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(working title)

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) is scant and mostly focused on proximal contexts and interpersonal relationships. This study examined the association between country- and school-level inequality (school relative deprivation and school wealth inequality) and PSMU in adolescence. In addition, the moderating role of family and peer support in these associations was evaluated. We used data from the 2017/18 Health Behaviour in School-aged Children (HBSC) study. The sample included 188,354 adolescents aged 11-, 13- and 15-year olds coming from 44 countries and sub regions of Belgium (French and Flanders) and the United Kingdom (England, Scotland, and Wales). Associations between inequality and PSMU were tested using multilevel logistic regression analyses, controlling for absolute deprivation, school deprivation, country wealth, gender, age, preference for online social interactions, and percent of internet users at the country level. Results showed that adolescents who were more relatively deprived than their schoolmates and who attended more economically unequal schools had a higher likelihood to report PSMU. The association between school wealth inequality and PSMU was stronger for adolescents with low 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 well-being, by showing the role of inequalities in the engagement in PSMU.

Keywords

Adolescence; social media use; inequality; relative deprivation; social support

Introduction

Social media use, referring to social network sites (SNS), such as Instagram, and instant messaging applications (IM), such as WhatsApp, has become part of daily life for many adolescents and young adults (Pew Research Center, 2016; Smahel et al., 2020). A 2020 survey among adolescents aged 9 to 17 in 19 European countries found that 54% use social media daily or more often 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 to 17 own a smartphone (Anderson & Jiang, 2018) and 90% regularly use one or more social media sites (Lenhard, 2015). The use of social media has been found to both represent a risk and a benefit to adolescents' well-being (Seabrook, Kern, & Rickard, 2016). For instance, social media can support adolescents' adjustment through facilitating off-line social relationships with friends (Boniel-Nissim et al., 2015), and offering entertainment and promoting civic engagement (Lenzi et al., 2015). In contrast, social media has also been suggested to have a negative impact upon life satisfaction (Kelly et al., 2018; Twenge et al., 2018).

When investigating social media use, a distinction between the intensity of social media use and problematic social media use (PSMU) is warranted. Although both concepts are correlated (Frost & Rickwood, 2017; Parry et al., 2020), PSMU, but not the intensity of social media use, may be detrimental to adolescents' wellbeing (Primack et al., 2017; Van den Eijnden et al., 2018). More specifically, PSMU has been 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 & Tiggerman, 2016), and negative mood (Abi-Jaoude, Naylor, & Pignatiello, 2020; Fardouly et al., 2014). Despite not being recognized as a behavioral addiction, PSMU can be briefly defined as the unregulated use of social media characterized by addiction-like symptoms (i.e. salience, mood modification, tolerance, withdrawal, conflict, relapse, deception, displacement, and conflict)

and causing impairments in daily life, for example in terms of problems in school and social functioning (Andreassen & Pallesen, 2014; Van den Eijnden et al., 2016; 2018).

Research on the social determinants of PSMU is scant. Some studies have identified antecedents of PSMU in adolescence, focusing on individual characteristics such as personality traits, motivations and metacognition (Bright et al., 2015; Casale et al., 2018; Marino et al., 2018). Studies on the contextual correlates of PSMU mostly examined proximal contexts and interpersonal relationships, such as parental conflict (Wang et al., 2021), attachment (Assunção, Costa, Tagliabue, & Mena Matos, 2017), and peer influence (Marino et al., 2020). However, as Boer et al. (2020) revealed large variations in country prevalence of PSMU, contextual antecedents on the more distal context – in this case the country level – can be expected as well. Particularly, considering that social comparison processes are vital to social media (e.g., Nesi & Prinstein, 2015), the likelihood of adolescents developing PSMU may be particularly high in contexts that arouse such processes, such as contexts in which social inequalities are relatively prevalent. Therefore, this study investigates the association between country-level income inequality, school relative deprivation, school wealth inequality and adolescent PMSU.

