Inequalities in adolescent self-rated health and smoking in Europe: comparing different indicators of socioeconomic status

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ABSTRACT

Background Although there is evidence for socioeconomic inequalities in health and health behaviour in adolescents, different indicators of socioeconomic status (SES) have rarely been compared within one data sample. We examined associations of five SES indicators with self-rated health (SRH) and smoking (ie, a leading cause of health inequalities) in Europe.

Methods Data of adolescents aged 14–17 years old were obtained from the 2013 SILNE survey (smoking inequalities: learning from natural experiments), carried out in 50 schools in 6 European cities (N=10 900). Capturing subjective perceptions of relative SES and objective measures of education and wealth, we measured adolescents' own SES (academic performance, pocket money), parental SES (parental educational level) and family SES (Family Affluence Scale, subjective social status (SSS)). Logistic regression models with SRH and smoking as dependent variables included all SES indicators, age and gender.

Results Correlations between SES indicators were weak to moderate. Low academic performance (OR=1.96, 95% CI 1.53 to 2.51) and low SSS (OR=2.75, 95% CI 2.12 to 3.55) were the strongest indicators of poor SRH after adjusting for other SES-indicators. Results for SSS were consistent across countries, while associations with academic performance varied. Low academic performance (OR=5.71, 95% CI 4.63 to 7.06) and more pocket money (OR=0.21, 95% CI 0.18 to 0.26) were most strongly associated with smoking in all countries.

Conclusions Socioeconomic inequalities in adolescent health were largest according to SES indicators more closely related to the adolescent's education as well as the adolescent's perception of relative family SES, rather than objective indicators of parental education and material family affluence. For future studies on adolescent health inequalities, consideration of adolescent-related SES indicators was recommended.

INTRODUCTION

Cross-national European studies have demonstrated socioeconomic inequalities in adolescents' self-reported health and health behaviours.[1] However, researchers are restricted to a small set of indicators to measure socioeconomic status (SES), making it difficult to determine which indicators capture health inequalities in adolescence across European settings. SES is a multidimensional construct for which different indicators exist capturing different aspects of the socioeconomic background of individuals. For example, educational level reflects knowledge and cognitive skills, occupational status determines working conditions, while income and wealth indicate financial and material circumstances. In order to achieve comparable and accurate quantifications of socioeconomic inequalities in health and health behaviour in adolescence, there is a need to know which indicators are most discriminating in identifying health inequalities in various settings.[2–4]

Measuring SES in adolescence is challenging because adolescents do not yet reveal and possess the traditional SES indicators of future income, completed education, occupational status and wealth.[5] Indicators of parents and family are often used instead. However, while suitable to measure childhood SES, family-related indicators may insufficiently capture adolescents' socioeconomic circumstances,[6] as adolescents are in a developmental stage of increasing independence. Adolescents therefore are in the process of developing their own SES, which may become increasingly self-determined.[7] It has been argued that those SES indicators being more closely related to adolescents' own status may capture their socioeconomic circumstances in a more accurate way.[8] For example, adolescent-based measures like academic achievement also reflect their future level of education and their social position in adulthood.[9] Studies imply that indicators directly concerning the adolescent are strong independent indicators of socioeconomic inequalities as the association between parental educational level and health as well as health behaviour was non-significant after adjusting for the adolescent's educational level or academic achievement.[10–12] Other studies demonstrated that adolescents receiving less pocket money and having higher levels of academic achievement were less likely to smoke[13 14] or to drink alcohol,[12] as well as less likely to report poor health.[10] These indicators have rarely been compared in the same sample or across countries.

Another important issue is the concern about the accuracy and validity of adolescents' reports on parental and family indicators, given the high levels of missing data and inadequate answers,[15] in particular for objective SES indicators measuring factual

characteristics of the parents or family that require accurate recall (eg, parental education or material possessions) as opposed to subjective indicators measuring perceived SES from the perspective of the adolescents themselves.[16] Subjective indicators may capture circumstances better than objective measures as they provide the possibility to incorporate past achievements and future prospects into their overall self-placement.[17] Studies on subjective SES in youth are growing,[18] observing strong associations between subjective social status (SSS) and health outcomes,[17 19] but comparisons with different SES indicators are scarce.

