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Longitudinal associations between different measures of socioeconomic status and health behavior among adolescents. Data from a wealthy Italian region

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ABSTRACT

We investigate the association between socio-economic status and unhealthy behaviors among adolescents. By using different measures of socio-economic status, we capture both subjective aspects, as operationalized by perceived family affluence, and objective aspects, such as parents' educational levels and family affluence scale. We use data from a sample of 11,623 adolescents who participated in the Health Behavior in School-aged Children (HBSC) study in 2007, 2010, and 2014 in the Lombardy region of Italy. Results show that all of our measures of socio-economic status are correlated with unhealthy behaviors among adolescents. In particular, perceiving a family affluence below average is significantly correlated with a higher probability of reporting all of the unhealthy behaviors included in our analysis. Having at least one parent with university education significantly decreases the odds of being obese or overweight, having an unbalance diet, being physically inactive, and reporting sedentary behaviors. However, adolescents with at least one university educated parent are more likely to make use of cannabis. When controlling for all of our SES measures simultaneously, we find that family affluence scale is no longer significant in determining adolescents' behaviors. Our findings suggest that, when focusing on health inequalities among adolescents, self-perceptions and non-material dimensions of SES have more explanatory power than its material dimensions.

1. Introduction

Noncommunicable diseases (NCDs) kill around 41 million people worldwide each year (World Health Organization, 2018a). Much of the burden of NCDs, also known as chronic diseases, results from a short list of risk factors that contribute to an unhealthy lifestyle, including physical inactivity and sedentary behaviors (such as television viewing time, use of the media, etc.), an unbalanced diet, smoking habits, alcohol and cannabis use, overweight and obesity, violent behaviors, and unprotected sexual intercourse (Bauer et al., 2014). Substantial evidence suggests that adolescence is the phase of life with the highest risk of developing an unhealthy lifestyle (Arnett, 1992; Jessor, 1991; Steinberg, 2008). Unhealthy behaviors most frequently analyzed among adolescents are dietary habits, substance use, sedentary behaviors, and early and/or unprotected sexual intercourse (de Winter et al., 2016; Alamian and Paradis, 2009; Kipping et al., 2014).

That unhealthy behaviors develop during adolescence seems to be particularly relevant in light of the fact that, once unfold, they are likely to persist into adulthood (de Winter et al., 2016; Kipping et al., 2012) and they are strongly related with chronic diseases (Suris et al., 2008). Nonetheless, most of the existing literature examines the prevalence and the co-occurrence of multiple health risk behaviors in adults (Burke et al., 1997; Conry et al., 2011; Mawditt et al., 2016; Meader et al., 2016; Schuit et al., 2002). Among these studies, the association between unhealthy behaviors and socio-economic status (SES) has been widely investigated. Results from this literature indicate that low SES adults are more likely to engage in multiple risky behaviors (Conry et al., 2011; Meader et al., 2016; Hoffmann et al., 2019). Interestingly, results seem to be consistent across measures capturing different dimensions of SES (Meader et al., 2016; Hoffmann et al., 2019). A more modest literature, despite recently growing, analyzes the same association among adolescents (de Winter et al., 2016; Alamian and Paradis, 2009; Kipping et al.,

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2014; Bøe et al., 2019; Elgar et al., 2016; Moor et al., 2019; Moreno-Maldonado et al., 2019). Within this literature, evidence is particularly controversial. Consistent with what has been found for adults, some studies point to the fact that low SES adolescents undertake unhealthy behaviors, such as poor eating habits and sedentary behaviors, more frequently than their high SES peers (de Winter et al., 2016; Alamian and Paradis, 2009; Kipping et al., 2014; Geckova et al., 2002). However, other studies do not detect any significant relationship between adolescents' unhealthy behaviors and their SES (Donato et al., 1995; Glendinning et al., 1994; Shucksmith et al., 1997; Tuinstra et al., 1998).

SES is usually measured through different dimensions such as occupation, education, income, material and financial wealth, or a combination of these. Importantly, measuring SES among adolescents can be particularly challenging given their little variation in terms of educational and occupational status. That is why, within this literature, SES is often measured by income, educational level, and occupational status of adolescents' parents (de Winter et al., 2016; Alamian and Paradis, 2009; Kipping et al., 2014; Moreno-Maldonado et al., 2019; Donato et al., 1995; Tuinstra et al., 1998). Nonetheless, recent studies on the role of adolescents' SES in determining specific outcomes such as mental health, self-reported health, and life satisfaction, test whether findings hold across different measures of SES (Bøe et al., 2019; Elgar et al., 2016; Moor et al., 2019; Moreno-Maldonado et al., 2019). A promising distinction that can help explain different types of variation is between objective measures (such as parents' educational level, parents' occupational status, or family affluence scale) and subjective measures of SES (such as self-perceptions of own socioeconomic position) (Tan et al., 2020; Goodman et al., 2007).