Country- and school-level socioeconomic inequalities and adolescent PSMU

Although empirical evidence on the association between country- and school-level socioeconomic inequalities and adolescent PSMU are extremely scarce, there are several theoretical reasons to expect such an association. According to Wilkinson and Pickett (2009, 2019), in contexts in which socioeconomic inequalities are sizeable, socioeconomic status has the potential to become very salient and (unfavorable) social comparisons are amplified; thus, in more socioeconomic unequal contexts, adolescents have a higher likelihood of making unfavorable social comparisons and experiencing feelings of shame and inferiority (Cabieses

et al.,2016). In addition, strongly unequal environments, by intensifying differences between individuals at many levels (e.g., lifestyle, cultural values etc.), can weaken trust and social capital and discourage cooperation (Nishi et al., 2015; Oishi et al., 2011). The increased relevance of social status and the weakening of social relationships represent two of the main processes explaining the higher rates of health and social problems characterizing these contexts (Wilkinson & Pickett, 2009, 2019), where adolescent PSMU might be also relatively prevalent. In these circumstances, adolescents may especially be in need of and have the tendency to use social media to a problematic level because it provides a setting to display and compare appearance, behavior, interests, status and social circumstances, often resulting in feedback from others in the network (Saunders & Eaton, 2018; Uhlmann et al., 2018). This might be a strategy to find different reference groups to compare with or search for role models who can serve as an inspiration. In addition, social media visual interactive tools allowing to modify and share pictures/videos of daily life give an opportunity for strategic self-presentation, shaping the way we present ourselves and our life (Ellison et al., 2006; McCrory et al., 2020). The strong concerns with status encouraged by a pronounced hierarchy might 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; Kim & Park, 2016).

Research investigating this theoretical notion is extremely scarce or even absent. However, more generally, accumulating evidence has shown that in more socioeconomic unequal societies, adolescents report worse physical and mental health (Elgar et al., 2015; Napoletano et al., 2016; Odgers, 2015; Pickett & Wilkinson, 2015). 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 was linked to risk behaviors such as bullying

(Elgar et al., 2009), physical assaults (Pabayo et al., 2014) and alcohol misuse (Elgar et al., 2005).

Despite the importance of research analyzing the impact of country-level inequality, characteristics of the social hierarchy in more proximal environment might be even more relevant for adolescent well-being. In the school context, adolescents have many opportunities to directly compare themselves with their classmates on income-related aspects of their lives. School-level inequality can be investigated both at an individual and contextual level. While contextual inequality describes variation of incomes within a school, relative deprivation (RD) represents an individual indicator of inequality which measures individual's income or resources compared with a reference group (Adjaye-Gbewonyo & Kawachi, 2012); within the school context, it can be defined as a shortfall in affluence relative to classmates. The prevailing explanation of the association between school-level inequality and adolescents' well-being (measured both at the individual and contextual level) is that, similarly to what happens at the national level, inequality creates stark contrasts of social class, resulting in increased class anxiety, reduced social trust and intensified upward social comparisons (Cheung & Lucas, 2016). Thus, higher levels of school wealth inequality might have a detrimental impact on well-being besides relative deprivation. At the individual level, students who are more relatively deprived might have increased opportunities of unfavorable social comparisons within the school context, leading to negative self-evaluations and lower levels of well-being. Indeed, school relative deprivation (RD) has been positively associated with victimization (physical, relational, and cyberbullying) and perpetration (relational and cyberbullying; Napoletano et al., 2016). In another study, school RD was related to unhealthy eating habits (skipping breakfasts, fewer healthful food choices) and less physical activity (Boen et al., 2020; Elgar et al.,2017

Moreover, recent evidence indicated that several characteristics at the school level are associated with concepts similar to PSMU. Liu and colleagues (2021) found that adolescents

perceiving a positive school climate were less likely to experience psychological insecurity and negative peer affiliation thus decreasing the risk of problematic Internet use. Similarly, Zhai and colleagues (2020) showed that adolescents perceiving more negative school environment may experience negative emotions, which, in turn, are regulated via "compensatory Internet use", that is the engagement in different online activities (gaming, social media etc.). Thus, it can be expected that adolescents attending schools with high level of inequality and experiencing high levels of relative deprivation have a higher likelihood of PSMU.

