determinants may yield different results on the contribution of material, psychosocial and behavioural factors. But we do not expect great changes in the importance of the three explanatory groups as research on adults has shown that biomedical⁷ and community factors⁸ have very little effect. Our study covered a balanced selection of self-reported material, psychosocial and behavioural variables from the main social contexts of adolescents: family, peers and school. However, the inclusion of more and other explanatory variables may have resulted in different estimates of the contribution on the different factors. Overall, we do not believe that the findings on the central role of material factors for explaining health inequalities in adolescence would be influenced by the inclusion of other and more variables. Including more material factors would probably even strengthen this result. However, it is important to acknowledge that the contribution of the three pathways should be seen as an approximate measure of the importance of the factors rather than absolute ‘parameters’.³ It is important if other studies using different variables can reproduce our findings.

Conclusions

Information on possible pathways by which health inequalities in adolescence develop would facilitate the design of effective interventions to tackle socioeconomic differences in health at an early stage. To our knowledge, no study has explicitly examined the pathways that explain inequalities in self-rated health in adolescence. By analysing a wide range of explanatory factors, our study extends previous findings on adults. All approaches contribute substantially to the explanation of health inequalities in self-rated health indicating multiple parallel processes. These findings suggest that all three approaches should be taken into account in an attempt to explain health inequalities in adolescence as well as in other stages in life. However, once the overlap of the approaches was considered, it became clear that the contribution of behavioural and psychosocial factors to the explanation is much lower as a large part can be attributed to

What is already known on this subject

- ▶ Previous research on the explanation of health inequalities emphasises the importance of material, psychosocial and behavioural factors.
- ▶ So far, most analyses focused on the adult populations, and few studies examined the role of different explanatory approaches among adolescents.

What this study adds

- ▶ Still little is known about the underlying factors and mechanisms for health inequalities in adolescence.
- ▶ The study is among the first to systematically examine the contribution of material, psychosocial and behavioural factors in the explanation of inequalities in adolescent self-rated health.
- ▶ In separate analyses, all the factors were important and contributed about 30–50% to the explanation of the inequalities, in combined analyses 80–100%.
- ▶ Inequalities in self-rated health among German adolescents were mainly explained by material factors based on their direct and indirect influence via psychosocial and behavioural determinants.
- ▶ Our study highlights the need for improving material circumstances in adolescence to reduce current and future health inequalities among young people.

material factors. These findings support the idea that behaviours and psychosocial factors are—at least—partly determined by the social structure. The results indicate that interventions targeted at behavioural and psychosocial factors can only be partly successful and that improving material circumstances in adolescence directly and indirectly (via behavioural and psychosocial factors) contributes strongly to reducing health inequalities in youth and the life course as any investment in improving material factors is likely to trigger improvements in psychosocial and behavioural determinants.

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Competing interests None.

Ethics approval This study was conducted with the approval of the federal data protection commissioner of each involved federal state as well as the data protection commissioner of the University of Bielefeld (Germany).

Contributors MR and IM contributed equally to the present work by analysing and interpreting the data and writing the article. They also agreed to share first authorship. MR supervised the study activities and led the writing. IM performed the statistical analysis. F.J.v.L. assisted with writing and data interpretation and participated in reviewing and revising the article. All authors helped to conceptualise ideas, interpret findings and review drafts of the article.

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