There is little evidence showing how objective and subjective SES dimensions help explain variation in health and lifestyle outcomes among adolescents (Hoffmann et al., 2019). We contribute to this literature using data from Lombardy, that is the richest and most populous region in Italy. Our data allow us to test the influence over time, namely between 2007 and 2014, of each of the following measures: family affluence scale, parents' educational level, and perceived family affluence. The aim of the study is to show how different dimensions of SES are associated with unhealthy behaviors among adolescents.

2. Methods

2.1. Data collection and participants

The HBSC research network is an international alliance of researchers that collaborate on the cross-national survey of school students: Health Behavior in School-aged Children (HBSC). The HBSC collects data every four years on 11-, 13- and 15-year-old boys' and girls' health and well-being, social environments and health behaviors (Currie, 2008). Our data come from school children who participated in the HBSC study in 2007, 2010, and 2014 in the Lombardy region of Italy. Italy participated for the first time in 2001/2002 and then in 2006. Since 2009/2010, all Italian regions have been involved in the study which is conducted in collaboration with the Italian Ministry of Health (Ministero della Salute/CCM). Representative samples of 4802, 3569, and 3172 students, aged between 11 and 16, were recruited in 2007, 2010, and 2014, respectively, drawing from systematic cluster sampling from all public and private schools in Lombardy officially acquired by the Italian Ministry of Education.

2.2. Measures

HBSC adopts a standardized self-administered questionnaire. Participation is voluntary, and students can leave the survey at any time. The survey is administered during a school day by trained health professionals.

2.3. Dependent variable(s) – Unhealthy behaviors

The survey asks participants to tell the frequency of unhealthy behaviors. The only exception relates to obesity and overweight conditions, that are computed using height and weight reported by subjects. We operationalize nine unhealthy behaviors using binary variables as explained in what follows.

2.3.1. Obesity/overweight

Adolescents were asked to provide their weight and height; the body mass index (BMI) was then computed according to the WHO definition, i.e. 'a person's weight in kilograms divided by the square of his height in meters (kg/m2)'. Using the international IOTF cut-off points (Cole and Lobstein, 2012), subjects with a BMI level indicating overweight or obesity were coded as 1, 0 otherwise.

2.3.2. Unbalanced diet

Considering current scientific evidence (World Health Organization, 2003), we created a healthy diet index using four items on eating habits including breakfast (that we coded equal to 1 for those subjects who eat breakfast every day, and value 0 for those who do not eat breakfast daily), fruit (1 'eating fruit once or more per day', 0 'less than once a day'), vegetable (1 'eating vegetables once or more per day', 0 less than once a day), and sugar intake (1 'drinking coke/eating sweets less than once a day', 0 'once or more per day'). Respondents scoring 2 or less on the index were coded as 1 in the binary variable indicating an unbalanced diet, 0 otherwise.

2.3.3. Physical inactivity

Participants were asked how many hours a week they exercise or participate in sports that make them sweat or out of breath. The WHO recommends vigorous-intensity activities to be incorporated at least three days a week (World Health Organization, 2022; Morgan et al., 2016). A binary variable capturing physical inactivity is therefore equal to 1 for adolescents reporting 3 h or less of physical activity per week, 0 otherwise.

2.3.4. Sedentary behavior

A binary variable was created based on two items asking adolescents their time spent watching TV and playing with videogames during weekdays. Consistent with previous research (Morgan et al., 2016), spending more than two hours per day in such activities was considered as an unhealthy behavior and was coded as 1, 0 otherwise.

2.3.5. Smoking habits

Regular smoking was defined as smoking every day and was represented by a binary variable assuming value 1 for daily smokers and value 0 for not daily smokers (Lorant and Tranmer, 2019).

2.3.6. Alcohol consumption

Given the young age of the sample, excess alcohol consumption was defined as consuming any type of alcoholic drink at least weekly, as defined by the WHO report on adolescent alcohol-related behaviors (World Health Organization, 2018b), and was represented by a binary variable (1 'alcohol consumption at least weekly', 0 'less than once a week').