The aim of this study was to compare the ability of five SES indicators, including adolescent, parental and family SES indicators, to identify socioeconomic inequalities in self-rated health (SRH) and smoking among adolescents. SRH is a strong predictor of mortality, and individuals with lower SES more often report poor SRH.[20] Smoking is one of the leading causes of health inequalities.[21] Socioeconomic inequalities in SRH[22] and smoking[23] are already present in adolescence and tend to increase during the life course,[1 6] therefore being particularly important to be monitored accurately.

We assessed (1) to what extent inequalities in SRH and smoking vary between five SES indicators, (2) which indicators are the strongest predictors when taking all SES indicators into account, and (3) whether SES indicators vary across six European cities.

METHODS

Study design and sample

Data were obtained from the SILNE survey ('smoking inequalities: learning from natural experiments') carried out between January and November 2013 in six cities from European countries (Amersfoort, The Netherlands; Coimbra, Portugal; Hannover, Germany; Latina, Italy; Namur, Belgium; and Tampere, Finland). In total, 11 015 students from 50 schools participated in the survey (79.4% response rate on student level), representing the age group of approximately 14–17 years. A detailed description of the survey design and instruments can be found elsewhere.[24] We included all respondents with valid values for age and gender (N=10 900).

Variables

Outcome variables

Self-rated health

SRH was measured by asking the students 'Would you say your health is…', with the following answer categories: (1) excellent, (2) good, (3) fair, and (4) poor dichotomised into excellent/good (reference group) and fair/poor. This is a standardised indicator of SRH which has been used extensively in public health research.[25]

Regular smoking

Adolescents reported their current smoking status which was dichotomised into never smoking or less than weekly smoking (reference group) and at least weekly smoking (regular smoking[23]).

SES indicators

We included SES indicators related to the adolescent, parent and family, including both objective and subjective SES indicators. All SES indicators were reported by the adolescent.

Parental SES

Parental educational level was reported for both parents separately. Country-specific response options were categorised into high, medium, low or unknown according to the educational system of each country.[24] In most countries, low referred to primary school and/or lower level of secondary school, medium corresponded to completed secondary school and/or lower level college, and high corresponded to college or university degree. The mother's and father's educational levels were combined using the highest educational level of either the mother or the father.[26]

Family SES

Family wealth was measured using the Family Affluence Scale (FAS). FAS was developed within the Health Behaviour in School-aged Children study.[27] FAS is an objective indicator measuring material assets or conditions of the family household. FAS was measured with four items, including car ownership, having own bedroom, number of family holidays per year and number of computers in the family. The sum score ranged from 0 to 7.[27] Some categories were combined for the descriptive analysis (table 1).

Adolescent SES

An increasing number of studies focus on the educational achievement and educational track of adolescents as a marker for adolescents' (future) social status.[28 29] Self-reported academic achievement was measured on a country-specific scale using the grading system of each country and was categorised into 'insufficient', 'low', 'average', 'good' or 'high'.

Pocket money of adolescents was measured by asking how much money adolescents receive per week acquired from allowances or jobs. Seven answer categories ranged from €0 to more than €100. For the descriptive analysis, some categories were combined (table 1).

SSS is a more recently introduced indicator of subjective SES. The MacArthur Scale of Subjective Social Status asked adolescents to rank their family's social status on a ladder from 0 (worst off) to 10 (best off) compared with other families in the country of residence.[16] As we used the family ladder, we considered this indicator as family SES indicator. For the descriptive analysis, some categories were combined (table 1).

Statistical analysis

First, we described age, gender, health outcomes and all five SES indicators. Second, we calculated bivariate Pearson's correlations between the five SES indicators. SES indicators were measured as ordinal categories, and the distribution of SES categories varied between indicators and countries. Therefore, we used a relative rank score.[30] Individuals in the same category received the same rank within each country, and this rank was divided by the total number of individuals that provided information on the SES indicator. This resulted in a score between 0 and 1 with a mean of 0.5. A score of 0 represented the highest SES relative to other adolescents in the country, and 1 represented the lowest relative SES (eg, higher values for pocket money indicate that less money is available). Using these relative scores a comparison between SES indicators is possible, as it measures the magnitude of systematic differences between higher and lower SES.[31] For FAS, SSS, academic performance and pocket money, less than 3% of values were missing, while for parental educational level 12% were missing. Adolescents with missing information on SES were not excluded from our analysis, but SES information was imputed with the mean (a relative score of 0.5).

