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Can an equal world reduce problematic social media use? Evidence from the Health Behavior in School-aged Children study in 43 countries

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ABSTRACT

Research on the social determinants of Problematic Social Media Use (PSMU) among adolescents is scant and focused on proximal contexts and interpersonal relationships. This study examines the relation of PSMU with economic inequality, measured at country, school and individual levels. It also evaluated the moderating role of family and peer support in these associations. The 2017/18 Health Behavior in School-aged Children (HBSC) study measured PSMU in 179,049 adolescents aged 11-, 13- and 15-year-olds in 43 countries and sub-regions of Belgium (Flanders and Wallonia) and the United Kingdom (England, Scotland, and Wales). Associations between inequality and PSMU were tested using multilevel logistic regression analysis. Results showed that adolescents who were relatively more deprived than their schoolmates and attended more economically unequal schools had a higher likelihood of reporting PSMU. In addition, school wealth inequality was more closely related to PSMU among adolescents with lower levels of peer support. A similar effect of country income inequality was found, but only in adolescents who reported low family support. Our findings expand the existing literature on the detrimental impact of inequalities in different social contexts on adolescent wellbeing by showing the role of inequalities in the engagement in PSMU.

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Introduction

Social media, referring to social network sites, such as Instagram, and instant messaging applications (IM), such as WhatsApp, has become part of daily life for many adolescents and young adults (Anderson & Jiang, 2018; Smahel et al., 2020). A recent survey among

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adolescents aged 9–17 in 19 European countries revealed that more than half use social media at least daily, and about 16% prefer online communication with friends over face-to-face contact (Smahel et al., 2020). US surveys found that nearly all adolescents aged 13–17 own a smartphone (Anderson & Jiang, 2018) and often use more than one electronic device simultaneously (Varghese et al., 2021). It appears that the use of social media has both risks and benefits to adolescents' well-being (Boer et al., 2020). For instance, social media can support adolescents' adjustment through facilitating offline social relationships with friends (Boniel-Nissim et al., 2015a) and offering entertainment and promoting civic engagement (Lenzi et al., 2015). In contrast, social media use correlates to reduced life satisfaction (Boer et al., 2020; Twenge et al., 2018) and symptoms of depression and anxiety (Keles et al., 2020). These contradictory effects on well-being may partly derive from the inherently ambivalent nature of social media. On the one hand, they strengthen our autonomy by connecting us to the world beyond time and place constraints. On the other hand, they challenge our autonomy and well-being by influencing our thoughts, emotions and behaviors. For this reason, some scholars have defined digital well-being as a subjective experience of optimal balance between the benefits and downsides of mobile connectivity tools (Vanden Abeele, 2021), such as social media, concerning life satisfaction in an environment suffused with mobile technologies (Büchi, 2021). Social media use impacts social and emotional well-being in a negative way when it resembles addiction-like symptoms (Boer et al., 2020). However, despite a growing literature in the field that considers the problematic use of social media a potential behavioral addiction, it has not been recognized as a proper behavioral addiction by the DSM-5 nor by the ICD-11 (Boer et al., 2022). Indeed, no consensus currently exists on conceptualization and terminology of Internet-related problematic uses, such as social media use. Therefore, in the present study, we will refer to the construct of 'problematic social media use' (PSMU) to avoid the risk of pathologization of everyday behaviors (Kardesfelt-Winther et al., 2017). PSMU refers to problematic behavior with negative consequences for everyday life in terms of problems in school and social functioning (Van den Eijnden et al., 2016, 2018). PSMU involves a dysregulated use of social media and is likely to be characterized by addiction-like features (e.g., salience, mood modification, tolerance, withdrawal, conflict, relapse, deception, displacement, and conflict). Accordingly, previous research found PSMU was associated with psychological distress (Marino et al., 2018), somatic symptoms (Andreassen, 2015), lower school achievement (Van Den Eijnden et al., 2018), body image concerns and disordered eating (Holland & Tiggemann, 2016), and negative mood (Abi-Jaoude et al., 2020).

To identify the determinants underlying PSMU, previous studies have focused on individual characteristics such as personality traits, motivations, and metacognition (Bright et al., 2015; Casale et al., 2018; Marino et al., 2018). Other studies pointed to contextual and interpersonal factors such as parental conflict (Wang et al., 2021), parental awareness (Paakkari et al., 2021), attachment style (Assunção et al., 2017), and peer influences (Marino et al., 2020). However, research on the social determinants of PSMU is scant. A previous study conducted by Boer et al. (2020) revealed a large international variation in the prevalence of PSMU. That variation has not been explained. According to the digital inequality framework, the socioeconomic structure of society and the position occupied in this hierarchy can influence social media use and consequently its positive or negative outcomes. Thus, there is a need to consider the role of social stratification

when studying different social media uses (Büchi & Hargittai, 2022). Given that social comparison processes are common on social networks (e.g., Nesi & Prinstein, 2015), adolescents might be more likely to develop PSMU in situations that elicit such comparisons, for example, in situations where social inequality is relatively common. Therefore, the following study aims to investigate the associations of adolescent PSMU with country-level income inequality, school-level wealth inequality, and individual-level relative deprivation in school.