2.3.7. Cannabis use

Adolescents aged 13–16 years were asked whether they used cannabis in the last month. A binary variable was coded as 1 for adolescents using cannabis in the last month, 0 otherwise.

2.3.8. Unprotected sexual intercourse

Adolescents aged 15–16 years were asked whether they used a condom in their last sexual intercourse. A binary variable assumes value 1 for those who declared not to have used a condom and value 0 for

those who declared to have used a condom in their last sexual intercourse.

2.3.9. Violent behaviors

Two items assess adolescents' engagement in violent behaviors, namely bullying others (in the last two months) and getting into fights (in the last twelve months). Having experienced such violent behaviors at least once was was included in the analysis through a dichotomous variable (1 'experience violent behaviors at least once', 0 'never').

2.4. Independent variable(s) - socioeconomic status

SES is our main explanatory variable. We distinguish between objective and subjective measures of SES. As to objective SES measures, firstly, we use parents' education level, that was classified according to the Italian school system: 1 'primary education', 2 'lower secondary education', 3 'technical/trade school education', 4 'upper secondary education', 5 'tertiary education'. A binary variable indicates whether at least one parent has an undergraduate or graduate degree.

Nonetheless, collecting such data from adolescents can be quite difficult, given that they may not know or may not be willing to reveal such information. This might result in high levels of missing values. Our second measure relies on Family Affluence Scale (FAS), precisely developed to overcome these difficulties and validated by various cross-national studies (Currie, 2008). FAS is composed of several easily answered questions, which aim at quantifying material assets of the family and, in particular, their material affluence/deprivation. In our setting, the scale consists of four items: number of cars, vans or trucks owned by the family (0 'none'; 1 'one'; 2 'two or more'), whether adolescents have their own bedroom (0 'no'; 1 'yes'), number of holidays trips taken in the last 12 months (0 'never'; 1 'once'; 2 'twice'; 3 'more than twice'), number of computers owned by the family (0 'none'; 1 'one'; 2 'two'; 3 'three or more'). The obtained score (0–9) was recorded in a 3-point ordinal scale and categorized as low (0–3), medium (4–6), and high (≥7) family affluence allowing in country and between countries comparisons, consistent with methodological choices made by Voračova and colleagues (Voráčová et al., 2016).

The third SES measure relates to adolescents' self-perceptions of their family conditions. This consists of a subjective measure of adolescents' family affluence. An item of the questionnaire asks participants the following question: "How well-off do you think your family is?" Participants had to indicate their perceptions on a scale from 1 ("not at all well-off") to 5 ("very well-off"). This binary outcome variable is equal to 1 for adolescents answering less than 3 ("on average"), that is less than average, to this item, 0 otherwise. The question has been used in the HBSC study since 1994 and it has been already used as a subjective measure of SES (Moreno-Maldonado et al., 2019).

2.5. Demographics

Demographics included in the analysis are the following: gender (1 'girls', 0 'boys'), age (from 11 to 16 years), and nationality (1 'Italian', 0 'foreign'). The nationality of subjects was defined by the nationality of both parents, as the Italian law (Law no. 91/1992) states that Italian citizenship is acquired by *'ius sanguinis'*, i.e. if at least one parent is an Italian citizen, rather than *'ius soli'*, i.e. the right of anyone born in the territory of a state to nationality or citizenship. Therefore, Italian nationality was attributed to those participants who stated to have at least one Italian parent. Type of school attended by students was also used as a control variable (0 'public', 1 'private'). Lastly, we control for survey fixed effects, to take into account time-specific characteristics.

2.6. Statistical analysis

We use logistic models to investigate the relationship between individual unhealthy behaviors and different SES measures (parents' educational level, FAS, and perceived family affluence), accounting also for demographic characteristics such as age, gender, and nationality, but also private schools and survey year. In addition, building on previous research (Harakeh et al., 2012), we compute an index of multiple unhealthy behaviors by summing together the nine variables analyzed. A linear regression model was then performed using the multiple unhealthy behaviors index as the dependent variable.

3. Results

In starting to analyze our results, it is important firstly to describe our sample, our SES measures and their degree of association among them. Table 1 include descriptive statistics of our sample.