Third, we investigated the association between SES indicators and SRH and smoking, respectively, using logistic regression analyses with continuous relative rank scores. ORs therefore represent the relative index of inequality for each

SES indicator,[30] the odds of the outcome for an SES score of 1 (low SES) compared with a score of 0 (high SES), while maintaining all details in the SES measure. All analyses were conducted for the total population and by country. Model 1 was adjusted for age, gender, country (in the non-stratified analysis), and for a dichotomous variable measuring whether the value of the SES indicator was valid or missing. In this way, we controlled for potential bias resulting from non-random

Table 1 Sample description (% of valid responses and % missing of the total sample) across countries and stratified by country

	All countries (N=10 900)	Belgium (n=2093)	Finland (n=1497)	Germany (n=1433)	Italy (n=2080)	The Netherlands (n=1912)	Portugal (n=1885)
Age							
12 or 13 years	1.3	0.4	0.3	6.2	0.2	1.7	0.0
14	23.7	16.5	34.7	39.4	26.9	28.0	3.3
15	38.8	33.0	49.8	36.5	40.4	43.4	32.0
16	25.1	30.4	13.8	13.4	24.1	22.9	40.3
17	8.5	14.5	1.3	4.4	6.9	3.5	17.3
18 or 19 years	2.6	5.1	0.0	0.1	1.5	0.6	7.0
Gender							
Female	52.0	51.0	49.4	50.3	59.4	50.5	49.9
Male	48.0	49.0	50.6	49.7	40.6	49.5	50.1
Health outcomes							
Self-rated health							
Excellent/good	89.5	82.5	90.7	89.7	94.7	89.7	90.4
Fair/poor	10.5	17.5	9.3	10.3	5.3	10.3	9.6
Missing	0.6	1.4	0.4	0.4	0.7	0.3	0.3
Smoking							
Non-smoker	80.9	75.9	83.2	88.0	73.6	87.9	80.2
Regular smoker	19.1	24.1	16.8	12.0	26.4	12.1	19.8
Missing	1.8	2.0	0.8	2.7	2.5	1.4	1.4
Socioeconomic status indicators							
Parental educational level							
High	26.5	30.3	30.2	30.5	9.9	39.9	24.4
Medium	41.0	41.5	61.4	45.8	43.1	34.5	29.2
Low	32.4	28.3	8.4	23.7	47.0	25.6	46.4
Missing	12.4	11.4	29.2	18.5	4.0	14.2	2.9
Family affluence (FAS)							
6–7 high FAS	29.2	26.0	30.4	30.9	15.4	43.8	30.9
4–5	41.1	42.4	41.4	38.2	38.4	44.6	41.1
2–3	23.8	25.2	23.1	24.0	35.4	10.5	23.2
0–1 low FAS	5.9	6.4	5.1	7.0	10.7	1.2	4.8
Missing	2.1	3.1	1.2	1.9	2.2	2.9	1.0
Subjective social status (SSS)							
8–10 high SSS	31.7	27.6	61.5	25.4	19.7	47.4	13.9
6–7	47.2	53.4	27.3	50.2	54.9	43.4	49.6
4–5	19.0	16.8	9.8	22.6	22.6	8.1	33.3
0–3 low SSS	2.1	2.2	1.4	1.8	2.8	1.0	3.1
Missing	3.0	3.6	1.5	5.3	4.3	1.7	1.5
Academic performance							
High	9.4	6.1	14.1	5.1	12.1	8.0	11.3
Good	30.9	33.2	18.9	26.9	41.5	32.5	27.4
Average	41.5	37.0	36.9	48.6	38.7	48.9	40.2
Low	13.6	16.3	14.6	17.1	6.5	9.3	19.9
Insufficient	4.5	7.4	15.5	2.3	1.1	1.3	1.2
Missing	2.8	2.7	3.2	1.5	1.1	0.6	8.0
Pocket money (€)							
More than 20	29.3	31.1	29.1	47.8	16.2	44.9	11.8
11–20	23.6	24.6	28.6	21.1	22.0	23.1	22.9
6–10	23.7	23.2	24.9	15.1	23.3	19.7	34.2
0–5	23.4	21.0	17.4	16.0	38.5	12.2	31.2
Missing	1.9	3.2	0.9	1.6	2.9	1.1	1.2

FAS, Family Affluence Scale.