Country- and school-level socio-economic inequalities and adolescent PSMU

Previous research found evidence of worse physical and mental health in adolescents in more socio-economically unequal societies (Odgers, 2015; Pickett & Wilkinson, 2015). For example, an analysis of adolescents living in 34 high-income countries showed that country-level income inequality was associated with a higher frequency of mental and physical health symptoms, less physical activity, and a higher body mass index (Elgar et al., 2015). Other studies on youth populations found that income inequality at the national or regional level is associated with risk behaviors such as bullying (Elgar et al., 2009; Napoletano et al., 2016), physical assaults (Pabayo et al., 2014) and alcohol misuse (Elgar et al., 2005).

Social hierarchy in a proximal environment may also affect adolescent well-being. In the school context, adolescents have many opportunities to directly compare themselves with classmates on the material aspects of their lives. School-level inequality can be investigated both at an individual and contextual level. While contextual inequality describes the variation of incomes within a school, relative deprivation (RD) indicates inequality between an individual and a reference group (Adjaye-Gbewonyo & Kawachi, 2012). RD can be defined as an individual's shortfall in affluence relative to classmates in the school context.

Thus, school wealth inequality might have a detrimental impact on well-being independently of RD at the individual level. At the individual level, more relatively deprived students might have increased opportunities for unfavorable social comparisons within the school context, leading to negative self-evaluations and lower levels of well-being. The prevailing explanation of the link between inequality and well-being, measured either at individual and contextual levels, is that socioeconomic stratification creates stark contrasts of social class, resulting in increased class anxiety, reduced social trust, and intensified upward social comparisons (Cheung & Lucas, 2016). Based on the dominance behavioral system theory (DBS; Johnson et al., 2012), Wilkinson and Pickett stated that the social evaluative threat deriving from more salient status differentials can lead to contrasting consequences. Possible reactions to a disadvantageous comparisons may include feelings of shame, inadequacy, low self-esteem and depression. At the same time, when confronting ourselves with someone wealthier, we might react by artificially inflating our ego as a compensation mechanism, thus developing forms of self-enhancement and narcissism.

Following these research findings, we hypothesized that social inequality might also play a significant role in adolescent PSMU. Although research on the association between country- and school-level socio-economic inequalities and adolescent PSMU is scarce, there are theoretical reasons to expect such an association. According to Wilkinson

and Pickett (2009, 2019), in contexts where socio-economic inequalities are more significant, the socio-economic status becomes more salient and amplifies unfavorable social comparisons. Thus, adolescents may be more likely to make unfavorable social comparisons and more frequently experience feelings of shame and inferiority in more socioeconomically unequal contexts (Cabieses et al., 2016). Strongly unequal environments intensify differences between individuals at many levels (e.g., lifestyle, cultural values etc.), weaken trust and social capital and discourage cooperation (Nishi et al., 2015). The increased salience of social status and the weakening of social relationships are two pathways that explain the higher rates of health and social problems – including PSMU (Wilkinson & Pickett, 2009, 2019). In these circumstances, adolescents may especially feel a stronger need to use social media because it provides a setting to display and compare appearance, behavior, interests, status and social affairs, often resulting in feedback from others in the network (Saunders & Eaton, 2018; Uhlmann et al., 2018). PSMU might be a consequence of seeking new reference groups to compare with or role models who can inspire. In addition, social media visual interactive tools allow youth to modify and share images of daily life and offer opportunities for strategic self-presentation, shaping the way they present themselves (McCrory et al., 2020). The salient concerns with status driven by a pronounced socioeconomic hierarchy may motivate adolescents to use social media as a way to present an ‘enhanced’ version of themselves and their lives (Brown & Tiggemann, 2016; Cohen et al., 2017).

Moreover, recent evidence has identified specific school characteristics associated with a pattern similar to PSMU. Liu et al. (2021) found that students’ perceptions of a positive school climate related to less psychological insecurity, thus decreasing the risk of problematic internet use. Similarly, Zhai et al. (2020) showed that negative perceptions of school environments are associated with more negative emotions, which, in turn, are regulated via ‘compensatory Internet use’, i.e., the active engagement in different online activities (gaming, social media, etc.) (Boer et al., 2021b). Hence, we hypothesized that adolescents experiencing high levels of RD (H1), attending schools with a high level of inequality (H2) and coming from more unequal countries (H3) have a more substantial likelihood of expressing PSMU.