As expected, when focusing on parents' educational level, we miss about one fourth of our observations. About 31.1% (2740) of the 8746 adolescents who provided with this information have at least one graduated parent. As for the FAS levels, 10.8% (1206) of respondents have a low family affluence, 56.6% (6316) have a medium level and the remaining 32.6% (3637) have a high level. Looking at our measure of perceived SES, it is quite interesting to observe that only 7% of our sample (797) perceive a family affluence below the average. 36% (4098) perceive an average family affluence and the remaining 57% (6488) perceive a family affluence above the average. Table 2 reports results from two logistic models, where perceiving a family affluence below the average was used as dependent variable. As expected, the subjective measure is strongly associated with our objective measures of SES. Indeed, with respect to those who belong to the high level of family affluence, belonging to low or medium levels increase the odds of perceiving a family affluence below average by 5.46 and 2.27, respectively. By contrast, having at least one graduated parent decreases the odds of perceiving a family affluence below average by 0.64. These odds ratios are statistically significant at the 0.001 level. We observe the same pattern of results both with and without controls.

Table 3 reports results from a series of logistic models estimating how the probability of each of the nine health risk behaviors change depending on different measures of SES. Models from 1.1 to 1.9 focus on parents' educational level; models from 2.1 to 2.9 focus on family affluence levels; models from 3.1 to 3.9 focus on perceived SES. Models from 4.1 to 4.9 include all of our SES measures. Controls for gender, age, nationality, private school and survey fixed effects are included in all the models, as a series of likelihood ratio tests reveals that, when keeping the sample fixed, they jointly improve models fit substantially.

When examining the odds ratios of objective measures of SES, we cannot detect a regular pattern. Having at least one graduated parent significantly ($p < 0.001$) decreases the odds of being obese or overweight, having an unbalance diet, being physically inactive, and reporting sedentary behaviors. However, adolescents with at least one graduated parent are more likely to make use of cannabis ($OR = 1.52, p < 0.001$). Coefficients are not statistically significant in the remaining unhealthy behaviors. The results are similar when looking at FAS levels.

Table 1
Descriptive statistics.

N	*11,623*
Female (proportion)	0.49
Age	13.4 (1.68)
Italian parent (proportion)	0.91
Private school (proportion)	0.09
Low FAS (proportion)	0.11
Medium FAS (proportion)	0.57
High FAS (proportion)	0.32
At least one graduated parent (proportion)	0.31
Perceived affluence below average (proportion)	0.07
Survey 2007 (proportion)	0.42
Survey 2010 (proportion)	0.31
Survey 2014 (proportion)	0.27

Standard deviations in parentheses.

Table 2
Association among subjective and objective measures of SES.

	DV: Perceived family affluence below average (odds ratio)				DV (continuous variable): Perceived family affluence			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	N = 11,087	*N = 8746*	*N = 11,082*	*N = 8741*	*N = 11,087*	*N = 8746*	*N = 11,082*	*N = 8741*
Low FAS	5.45***		5.00***		−0.64*** (0.029)		−0.64*** (0.030)	
Medium FAS	2.28***		2.15***		−0.38*** (0.018)		−0.37*** (0.017)	
At least one graduated parent		0.64***		0.66***		0.31*** (0.020)		0.27*** (0.020)
Female	No	No	Yes	Yes	No	No	Yes	Yes
Age	No	No	Yes	Yes	No	No	Yes	Yes
Italian	No	No	Yes	Yes	No	No	Yes	Yes
Private school	No	No	Yes	Yes	No	No	Yes	Yes
Survey fixed effects	No	No	Yes	Yes	No	No	Yes	Yes

(Standard errors in parentheses)*** *p-value < 0.001*; ** *p-value < 0.01*; * *p-value < 0.05*.

Table 3
Logistic models on the nine unhealthy behaviors (odds ratio are reported).