Table 2 Bivariate Pearson's correlations between relative rank scores of SES indicators

	Parental educational level	Family affluence (FAS)	Subjective social status	Academic performance	Pocket money
Parental educational level	–				
Family affluence (FAS)	0.250*	–			
Subjective social status	0.232*	0.369*	–		
Academic performance	0.189*	0.112*	0.125*	–	
Pocket money	–0.014	0.159*	0.189*	–0.083*	–

For all SES indicators, higher values reflect poorer SES.
*P<0.01.
FAS, Family Affluence Scale; SES, socioeconomic status.

Table 3 OR and 95% CI of logistic regression analyses for the association between SES indicators and self-rated health

	OR (95% CI)	
Poor self-rated health	Model 1†	Model 2‡
All countries (n=10 833)		
Parental educational level	1.85 (1.43 to 2.39)***	1.23 (0.94 to 1.62)
Family affluence (FAS)	2.00 (1.60 to 1.74)***	1.41 (1.10 to 1.81)**
Subjective social status	3.09 (2.45 to 3.89)***	2.75 (2.12 to 3.55)***
Academic performance	2.24 (1.76 to 2.85)***	1.96 (1.53 to 2.51)***
Pocket money	0.84 (0.67 to 1.05)	0.62 (0.49 to 0.79)***
Belgium (n=2094)		
Parental educational level	2.36 (1.49 to 3.73)***	1.88 (1.16 to 3.03)*
Family affluence (FAS)	1.78 (1.18 to 2.70)**	1.23 (0.77 to 1.96)
Subjective social status	2.97 (1.94 to 4.56)***	2.88 (1.78 to 4.65)***
Academic performance	1.69 (1.10 to 2.60)*	1.51 (0.98 to 2.34)
Pocket money	0.77 (0.51 to 1.17)	0.55 (0.35 to 0.85)**
Finland (n=1493)		
Parental educational level	1.80 (0.72 to 4.48)	0.86 (0.32 to 2.30)
Family affluence (FAS)	2.91 (1.55 to 5.47)**	1.60 (0.81 to 3.16)
Subjective social status	6.14 (3.15 to 11.97)***	4.75 (2.29 to 9.84)***
Academic performance	3.40 (1.73 to 6.67)***	2.24 (1.09 to 4.61)*
Pocket money	0.99 (0.13 to 7.73)	0.72 (0.37 to 1.39)
Germany (n=1438)		
Parental educational level	4.04 (1.91 to 8.56)***	2.38 (1.08 to 5.27)*
Family affluence (FAS)	3.65 (1.93 to 6.93)***	2.06 (1.02 to 4.17)*
Subjective social status	3.41 (1.79 to 6.51)***	2.24 (1.13 to 4.45)*
Academic performance	2.55 (1.31 to 4.98)**	1.68 (0.84 to 3.37)
Pocket money	1.23 (0.65 to 5.88)	1.02 (0.53 to 1.94)
Italy (n=2070)		
Parental educational level	1.08 (0.50 to 2.38)	0.74 (0.32 to 1.71)
Family affluence (FAS)	0.94 (0.47 to 1.89)	0.57 (0.26 to 1.24)
Subjective social status	3.48 (1.70 to 7.13)***	4.34 (1.94 to 9.72)***
Academic performance	3.30 (1.52 to 7.16)**	2.62 (1.17 to 5.83)*
Pocket money	0.77 (0.37 to 1.58)	0.67 (0.31 to 1.44)
The Netherlands (n=1908)		
Parental educational level	1.71 (0.94 to 3.12)	1.12 (0.59 to 2.11)
Family affluence (FAS)	1.82 (1.07 to 3.12)*	1.43 (0.78 to 2.62)
Subjective social status	2.67 (1.54 to 4.63)***	2.23 (1.20 to 4.13)*
Academic performance	2.50 (1.39 to 4.51)**	2.33 (1.28 to 4.25)**
Pocket money	0.56 (0.32 to 0.99)*	0.50 (0.28 to 0.91)*
Portugal (n=1894)		
Parental educational level	1.12 (0.61 to 1.72)	0.61 (0.31 to 1.20)
Family affluence (FAS)	2.27 (1.30 to 3.98)**	2.13 (1.14 to 3.98)*
Subjective social status	2.19 (1.24 to 3.85)*	2.05 (1.08 to 3.91)*
Academic performance	2.09 (1.08 to 4.02)*	1.96 (0.99 to 3.87)
Pocket money	0.78 (0.45 to 1.37)	0.58 (0.32 to 1.05)