Moderating role of family and peer support

Social support protects against adolescent risk behaviors and psychological distress. Highly supportive friendships are associated with better social competencies (Lenzi et al., 2012) and less loneliness (Cavanaugh & Buehler, 2016). For instance, in an international study aimed at investigating new and traditional risk behaviors and their association with adolescent mental well-being, high levels of peer support were associated with higher life satisfaction and lower psychosomatic complaints (Walsh et al., 2020). Perceiving social support from parents and friends was also shown to have a negative association with PSMU (e.g., Boer et al., 2020; Boniel-Nissim et al., 2015b) and to protect against exposures to inequality and relative deprivation (e.g., Elgar et al., 2018; Nepomnyaschy et al., 2020). Therefore, we hypothesized that perceived social support moderates the influence of inequality on adolescent PSMU. Specifically, we hypothesized that a lack of social support strengthens the associations of country- and school-level inequality on adolescent PSMU (H4).

The current study

Considering the various detrimental effects that PSMU can have on adolescents' well-being (e.g., Boer et al., 2021a; Schønning et al., 2020), it is useful to identify its social determinants. Previous studies of PSMU focused on individual factors and interpersonal relationships formed online (e.g., Assunção et al., 2017; Bright et al., 2015; Casale et al., 2018; Marino et al., 2018; Wang et al., 2021). To our knowledge, no study has investigated the role of inequality at multiple levels in a cross-national perspective. Therefore, the current study examined the associations of PSMU with country-level income inequality, school wealth inequality and individual RD and the moderating role of family and peers' support in these associations. We expected to find positive associations between PSMU and each indicator of inequality and that these associations are weaker when adolescents report higher levels of support.

Methods

Sample

Data were obtained from the 2017/18 Health Behavior in School-aged Children (HBSC) study, an international World Health Organization collaborative cross-sectional study carried out every four years in a growing network of countries and regions in Europe and Canada (Inchley et al., 2016; Inchley et al., 2020). The survey included representative samples of 11-, 13-, and 15-year-olds in 47 countries and regions. The current study used data from 43 countries and subregions of Belgium (Flanders and Wallonia) and the United Kingdom (England, Scotland, and Wales) that included measures of PSMU and preference for online social interaction in their questionnaires. From a sample of 244,097 adolescents, 65,048 cases were removed (26.65% of the sample) including four countries, Azerbaijan, Bulgaria, Greenland and Slovakia, that were missing data on key variables or whose schools had fewer than 10 students in the dataset, given our interest in relative deprivation and wealth inequality in schools. These exclusions resulted in an analytic sample of 179,049 adolescents (see Figure 1).

The HBSC study used a two-stage sampling of schools and then classes within schools to reflect regional variations within each country. Standardized weights were created to ensure representativeness in some countries that oversampled subpopulations by geography and ethnicity. Furthermore, standardized and internationally validated questionnaires were administered in classroom settings following instruction by and under the supervision of a teacher or trained interviewer (Roberts et al., 2009). Participation was anonymous and voluntary after passive or active consent from school administrators, parents, and children (following the ethical clearance requirements in each country).

Measures

Problematic social media use

The Social Media Disorder Scale (Boer et al., 2022; Van den Eijnden et al., 2016) measured PSMU in nine dichotomous (yes/no) items ($\alpha = 0.89$). The scale describes addiction-like symptoms: preoccupation with social media, dissatisfaction about a lack of time for its use, feeling bad when not using it, trying but failing to spend less time

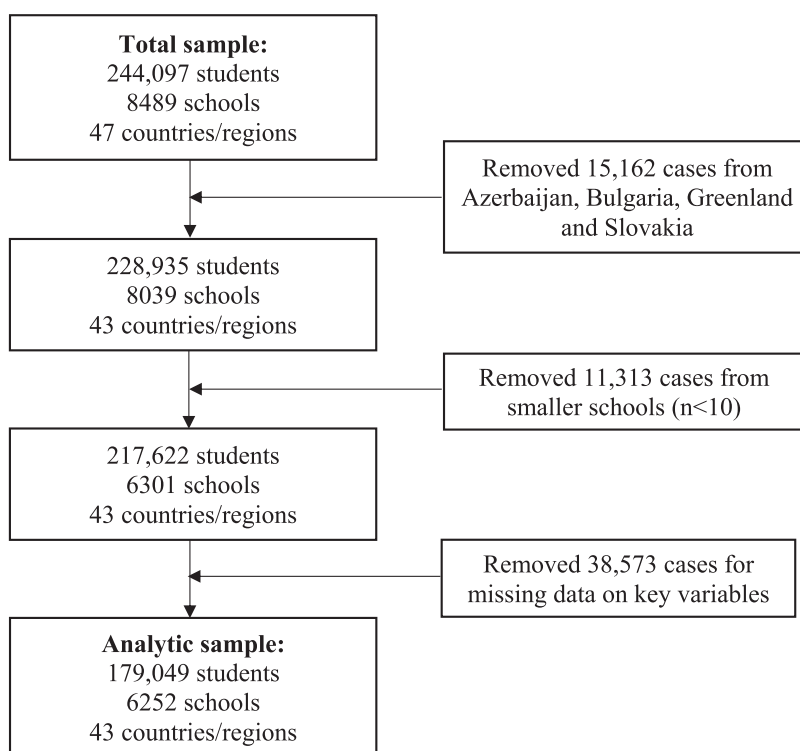


Figure 1. Flow chart describing the composition of the sample.