Dependent variable	Obesity / overweight	Unbalanced diet	Physical inactivity	Sedentary behaviors	Smoking habits	Alcohol consumption	Cannabis use	Unprotected sex	Violent behaviors
Model (reference group = no graduate parents)	(1.1)	(1.2)	(1.3)	(1.4)	(1.5)	(1.6)	(1.7)	(1.8)	(1.9)
N	*7837*	*8462*	*8728*	*8772*	*8763*	*8756*	*5421*	*509*	*8781*
At least one graduated parent	0.72***	0.56***	0.79***	0.77***	0.99	1.12	1.52***	0.87	0.93
Model (reference group = high FAS)	(2.1)	(2.2)	(2.3)	(2.4)	(2.5)	(2.6)	(2.7)	(2.8)	(2.9)
N	*9630*	*10,670*	*11,070*	*11,124*	*11,099*	*11,085*	*5931*	*584*	*11,127*
Low FAS	1.38***	1.73***	2.20***	1.03	1.04	0.64***	0.9	1.94	0.9
Medium FAS	1.29***	1.42***	1.44***	1.09	0.81*	0.74***	0.67***	1.17	0.82***
Model (reference group = above average affluence)	(3.1)	(3.2)	(3.3)	(3.4)	(3.5)	(3.6)	(3.7)	(3.8)	(3.9)
N	*9813*	*10,868*	*11,270*	*11,334*	*11,322*	*11,307*	*5963*	*591*	*11,353*
Perceived affluence below average	1.35***	1.34*	1.32***	1.17*	1.64***	1.28*	2.06***	2.29**	1.57***
Model (reference group = no graduate parents)	(4.1)	(4.2)	(4.3)	(4.4)	(4.5)	(4.6)	(4.7)	(4.8)	(4.9)
N	*7623*	*8235*	*8487*	*8526*	*8509*	*8503*	*5336*	*502*	*8530*
At least one graduated parent	0.75***	0.59***	0.87**	0.77***	0.94	1.05	1.46***	0.93	0.95*
Low FAS	1.19	1.39*	1.87***	0.98	0.97	0.65***	0.96	1.26	0.86***
Medium FAS	1.19**	1.23**	1.33***	1.03	0.78*	0.75***	0.71*	0.98	0.95*
Perceived affluence below average	1.24*	1.28	1.29**	1.16	1.72***	1.49***	2.34***	2.29**	1.13***
Female	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Age	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Italian	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Private school	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Survey fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

*** *p-value < 0.001*; ** *p-value < 0.01*; * *p-value < 0.05*.

With respect to those in high FAS level, both respondents in low and medium levels are more likely to be obese or overweight ($OR = 1.38$, $p < 0.001$; $OR\ 1.29$, $p < 0.001$), have an unbalance diet ($OR = 1.73$, $p < 0.001$; $OR = 1.42$, $p < 0.001$), and be physically inactive ($OR = 2.30$, $p < 0.001$; $OR = 1.75$, $p < 0.001$). In addition, with respect to a high FAS level, a low FAS level decreases the odds of alcohol consumption by 0.64 ($p < 0.001$), while a medium level decreases the odds of smoking by 0.81 ($p < 0.05$), consuming alcohol by 0.74 ($p < 0.001$), using cannabis by 0.67 ($p < 0.001$), and behaving violently by 0.82 ($p < 0.001$). By contrast, when focusing on our subjective measure of SES, it can be observed that perceiving a family affluence below average is regularly associated with a higher probability of reporting all the nine health risk behaviors. The increasing in the odds of reporting unhealthy behaviors ranges from 1.17 and 1.28 for sedentary behaviors and alcohol consumption, respectively, to 2.06 and 2.29 for cannabis use and unprotected sex, respectively.

When simultaneously testing all our SES measures, we observe three main patterns. First, the association between FAS levels and unhealthy behaviors is generally quite week. Second, having at least one graduated parent significantly decreases the odd of being obese/overweight, having an unbalanced diet, being physically inactive, and sedentary behaviors (ORs from 0.59 to 0.87). Again, adolescents with at least one graduated parent are more likely to report cannabis use ($OR = 1.46$, $p < 0.001$). Third, perceptions of family affluence below average is a statistically significant factor in increasing all the risk factors included in our analysis, with the exceptions of an unbalanced diet and sedentary behaviors (that would be significant using a 10% threshold though).

We can now focus on our multiple unhealthy behaviors index as a dependent variable. The index goes from a minimum of 0 to a maximum of 9. It includes all variables analyzed in Table 2: overweight/obesity, unbalanced diet, physical inactivity, sedentary behaviors, smoking habits, alcohol consumption, cannabis use, unprotected sex, and violent

behaviors. On average, the index is equal to 2.5 in our sample ($SD = 1.3$). The higher the index, the more unhealthy behaviors reported by the adolescent.

Table 4 reports coefficients from linear regression models with robust standard errors. Controls for gender, age, nationality, private school and survey fixed effects are included, again because a series of likelihood ratio tests reveals that, when keeping the sample fixed, they jointly improve models fit substantially. In model 1 we see that, with respect to a high level of family affluence, a low level is associated with 0.15 points more on our multiple health risk behaviors index ($p < 0.001$), while a medium level is associated with 0.06 points more ($p < 0.05$). Model 2 shows that having at least one graduated parent, by contrast, is associated with 0.2 points less on the index ($p < 0.001$). Model 3 shows that perceiving a SES below average is associated with 0.41 points more on our index. Model 4 includes all of our measures of SES simultaneously. Interestingly, the FAS coefficients become statistically not significant, while having at least one graduated parent is significantly associated with 0.19 points less on the index ($p < 0.001$) and a low perception of SES is significantly associated with 0.44 points more on the index ($p < 0.001$), that is about one third of a standard deviation.