For all SES indicators, higher values reflect poorer SES.
*P<0.05, **P<0.01, ***P<0.001.
†Model 1: Aadjusted for gender, and age. Analysis on the total sample additionally adjusted for country.
‡Model 2: Aadjusted for gender, age, and all other SES indicators. Analysis on the total sample additionally adjusted for country.
FAS, Family Affluence Scale; SES, socioeconomic status.

missing data. Additionally, model 2 controlled for all other SES indicators.

We performed a sensitivity analysis for the total sample, on data in which missing values were imputed based on age, gender, SRH, smoking and the four other SES indicators. Lastly, we also performed a post-hoc analysis for the total sample in which we tested interactions for each SES indicator with gender and age, to detect potential differences in associations between boys and girls, and age-specific differences.

Analyses were performed in Stata V.14.0.

RESULTS

Table 1 presents the sample distribution. In total, 89.5% of the adolescents reported excellent/good health, with a range of 82.5%–94.7%. Of these, 19.1% were regular smokers across all countries, whereas adolescents in Italy (26.4%) and Belgium (24.1%) were more often regular smokers compared with adolescents from Germany (12.0%) and the Netherlands (12.1%). Adolescents from the Netherlands and Finland tended to have higher scores on the family SES indicators, while scores were relatively low in Italy and Portugal. Academic performance was more evenly distributed in Finland than in other countries, and adolescents from the Netherlands and Germany received a relatively higher amount of pocket money.

Table 2 presents the bivariate correlations between the five SES indicators. Moderate positive correlations were found between FAS and SSS, parental education and FAS, and parental education and SSS. A weak negative correlation was found between academic performance and pocket money. Correlations were of similar magnitude and direction across countries.

Table 3 presents the associations between all SES indicators and SRH. In model 1, lower levels of parental education, FAS, SSS and academic performance were associated with higher odds of poor SRH across all countries. Pocket money was not significantly associated with poor SRH, but the association tended to be inverse. When controlled for other SES indicators (model 2), parental educational level turned insignificant regarding SRH. The OR for FAS decreased after controlling for other SES indicators, but remained significant (OR: 1.41, 95% CI 1.10 to 1.81). The associations of SSS and academic performance with SRH remained strong and significant (OR: 2.75, 95% CI 2.12 to 3.55 and OR 1.96, 95% CI 1.53 to 2.51). In the multivariate analysis the inverse association with pocket money became significant (OR: 0.62, 95% CI 0.49 to 0.79). Parental educational level showed a stronger association with SRH in Belgium and Germany than in the other countries. FAS was not related to SRH in Italy, and pocket money was not associated with SRH in Germany. Across all countries, SSS was strongly associated with SRH.

Table 4 OR and 95% CI of logistic regression analyses for the association between SES indicators and regular smoking