using it, neglecting other duties to use social media, regular arguments over social media, lying to parents or friends about its use, using social media to escape from negative feelings, and having a severe conflict with family over social media use. Endorsement of six or more items indicates PSMU, in line with results from the last cross-national validation of the scale suggesting that such threshold is robust for the operationalization of PSMU (see Boer et al., 2022 for more details on the properties of the scale and sensitivity analysis defining PSMU as reporting five or seven symptoms). The scale showed good validity and reliability across countries (Boer et al., 2022).

Absolute and relative deprivation

Individual scores for absolute deprivation (AD) were calculated using a six-item index of material assets in the home or family activities (Currie et al., 2008): number of cars, vans or trucks (none, one or two or more), having own bedroom (no or yes), number of bathrooms (none, one, two or more than two), dishwasher (no or yes), computers (none, one, two, more than two), and family vacations out of the country in the past year (none, once, twice, more than twice). A summary score of these items represents a 13-point index of material family affluence (Currie et al., 2008). AD was calculated by reverse scoring family affluence and scaling the distribution to a 1-point range from 0 (lowest) to 1 (highest).

Relative deprivation (RD) was derived by applying family affluence scores and school reference groups to the Yitzhaki index (Subramanyam et al., 2009; Yitzhaki, 1979). This

index represents the average shortfall in affluence between the individual and all better-off schoolmates. Specifically, the formula estimated the average difference in affluence between the individual (i) and all N schoolmates with higher scores (j): $RD_i = 1/N \sum (y_j - y_i), \forall y_j > y_i$. The resulting score was divided by the average family affluence score of the school to give RD a 1-point range from 0 (lowest) to 1 (highest).

School deprivation and wealth inequality

We estimated school-level deprivation by calculating the weighted AD scores of its students. Then, school-level wealth inequality was estimated using the same 6-item index of material family assets described above and Gini index of inequality using the *fastgini* command in Stata/SE v16.1 (College Station, TX). The Gini index represents a deviation from perfect equality and has a theoretical 1-point range, where 0 represents perfect equality (everyone has equal wealth) and 1 represents perfect inequality (one person has all the wealth).

Country wealth and income inequality

We controlled differences in country wealth using data on national gross domestic product per capita, measured in thousands of international dollars in 2018 (World Bank, 2021). Data on country income inequality (post-taxation Gini index in 2018) were provided by the Standardized World Income Inequality Database (Solt, 2019). Like school wealth inequality, national income inequality has a theoretical range of 0 (perfect equality) to 1 (perfect inequality).

Social support

Family and peer social support were measured by two of the three subscales of the Multi-dimensional Scale of Perceived Social Support (Zimet et al., 1988). Four items measured friend support (degree of help from friends, ability to count on them when things go wrong, ability to share both happy and sad feelings, and ability to talk about problems; $\alpha = 0.92$). Four items measured family support (degree of help from family, availability of emotional help and support, ability to talk about problems, and willingness to help make decisions; $\alpha = 0.94$). The response options for these items ranged from 1 (very strongly disagree) to 7 (very strongly agree). The score for each subscale was the average of each item set to construct 7-point indices, ranging from 1 (low support) to 7 (high support). The scales were validated in a wide range of samples from adolescents (e.g., Bruwer et al., 2008; Cheng & Chan, 2004).

Control variables

AD, gender, and age group were included as control variables at the individual level. In addition, we controlled for Preference for Online Social Interactions (POSI) by calculating the average score of three items ($\alpha = 0.83$) that describe the extent to which an adolescent prefer online social interaction over offline communication to self-disclose private information (Caplan, 2010; Peter & Valkenburg, 2006), for example, 'On the internet, I talk more easily about secrets/inner feelings/concerns than in a face-to-face encounter' (responses ranging from 1 = strongly disagree to 5 = strongly agree). POSI was selected as a plausible control variable because it is considered to increase risk for engaging in problematic online behaviors, including PSMU (Caplan, 2010; Fioravanti et al., 2013, 2020; Marino et al., 2020). The international dataset and the research protocol

(with the full list of items composing the measures employed in the study) are available, upon request, at: <http://www.hbsc.org/>

To control country differences in access to social media, we controlled for the percentage of the national population (0–100) that uses the Internet, based on data from the International Telecommunication Union's (2020) World Telecommunication/ICT Indicators Database.