Table 4
Linear regression models with robust standard error. DV: multiple unhealthy index.

	(1)	(2)	(3)	(4)
N	*11,154*	*8798*	*11,377*	*8544*
Low FAS	0.20***			0.09
	(0.043)			(0.054)
Medium FAS	0.06*			−0.01
	(0.027)			(0.031)
At least one graduated parent		−0.21***		−0.19***
		(0.031)		(0.032)
Perceived affluence below average			0.40***	0.43***
			(0.049)	(0.058)
Female	Yes	Yes	Yes	Yes
Age	Yes	Yes	Yes	Yes
Italian	Yes	Yes	Yes	Yes
Private school	Yes	Yes	Yes	Yes
Survey fixed effects	Yes	Yes	Yes	Yes

Standard error in parentheses; *** *p-value* < *0.001;* ** *p-value* < *0.01;* * *p-value* < *0.05.*

4. Discussion

This study investigates the interplay between different SES measures and unhealthy behaviors among adolescents. In particular, we use two measures of objective SES, namely parents' educational level and FAS, and one subjective measure given by adolescents' perceived family affluence. We show that all SES measures are significantly correlated with unhealthy behaviors among adolescents. In particular, belonging to the lowest FAS category significantly increases the chances of being overweight/obese, of having an unbalanced diet, and of being physical inactive. In addition, we find that having at least one graduated parent makes students less likely to engage in unhealthy behaviors. The only behavior that deviates from this general pattern of results is cannabis use, that is more likely to happen for adolescents with at least one graduated parent. Our data do not allow us to test the mechanisms behind this relationship. We posit that cultural determinants of this specific behavior might help explain this result, as some evidence already exists showing that cannabis use is becoming more and more acceptable (Lau et al., 2015). Thirdly, we find a systematic, strong, and significant relation between perceived SES and all unhealthy behaviors included in our analysis.

Nonetheless, when simultaneously controlling for all our SES measures, FAS, that is our measure aimed at targeting material deprivation, loses its significance. This finding corroborates the idea that material deprivation would be less important than other SES dimensions when focusing on adolescents' poor behavioral outcomes. This is confirmed in our analysis, on the one hand, by the finding that self-perceptions of family affluence have more explanatory power than actual family affluence and, on the other hand, by the finding that adolescents whose parents' education is lower have poorer behavioral outcomes. These results are consistent with previous studies finding that education, more than occupation or income, seems to be the factor most consistently associated with different risky behavioral habits among adults (Wilkinson, 1997; Galán et al., 2005). In this respect, our findings suggest that the relationship between SES and unhealthy behavior might be similar between adolescents and adults, at least when focusing on the same dimensions of SES. Future research shall test the robustness of this claim.

To conclude, while we provide with strong evidence in favor of rethinking the role of SES and material deprivation in determining adolescents' behaviors, our study should be interpreted in light of some limitations. First, our SES objective and subjective measures are all based on adolescents' self-reported data, which might make the idea of having "objective" measures controversial. Second, results might be driven by the specific context of our research, Lombardy, that is one of the richest regions in Europe. 10 million people live in this region, out of 60 million of the Italian population. The Italian GDP per capita was about €29,700 in 2019, while this was €39,700 the same year in Lombardy. Inequality levels in Lombardy are lower than the national average, as the Gini index here was 0.28, 0.30, and 0.28, respectively in 2009, 2014, and 2019, while in Italy this was equal to 0.34, 0.37, and 0.35 the same years. Individuals belonging to families without any income were 3.5%, 5.5%, and 4.1% in Lombardy in 2009, 2014, and 2019, while they were respectively 7.8%, 11.2%, and 9.9% in Italy (Banca d'Italia, 2020). Therefore, our finding suggest that material deprivation is less important than self-perceptions of deprivation in determining adolescents' behavioral outcomes in a relatively rich context. It might be the case that material deprivation is a more serious concern in poorer regions. Third, the use of binary variables to operationalize behavioral outcomes limits the sensitivity of the study to examine the relationship between SES and unhealthy behaviors, as individuals vary in their physical inactivity, unhealthy diet, smoking habits, alcohol consumption, etc. Further research is needed to improve our understanding of the pathways explaining the relationship between subjective vs objective SES and unhealthy behaviors among adolescents.