	OR (95% CI)	
Smoking	**Model 1†**	**Model 2‡**
All countries (n=10 705)		
Parental educational level	1.55 (1.27 to 1.89)***	1.18 (0.94 to 1.47)
Family affluence (FAS)	0.88 (0.74 to 1.06)	0.89 (0.73 to 1.10)
Subjective social status	1.12 (0.94 to 1.34)	1.33 (1.08 to 1.64)**
Academic performance	5.85 (4.78 to 7.17)***	5.71 (4.63 to 7.06)***
Pocket money	0.24 (0.20 to 0.29)***	0.21 (0.18 to 0.26)***
Belgium (n=2085)		
Parental educational level	0.87 (0.58 to 1.32)	0.83 (0.54 to 1.28)
Family affluence (FAS)	0.70 (0.48 to 1.02)	0.84 (0.55 to 1.28)
Subjective social status	0.79 (0.54 to 1.16)	1.04 (0.68 to 1.61)
Academic performance	2.60 (1.75 to 3.85)***	2.77 (1.86 to 4.12)***
Pocket money	0.38 (0.26 to 0.56)***	0.39 (0.26 to 0.58)***
Finland (n=1486)		
Parental educational level	3.45 (1.70 to 7.01)**	0.99 (0.45 to 2.21)
Family affluence (FAS)	1.34 (0.82 to 2.19)	0.74 (0.42 to 1.30)
Subjective social status	1.68 (1.02 to 2.77)*	1.26 (0.82 to 2.60)
Academic performance	52.1 (26.8 to 101.28)***	49.38 (24.38 to 100.02)***
Pocket money	0.34 (0.21 to 0.57)***	0.34 (0.19 to 0.61)***
Germany (n=1407)		
Parental educational level	2.43 (1.20 to 4.92)*	1.96 (0.90 to 4.25)
Family affluence (FAS)	0.75 (0.41 to 1.38)	0.51 (0.25 to 1.02)
Subjective social status	1.30 (0.71 to 2.39)	1.69 (0.86 to 3.32)
Academic performance	6.92 (3.43 to 13.94)***	6.15 (2.91 to 13.01)***
Pocket money	0.19 (0.10 to 0.36)***	0.20 (0.10 to 0.40)***
Italy (n=2032)		
Parental educational level	1.77 (1.18 to 2.66)**	1.30 (0.83 to 2.04)
Family affluence (FAS)	1.04 (0.72 to 1.50)	1.16 (0.75 to 1.79)
Subjective social status	1.34 (0.92 to 1.94)	1.52 (0.98 to 2.36)
Academic performance	10.36 (6.72 to 15.93)***	9.22 (5.89 to 14.45)***
Pocket money	0.15 (0.10 to 0.23)***	0.13 (0.09 to 0.20)***
The Netherlands (n=1896)		
Parental educational level	2.43 (1.38 to 4.29)**	1.85 (1.01 to 3.41)*
Family affluence (FAS)	0.93 (0.56 to 1.55)	0.96 (0.53 to 1.71)
Subjective social status	1.37 (0.81 to 2.30)	1.36 (0.75 to 2.45)
Academic performance	3.92 (2.21 to 6.96)***	3.44 (1.90 to 6.23)***
Pocket money	0.12 (0.07 to 0.22)***	0.12 (0.07 to 0.23)***
Portugal (n=1874)		
Parental educational level	1.11 (0.69 to 1.76)	0.95 (0.56 to 1.61)
Family affluence (FAS)	0.69 (0.44 to 1.02)	0.79 (0.49 to 1.28)
Subjective social status	0.81 (0.53 to 1.23)	1.15 (0.70 to 1.90)
Academic performance	2.90 (1.73 to 4.86)***	3.00 (1.75 to 5.16)***
Pocket money	0.21 (0.14 to 0.33)***	0.20 (0.13 to 0.32)***

For all SES indicators, higher values reflect poorer SES.
*P<0.05, **P<0.01, ***P<0.001.
†Model 1: Aadjusted for gender, and age. Analysis on the total sample additionally adjusted for country.
‡Model 2: Aadjusted for gender, age, and all other SES indicators. Analysis on the total sample additionally adjusted for country.
FAS, Family Affluence Scale; SES, socioeconomic status.

Table 4 presents the associations with regular smoking. In model 1, low parental educational level, low academic performance and a high amount of pocket money were associated with higher odds of smoking. Estimates for academic performance and pocket money remained stable and significant in the multivariate analyses. FAS and SSS were not significantly associated with adolescent smoking. The OR for SSS turned significant after controlling for other SES indicators in model 2 (OR: 1.33, 95% CI 1.08 to 1.64). The results were mostly consistent between countries. In all countries, SSS and FAS were not significantly associated with smoking in model 2. In the Netherlands, low parental educational level remained significantly associated with higher odds of smoking in the multivariate analysis. Adolescents with a poor academic performance were more likely to smoke in all countries, although effect estimates differed considerably between countries (OR Finland: 49.38, 95% CI 24.38 to 100.02; OR Italy: 9.22, 95% CI 5.89 to 14.45; OR Belgium: 2.77, 95% CI 1.86 to 4.12).