Data analysis

Descriptive statistics are weighted and incorporate standard errors adjusted for school-level and country-level clustering in the data. We did not impute missing data given potentially nonrandom exclusions of countries and schools (see Figure 1) and individuals who did not have data on AD (3.7%), RD (3.7%), peer support (3.3%) and family support (5.8%). A complete case analysis on 179,049 cases located in 6262 schools and 43 countries and regions tested associations with PSMU using 3-level bivariate and multiple logistic regression, reported as odds ratios (ORs). These models included our three main variables of interest (RD, school wealth inequality, and country wealth inequality) and controls for AD, school deprivation, country wealth, gender, age, POSI, and percent of Internet users at the country level. Moderation by peer support and family support were tested by adding interactions to this model. In addition, we used *margins* and *marginsplot* in Stata to graphically show moderated associations with PSMU.¹

Results

Descriptive statistics are shown in Table 1. The weighted prevalence of PSMU in the sample was 7.2%. The sample was evenly distributed between gender and age groups.

Table 1. Descriptive statistics on key variables.

	<i>n</i>	%
<i>Individual level (n = 179,049)</i>		
Gender		
Male	85,311	47.65
Female	93,738	52.35
Age group		
11 years	54,848	30.69
13 years	64,218	35.45
15 years	59,983	33.86
Problematic SMU	12,867	7.18
	Mean	SD
AD	0.49	0.28
RD	0.16	0.15
POSI	2.33	1.19
Peer support	5.34	1.72
Family support	5.70	1.71
<i>School level (n = 6252)</i>		
School deprivation	0.51	0.12
School wealth inequality	0.13	0.05
<i>Country level (n = 43)</i>		
Country wealth, GDP pc \$000s	44.53	25.40
Income inequality, Gini index	0.32	0.04
Internet users, % of population	82.62	9.94

AD = absolute deprivation, RD = relative deprivation; POSI = preference for online social interaction; SMU = social media use; GDP pc = gross domestic product per capita reported in thousands of international dollars (2018).

Table 2. Logistic regression of problematic social media use in adolescents ($n = 179,049$).

Variable	Model 1: bivariate associations		Model 2: mutually adjusted		Model 3: mutually adjusted with interactions	
	Odds ratio	(95% CI)	Odds ratio	(95% CI)	Odds ratio	(95% CI)
Gender						
Male	1.00		1.00		1.00	
Female	1.26**	(1.21–1.31)	1.28***	(1.23–1.33)	1.28***	(1.23–1.33)
Age group						
11 years	1.00		1.00		1.00	
13 years	1.63***	(1.55–1.71)	1.30***	(1.24–1.37)	1.30***	(1.24–1.37)
15 years	1.74***	(1.65–1.83)	1.28***	(1.22–1.35)	1.28***	(1.22–1.35)
POSI	1.64**	(1.61–1.66)	1.58***	(1.55–1.60)	1.58***	(1.55–1.60)
AD	0.97*	(0.91–1.04)	0.50***	(0.41–0.61)	0.50***	(0.41–0.62)
RD	0.94	(0.83–1.07)	2.52***	(1.75–3.63)	3.22***	(2.10–4.94)
Family support	0.81**	(0.80–0.82)	0.99*	(0.98–1.00)	0.98	(0.90–1.06)
Peer support	0.93**	(0.93–0.94)	0.85***	(0.84–0.86)	0.90*	(0.83–0.98)
School deprivation	2.02**	(1.65–2.48)	3.08***	(2.17–4.37)	3.07***	(2.17–4.35)
School wealth inequality (WI)	14.78**	(6.80–32.12)	3.23*	(1.18–8.84)	3.34	(0.87–12.77)
Country wealth	1.00	(0.99–1.00)	1.01	(1.00–1.01)	1.01	(1.00–1.01)
Country income inequality (II)	18.09	(0.94–347.42)	16.40	(0.68–395.42)	21.99	(0.81–597.18)
Internet users, % of pop.	0.48	(0.14–1.70)	0.21	(0.03–1.53)	0.20	(0.03–1.51)
<i>Interactions</i>						
RD * Peer support					0.93*	(0.87–1.00)
RD * Family support					0.99	(0.92–1.06)
WI * Peer support					0.85	(0.67–1.07)
WI * Family support					1.18	(0.93–1.49)
II * Peer support					1.16	(0.90–1.49)
II * Family support					0.77*	(0.60–0.99)
<i>Random components</i>						
Country variance	0.18 [†]		1.19		1.19	
School variance	0.22 [†]		1.14		1.14	
<i>Goodness-of-fit</i>						
AIC	90580.44 [†]		84984.43		84984.87	
BIC	90610.73 [†]		85145.96		85206.96	
Log-likelihoodLR test (vs. intercept only)	LR45287.22		–42476.225622.01**		–42470.435633.58**11.57	
test (vs. mutually adjusted)						

* $p < 0.05$. ** $p < 0.01$. [†]Calculated on intercept-only model.