Credit author statement

Authors have equally contributed to the development of this manuscript.

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Declaration of Competing Interest

None of the authors have conflicts of interest to declare.

References

Alamian, A., Paradis, G., 2009. Clustering of chronic disease behavioral risk factors in Canadian children and adolescents. Prev. Med. 48 (5), 493–499.
Arnett, J., 1992. Reckless behavior in adolescence: a developmental perspective. Dev. Rev. 12 (4), 339–373.
Banca d''Italia, 2020. Economie Regionali. L'Economia Della Lombardia.
Bauer, U.E., Briss, P.A., Goodman, R.A., Bowman, B.A., 2014. Prevention of chronic disease in the 21st century: elimination of the leading preventable causes of premature death and disability in the USA. Lancet 384 (9937), 45–52.

Bøe, T., Petrie, K.J., Sivertsen, B., Hysing, M., 2019. Interplay of subjective and objective economic well-being on the mental health of Norwegian adolescents. SSM-Popul. Health 9, 100471.
Burke, V., Milligan, R.A.K., Beilin, L.J., Dunbar, D., Spencer, M., Balde, E., Gracey, M.P., 1997. Clustering of health-related behaviors among 18-year-old Australians. Prev. Med. 26 (5), 724–733.
Cole, T.J., Lobstein, T., 2012. Extended international (IOTF) body mass index cut-offs for thinness, overweight and obesity. Pediatric Obesity 7 (4), 284–294.
Conry, M.C., Morgan, K., Curry, P., McGee, H., Harrington, J., Ward, M., Shelley, E., 2011. The clustering of health behaviours in Ireland and their relationship with mental health, self-rated health and quality of life. BMC Public Health 11 (1), 692.
Currie, C., 2008. Inequalities in Young people's Health: HBSC International Report from the 2005/2006 Survey, vol. 5. World Health Organization.
de Winter, A.F., Visser, L., Verhulst, F.C., Vollebergh, W.A., Reijneveld, S.A., 2016. Longitudinal patterns and predictors of multiple health risk behaviors among adolescents: the TRAILS study. Prev. Med. 84, 76–82.
Donato, F., Monarca, S., Chiesa, R., Feretti, D., Modolo, M.A., Nardi, G., 1995. Patterns and covariates of alcohol drinking among high school students in 10 towns in Italy: a cross-sectional study. Drug Alcohol Depend. 37 (1), 59–69.
Elgar, F.J., McKinnon, B., Torsheim, T., Schnohr, C.W., Mazur, J., Cavallo, F., Currie, C., 2016. Patterns of socioeconomic inequality in adolescent health differ according to the measure of socioeconomic position. Soc. Indic. Res. 127 (3), 1169–1180.
Galán, I., Rodríguez-Artalejo, F., Tobías, A., Díez-Gañán, L., Gandarillas, A., Zorrilla, B., 2005. Clustering of behavioural risk factors and their association with subjective health. Gac. Sanit. 19, 370–378.
Geckova, A., van Dijk, J.P., Groothoff, J.W., Post, D., 2002. Socio-economic differences in health risk behaviour and attitudes towards health risk behaviour among Slovak adolescents. Sozial-und Präventivmedizin 47 (4), 233–239.
Glendinning, A., Shucksmith, J., Hendry, L., 1994. Social class and adolescent smoking behaviour. Soc. Sci. Med. 38 (10), 1449–1460.
Goodman, E., Huang, B., Schafer-Kalkhoff, T., Adler, N.E., 2007. Perceived socioeconomic status: a new type of identity that influences adolescents' self-rated health. J. Adolesc. Health 41 (5), 479–487.
Harakeh, Z., De Looze, M.E., Schrijvers, C.T.M., Van Dorsselaer, S.A.F.M., Vollebergh, W. A.M., 2012. Individual and environmental predictors of health risk behaviours among Dutch adolescents: the HBSC study. Public Health 126 (7), 566–573.
Hoffmann, R., Kröger, H., Geyer, S., 2019. Social causation versus health selection in the life course: does their relative importance differ by dimension of SES? Soc. Indic. Res. 141 (3), 1341–1367.
Jessor, R., 1991. Risk behavior in adolescence: a psychosocial framework for understanding and action. J. Adolesc. Health 12, 597–605.