We did sensitivity analyses for the total sample where we have rerun all analyses using age, gender, SRH, smoking and the other four SES indicators for imputation of missing values. The results were very similar to the main analysis. We also analysed age and gender interactions for the total sample and could not find any significant interactions, suggesting similar associations across gender and age (results not shown).

DISCUSSION

Key findings

Correlations between SES indicators were weak to moderate, and most associations between SES indicators and health outcomes were consistent when controlled for other SES indicators. Out of all five SES indicators, low academic performance and low SSS were the strongest predictors of poor SRH. The results for SSS were consistent across countries, while associations with academic performance varied. Low academic performance and more pocket money were most strongly associated with smoking in all countries. Parental education and FAS showed only weak or no independent associations across countries.

Limitations

While SSS, FAS, academic performance and pocket money were reported by more than 95% of adolescents, item response rates were lower for parental education (83%–85% for mother's and father's educational level). Difficulty in answering questions on parental educational level has also been observed in previous studies.[32] We imputed missing values on SES indicators and controlled for a dichotomous variable indicating missingness, preventing bias caused by data missing not at random. Additionally, the sensitivity analysis showed results very similar to the main analysis.

The use of self-reported data has limitations. For SES indicators, adolescents may report socially desirable answers[33] and overestimate their own positive traits compared with others.[34] It has been argued that SSS may also be affected by self-esteem or even represent it, and that health status might affect SSS.[35] Moreover, the most disadvantaged groups tended to rank their social position less based on objective measures than those of higher SES,[36] and adolescents from low SES families may score relatively high.[6] We may therefore have underestimated both the proportion of low SES individuals and the strength of the association with SRH or smoking.

Our data showed cross-country differences in SRH. A study among adults in 10 European countries found similar differences.[37] However, prevalence rates of poor health tend to be higher in Southern Europe. Such country variations may in part be attributed to differences in reporting styles and different interpretations of questions on health.[37]

Comparison and interpretation

Inequalities found in smoking according to SSS, academic performance and pocket money were independent of other

SES indicators. This is in line with previous research, in which different SES indicators were found to be independent predictors of smoking and health.[6 11] This is also consistent with the weak to moderate correlations found between SES indicators, suggesting that each SES indicator measures a different dimension of SES.[5]

Our study supports previous findings that smoking inequalities according to adolescent SES indicators are larger than inequalities according to family or parental SES.[11 38] However, the difference between adolescent and family SES was less evident for SRH.[17 19] This difference may be due to the fact that smoking initiation starts in adolescence and is thus connected to the process of gaining independence from parents,[39] while SRH inherently develops from early life onwards. SRH has important determinants in childhood, such as good child–parent relationship, growing up in a stable family structure and family socialisation.[40] These determinants may be reflected to some extent by family SES indicators, which are indicators of social class of origin.[38] Smoking may be more strongly determined by adolescent social circumstances such as peer smoking,[41] and adolescent SES indicators may better reflect the environment at school and other settings outside home. The strong relationship between academic performance and smoking is in line with previous studies, and implies that educational level is a key socioeconomic indicator for smoking.[42 43] Educational level reflects knowledge and skills that are important to make healthy choices, for example concerning smoking.[44] Another explanation could be that smoking is also a mechanism for coping with stress induced by unfavourable socioeconomic circumstances and/or (school) stress and demands. It is known that those with deprived SES are more often faced with stressful situations.[42 44–46]

We found that adolescents who have lower amounts of pocket money were less likely to smoke and tended to have a better SRH. Pocket money provides the resources to purchase tobacco, but the association with SRH is less obvious. Income is considered a measurement of financial resources,[8] and higher financial capital indicates higher SES in adulthood. However, adolescents of lower SES parents may have more disposable income on average.[47] This may be due to parenting styles varying by parental education or income,[48] or adolescents with lower family SES or less connected to school being more likely to have part-time paid work and therefore their own income.[47] Because of this inverse association between pocket money and other SES indicators, and the positive association between pocket money and smoking behaviour,[13] we found that the adjustment for family SES indicators increased the magnitude of the association between pocket money and smoking. Pocket money, although being a clear economic indicator, may not necessarily represent family affluence[38] but is above all an indicator of purchasing power[4] and financial independence.[13 47]