As shown in the unadjusted bivariate associations reported in Table 2, PSMU was positively associated with female gender (OR = 1.26, 95% CI 1.21–1.31), older age groups and POSI (OR = 1.64, 95% CI 1.61–1.66). Family and peer support were both negatively

related to PSMU, whereas school deprivation and school wealth inequality were positively related. Neither AD, RD, country wealth, nor country income inequality were associated with PSMU. However, in a mutually controlled regression (model 2), AD was negatively related (OR = 0.50, 95% CI 0.41–0.61) whilst RD was positively related to PSMU (OR = 2.52, 95% CI 1.75–3.63). Following Chen et al. (2010), this represents an association of medium strength, also considering the relatively narrow CIs. The positive associations with school deprivation and school wealth inequality also held to these additional controls. Country wealth and income inequality were not directly related to PSMU.

The inclusion of interactions in the model revealed two significant moderators (model 3). First, the association of PSMU with individual RD was moderated by peer support (OR = 0.93, 95% CI 0.87–1.00). As shown in Figure 2, the association was slightly stronger in adolescents who reported less peer support (1 SD below the mean) compared to adolescents who reported more peer support (1 SD above the mean), partially confirming H4. In line with H1, the main effect of RD was still significant at the average level of peer support. However, the strength of the association depended on peer support. The association between school wealth inequality and PSMU, instead, was not significant anymore (not supporting H2).

Second, the association of PSMU with country income inequality was moderated by family support (OR = 0.77, 95% CI = 0.60–0.99). As shown in Figure 3, although there was no main effect of income inequality (thus not confirming H3), its association with PSMU was significantly stronger for adolescents who reported lower family support (1 SD below the mean) compared to adolescents who reported higher family support (1 SD above the mean); these findings partially support H4. A caveat to note about both interactions is that although they are each statistically significant, they did not improve the model's overall fit to the data, as determined by a log-likelihood test ($\chi^2 = 11.57$, $p = 0.07$; Table 2). Moreover, it should be noted that the two interactions have a very small

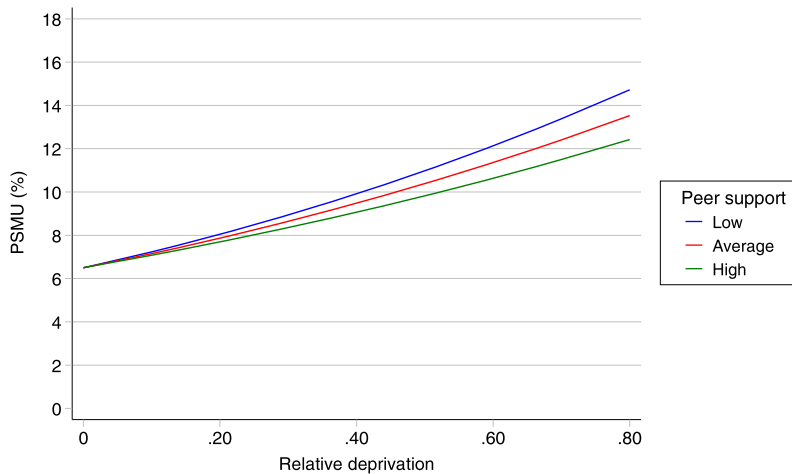


Figure 2. Moderated association of individual relative deprivation (Yitzhaki index) and predicted probability of PSMU at low and high (mean \pm 1 SD) peer support.

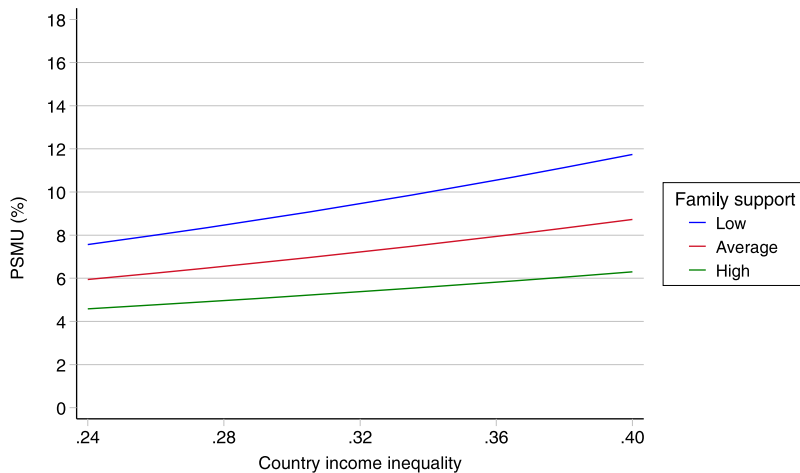


Figure 3. Moderated association of country income inequality (Gini index) and predicted probability of PSMU at low and high (mean \pm 1 SD) family support.

effect size, especially if we consider that the CIs are relatively large and close to 1. Thus, these findings should be interpreted with caution.