Kipping, R.R., Campbell, R.M., MacArthur, G.J., Gunnell, D.J., Hickman, M., 2012. Multiple risk behaviour in adolescence. J. Public Health 34 (suppl_1), i1–i2.
Kipping, R.R., Smith, M., Heron, J., Hickman, M., Campbell, R., 2014. Multiple risk behaviour in adolescence and socio-economic status: findings from a UK birth cohort. Europ. J. Publ. Health 25 (1), 44–49.
Lau, N., Sales, P., Averill, S., Murphy, F., Sato, S.O., Murphy, S., 2015. Responsible and controlled use: older cannabis users and harm reduction. Int. J. Drug Pol. 26 (8), 709–718.
Lorant, V., Tranmer, M., 2019. Peer, school, and country variations in adolescents' health behaviour: a multilevel analysis of binary response variables in six European cities. Soc. Networks 59, 31–40.
Mawditt, C., Sacker, A., Britton, A., Kelly, Y., Cable, N., 2016. The clustering of health-related behaviours in a British population sample: testing for cohort differences. Prev. Med. 88, 95–107.
Meader, N., King, K., Moe-Byrne, T., Wright, K., Graham, H., Petticrew, M., Sowden, A.J., 2016. A systematic review on the clustering and co-occurrence of multiple risk behaviours. BMC Public Health 16 (1), 657.
Moor, I., Kuipers, M.A., Lorant, V., Pförtner, T.K., Kinnunen, J.M., Rathmann, K., Richter, M., 2019. Inequalities in adolescent self-rated health and smoking in Europe: comparing different indicators of socioeconomic status. J. Epidemiol. Community Health 73 (10), 963–970.
Moreno-Maldonado, C., Ramos, P., Moreno, C., Rivera, F., 2019. Direct and indirect influences of objective socioeconomic position on adolescent health: the mediating roles of subjective socioeconomic status and lifestyles. Int. J. Environ. Res. Public Health 16 (9), 1637.
Morgan, K., Hallingberg, B., Littlecott, H., Murphy, S., Fletcher, A., Roberts, C., Moore, G., 2016. Predictors of physical activity and sedentary behaviours among 11-16 year olds: multilevel analysis of the 2013 health behaviour in school-aged children (HBSC) study in Wales. BMC Public Health 16 (1), 1–10.
Schuit, A.J., van Loon, A.J.M., Tijhuis, M., Ocké, M.C., 2002. Clustering of lifestyle risk factors in a general adult population. Prev. Med. 35 (3), 219–224.
Shucksmith, J., Glendinning, A., Hendry, L., 1997. Adolescent drinking behaviour and the role of family life: a Scottish perspective. J. Adolesc. 20 (1), 85–101.
Steinberg, L., 2008. A social neuroscience perspective on adolescent risk-taking. Dev. Rev. 28 (1), 78–106.
Suris, J.C., Michaud, P.A., Akre, C., Sawyer, S.M., 2008. Health risk behaviors in adolescents with chronic conditions. Pediatrics 122 (5), e1113–e1118.
Tan, J.J., Kraus, M.W., Carpenter, N.C., Adler, N.E., 2020. The association between objective and subjective socioeconomic status and subjective well-being: a meta-analytic review. Psychol. Bull. 146 (11), 970.
Tuinstra, J., Groothoff, J.W., Van Den Heuvel, W.J., Post, D., 1998. Socio–economic differences in health risk behavior in adolescence: do they exist? Soc. Sci. Med. 47 (1), 67–74.
Voráčová, J., Sigmund, E., Sigmundová, D., Kalman, M., 2016. Family affluence and the eating habits of 11-to 15-year-old Czech adolescents: HBSC 2002 and 2014. Int. J. Environ. Res. Public Health 13 (10), 1034.
Wilkinson, R.G., 1997. Socioeconomic determinants of health: health inequalities: relative or absolute material standards? Bmj 314 (7080), 591.
World Health Organization, 2003. Diet, Nutrition, and the Prevention of Chronic Diseases: Report of a Joint WHO/FAO Expert Consultation, vol. 916. World Health Organization.
World Health Organization, 2018a. World Health Statistics 2018: Monitoring Health for the SDGs, Sustainable Development Goals. World Health Organization, Geneva.
World Health Organization, 2018b. Adolescent Alcohol-Related Behaviours: Trends and Inequalities in the WHO European Region, 2002–2014. WHO Regional Office for Europe, Copenhagen.
World Health Organization, 2022. Physical Activity Recommendations. World Health Organizaiton.