SSS was predictive of SRH and to a lesser extent of smoking. SSS could affect health outcomes through psychological pathways, with low SSS increasing feelings of stress, anxiety and deprivation.[49] Subjective SES indicators may be of added value to more traditional objective measurements because they reflect the adolescent's perceptions of socioeconomic circumstances, and incorporates past and present circumstances, as well as future prospects and their related feelings.[36] This is in agreement with the evidence that material SES affects health through psychosocial pathways.[46] Furthermore, SSS is a holistic concept, as it incorporates objective measures of SES, as well as subjective assessment, observational as well as non-observational aspects, comparison processes, and the perceived hierarchy.[41] Further studies are needed to assess the value of SSS, and compare measures relative to other families, the peer group or the school level.[17]

Differences found between countries in the size of the association between academic performance and smoking may be due to differences between national educational systems. Some included countries have distinct educational tracks from an early age (Germany, Belgium and the Netherlands), while others have less strong tracking (Italy and Portugal) or do not have tracking within our age range (Finland).[24] We observed a weaker association between academic performance and smoking in early-tracking countries that may reflect the smaller relative differences in academic performance that young people perceive there within their own tracks. This is supported by a study in 37 European countries showing that inequalities in smoking were smaller in highly differentiated educational systems.[50] Besides the educational systems, it could be that differences in the results might also be due to differences in economic and sociocultural variables across the countries.[7] Further studies need to consider these possible explanations in order to understand country-specific differences in the effect of different SES indicators.

Implications

The results show that the magnitude of inequalities depends on the SES indicator. Careful consideration is required in the selection of SES indicators in future studies on inequalities in adolescent health and health behaviour. Conceptual considerations in relation to the research objectives are important, as well as the choice for indicators that can demonstrate the full size of existing inequalities. Our results suggest that it is important to measure SES indicators capturing the perceptions of adolescents, additionally or as an alternative to objective parental and familial indicators. Composite SES measures may be useful in measuring the wider concept of SES; however, it is difficult to determine the weight of each dimension and they may obscure what is actually being measured, as well as the result less stable across time and populations. Therefore, the deliberate choice for one indicator or a set of separate indicators may be preferable.

CONCLUSIONS

The selection of SES indicators to measure inequalities in adolescent health and health behaviour influences the magnitude of inequalities found. Inequalities in SRH and smoking were larger with SES indicators more closely related to the adolescent's education as well as the adolescent's perception of relative family SES, as opposed to objective indicators of parental education and material family affluence. This study stresses the need for careful consideration of the choice of SES indicators for future studies on inequalities in adolescent health. We encourage the use of adolescent SES indicators and SSS additionally to more traditional objective parental and family-based SES indicators.

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What is already known on this subject

- Measuring socioeconomic status (SES) in adolescence is difficult because adolescents do not have their own SES yet.
- Indicators of parents and family are often used as proxies, but do only insufficiently capture adolescents' circumstances and are less accurate and valid due to high levels of missing data and inadequate answers by adolescents.
- Inequalities in adolescent health and health behaviour may be underestimated taking only parental or familial indicators into account and neglect adolescents' own social circumstances.
- Indicators that capture adolescents' circumstances or include their perspective (such as subjective indicators) showed strong associations to their health and health behaviour.

What this study adds

- This study compares five indicators of SES on parental, familial and adolescent level, including objective and subjective indicators, on adolescent health and health behaviour across 6 different European cities.
- The results show that the magnitude of inequalities depends on the SES indicator.
- Out of all five SES indicators, low academic performance and low subjective social status of the family were the strongest predictors of poor self-rated health.
- Low academic performance and higher pocket money were most strongly associated with smoking in all countries.
- Parental education and family affluence (Family Affluence Scale) showed only weak or no independent associations across countries.
- We encourage the use of adolescent SES indicators and subjective social status additionally to more traditional objective parental and family-based SES indicators.

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