Discussion

This study aimed to investigate the associations between socio-economic inequalities, measured at individual, school and country level, and adolescent PSMU. More specifically, the associations with individual RD assessed against schoolmates, school-level wealth inequality, and country-level income inequality were examined in a large cross-national sample of adolescents. In addition, we evaluated the role of peer and family support as moderators of these associations. With differences in AD, school deprivation and country wealth all controlled simultaneously, findings showed that relatively more deprived adolescents than their schoolmates and attending more economically unequal schools were more likely to report PSMU. The association with school wealth inequality was stronger in youths with lower peer support. Furthermore, the association between country income inequality and PSMU was also found in adolescents reporting low levels of family support. Altogether, these findings indicate the potentially harmful influences of inequality at the individual, school and country level on adolescents' problematic social media use.

These results highlight a possible pathway through which economic inequality impacts adolescent PSMU. Adolescents occupying lower socio-economic positions than their classmates might be at greater risk of engaging in PSMU due to amplified social comparisons upward (Cheung & Lucas, 2016) and increased status preoccupation, resulting in increased status anxiety and feelings of inferiority. The problematic use of social media may represent a means to attenuate the negative consequences of being relatively deprived by venting negative emotions or escaping from negative feelings through online activities. In this vein, engaging in PSMU may represent an additional negative consequence of disadvantageous comparisons with wealthier classmates (Elgar et al.,

2018). A similar mechanism might explain the positive association between contextual-level school inequalities and adolescent PSMU. In schools characterized by wide disparities in wealth between students, many adolescents have the opportunity to compare status-related features with wealthier classmates, thus being more at risk of using social media to be distracted from or escape negative feelings. This strategy to confront negative emotions might lead to unregulated use of social media, which is a crucial component of PSMU. It is noteworthy that our analysis had controlled for a preference to use online social media, and therefore the effects of inequality appear to be specific to its pathological or problematic use.

The findings can also be interpreted in light of specific processes that make social media a salient context for experiencing social comparisons. One of the most popular aspects of social media is interactive visual tools that allow users to create, modify and share images or videos (Haferkamp et al., 2012). The potential to share visual images is attractive, especially for adolescents, who tend to engage in appearance-based social comparisons (de Vries et al., 2016). For this reason, social media platforms are used not only to cultivate and project a profile driven by physical appearances but also to evaluate one's socio-economic status via shared images and videos. These platforms exchange salient messages about status and power that resonate especially strongly for adolescents who are relatively more deprived than their classmates or attend highly unequal schools. Indeed, these adolescents possibly are more motivated to use social media as a tool for social comparison to find more advantageous comparisons or inspiring role models. Moreover, adolescents who are exposed to more extreme inequalities at school might have a greater tendency to seek peer approval and use social media to gather self-relevant information through feedback and reflected reappraisal (Borelli & Prinstein, 2006; Butzer & Kuiper, 2006), thus increasing the risk of PSMU.

Another mechanism that can explain the associations of RD and wealth inequality with PSMU is the possibility of shaping one's image on social media. Adolescents who have relatively lower socio-economic positions than their classmates or attend schools characterized by significant inequalities might use social media as a tool to manage a pre-occupation with status by engaging in selective self-presentation on social networks. The possibility to select and modify the content to be shared online, which allows displaying an enhanced version of their identities and lives (Brown & Tiggemann, 2016; Cohen et al., 2017; Kim & Chock, 2015; Nesi et al., 2018; Subrahmanyam & Šmahel, 2011), could be one of the processes underlying the associations with PSMU.

In line with previous studies (e.g., Elgar et al., 2018), our findings also suggest that peer support offers some protection from the negative consequences of relative deprivation. It is possible that youths perceiving their peers as more supportive are less worried about their status, thus reducing the harms of relative deprivation. Adolescents with a supportive network of friends might have a greater tendency to value relational goals (i.e., goals aimed at nurturing social relationships) more highly than instrumental goals (i.e., goals aimed at obtaining resource control and power; Arsenio et al., 2009) and be less sensitive to hierarchies that are based on socio-economic status. Conversely, the risk of engaging in PSMU due to relative deprivation was significantly greater among socially isolated adolescents who lacked a supportive network of peers. However, the small effect sizes of these interaction require a very cautious interpretation and confirmation in future research.

Contrary to our hypotheses, country-level income inequality was not directly linked with adolescents' PSMU. Interestingly, an association was found but only in youth who reported low levels of family support. This result differs from previous studies that showed the detrimental effects of socio-economic inequalities on a wide range of adolescent health indicators (e.g., Elgar et al., 2015; Odgers, 2015; Pickett & Wilkinson, 2015). Although PSMU does not appear more prevalent in highly unequal countries, it may be more prevalent in adolescents who lack the support of family members. The absence of family support, which has well-known negative consequences on adolescents' self-worth and self-esteem (e.g., Yeung et al., 2016), appears to interact with country-level inequalities and increase the likelihood of PSMU. However, the strength of this interaction was very small and needs to be interpreted with caution. Another possibility is that inequality affects adolescent PSMU primarily when it is experienced in more proximal settings, such as school contexts where differences in status and socio-economic circumstances might be more salient. However, further studies are needed to confirm these findings.

Strengths and limitations

The study has some limitations that need to be highlighted. First, the cross-sectional design of the study hampers the possibility to draw causal conclusions about the association between inequalities and PSMU. Second, the representative samples of adolescents were drawn mainly from European countries. Further research that replicates these results in other cultural and economic continents would be beneficial. For example, the non-significant association between PSMU and the country percentage of Internet users might be due to the relative homogeneity of Internet access in European countries, which might not be the case in most regions of the Global South (Statista, 2021). Third, the assessment of the main variables in our analysis relied on self-report indices that may be not accurate and provide potentially under- or overestimated scores. Moreover, the operationalization of PSMU is limited to the definition of reporting six or more addiction-like symptoms, possibly leading to diagnostic inflation of a normative behavior, such as social media use. For this reason, more studies are needed in order to ascertain the nature of PSMU. Fourth, the underlying mechanism linking multiple levels of inequalities to PSMU were inferred in accordance with the literature in the field and despite gaps in our data. The HBSC 2017/18 survey did not include measures of explicit social comparison and self-presentation processes or actual social media frequency of use and types of specific social media activities (e.g., video/photo editing, posting, the content of photos and videos, reaction-seeking strategies, etc.). Therefore, this limitation prevented us from operationalising the relevant mechanisms and testing a comprehensive model of adolescent PSMU. Lastly, the current study used the data of the HBSC 2017/18 survey, meaning that few years have passed from data collection to the present work. Despite the rapid and constant evolving of social media use, this study captured typical adolescent behaviors assessed by well-established measures. However, such behaviors and relative underlying mechanisms may have been changing over time due to the COVID-19 pandemic. Indeed, although studies indicated that Internet use, including social media, generally increased in 2020 due to home confinement (e.g., Wiederhold, 2020), it is still not clear whether the prevalence of PSMU permanently increased or

not. Indeed, social media use was also proved to be a constructive coping strategy for adolescents to deal with negative feelings during the COVID-19 quarantine (e.g., Cauberghe et al., 2021). Therefore, results of the present study should be replicated using the next HBSC 2022/23 data, specifically looking at trends on the variables of interest and possible changes in adolescent lifestyle.

Notwithstanding these limitations, this is the first study to investigate the association between multiple-level socio-economic inequalities and adolescent PSMU from a cross-national perspective. Overall, our findings underline the potential detrimental influences of growing up in highly unequal settings on adolescents' PSMU, above and beyond differences in individual absolute and school deprivation, as well as the protective role of social support from family and peers. Moreover, socio-economic hierarchies in the school context appeared to be especially influential on the likelihood of engaging in PSMU.

Policy implications

Despite having no formal recognition as a behavioral addiction by the American Psychiatric Association's Diagnostic and Statistical Manual of Mental Disorders (DSM-5; APA 2013) or by the International Classification of Diseases 11th Revision (ICD-11; WHO, 2018), PSMU is recognized as a potential health issue, primarily for youths. The findings of the current study suggest that policymakers should develop actions to reduce inequalities at country and school levels to limit maladaptive patterns of social media use by adolescents. As the digital divide continues to close in many countries (Haight et al., 2014), economic inequalities persist and remain a robust social determinant of adolescent health and well-being. In this context, schools represent an ideal setting to foster safe and pro-social online behaviors. Previous studies (Throuvala et al., 2019; Vondráčková & Gabrhelík, 2016) indicated that preventive strategies and school-based interventions are effective in reducing the potential harms of social media platforms.

These results will inform practitioners in the field of adolescents' technology use about the social determinants of PSMU. For example, school-based prevention efforts might target: (i) objective and perceived social class differences among schoolmates, which could have far-reaching positive effects on well-being beyond social media use; (ii) increasing peer support, which we found as a protective factor in the relationship between RD and PSMU; and (iii) using social and emotional learning curricula (SEL; Durlak et al., 2011; Marino et al., 2020) to help reduce PMSU in children and adolescents.

Note

1. Analyses syntaxes are available on the Open Science Framework (OSF) at https://osf.io/t3ha8/?view_only=1af8de7cb9d542b2935d87a74ffe769b.

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Data availability statement

Data are available upon request at: <https://www.uib.no/en/hbscdata>.

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