The moderating role of family and friends' support on PSMU

Social support is a strong protective factor against adolescent risk behaviors and psychological distress. Perceiving social support from parents and friends was shown to have a negative association with PSMU (Boer et al., 2020; Lin et al, 2021) and to reduce vulnerability in the occurrence of inequality and relative deprivation (e.g., Elgar et al., 2018; Nepomnyaschy, Miller, Waller, Emory, & Dwyer, 2020). Perceiving social support might also moderate the influence of inequality on adolescent PSMU. Indeed, the lack of social support might exacerbate the impact of country- and school-level inequality on adolescent PSMU.

This study

Considered the variety of detrimental effects that PSMU can have on adolescents' well-being (Schønning et al., 2020), it is very important to identify its antecedents. To date, studies were mostly focused on identifying individual factors, proximal contexts and interpersonal relationships linked to social media use (Bright et al., 2015; Casale et al., 2018; Marino et al., 2018; Wang et al., 2021; Assunção et al., 2017). To our knowledge, no study has investigated the role of inequality at multiple levels in a cross-national perspective. Therefore, the aim of

the current study is to evaluate the associations between country-level income inequality, school relative deprivation and school wealth inequality and PSMU, as well as the moderating role of family and friends' support in a sample of adolescents coming from 44 countries. We expect a positive association between inequality, measured at the country- and school-level, and adolescent PSMU. Moreover, we hypothesize that the association between inequality and PSMU is weaker when adolescents report higher levels of perceived family and friend support.

Material and Methods

Sample

We used data from the Health Behaviour in School-aged Children (HBSC) study, an international World Health Organization collaborative cross-sectional study that is carried out every 4 years in a growing network of countries and regions in Europe and Canada (Inchley et al., 2016). Its 2017/18 survey involved representative samples of 11-, 13-, and 15-year-olds in 47 countries and regions. This analysis used data from 44 countries and sub regions of Belgium (French and Flanders) and the United Kingdom (England, Scotland, and Wales) that included a measure of problematic social media use in their questionnaires. We removed XXX (XX%) cases whose schools had fewer than 10 students in the dataset given our interest in school-level deprivation and inequality, resulting in an analytic sample of 188,354 individuals in 6,454 schools.

Two-stage sampling involved the selection of schools and then classes to reflect regional variations within each country. Some countries oversampled subpopulations by geography and ethnicity, and standardized weights were created to ensure representativeness. Standardised 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 voluntarily after passive or active consent from school administrators, parents, and children (in accordance with the requirements in the different countries). Ethical clearance or equivalent approval to conduct the study was granted in each country.

Measures

Problematic Social Media Use. The Social Media Disorder Scale (Boer et al., 2021) 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 using it, neglecting other duties in order to use SMU, regular arguments over SMU, lying to parents or friends about its use, using SMU to escape from negative feelings, and having a serious conflict with family over SMU. Endorsement of six or more items indicates problematic levels of SMU (Boer at el., 2021; Van den Eijnden et al., 2016).

School Relative Deprivation. Individual scores for relative deprivation were calculated using data on family affluence. Family affluence was measured using a six-items 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. Absolute deprivation (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 and school reference groups to the Yitzhaki index (Yitzhaki, 1979; Subramanyam et al., 2009). This index represents the average shortfall in affluence between the individual and all better schoolmates in the reference group. 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).

We estimated school-level deprivation by calculating the weighted AD scores of its students.

School-level wealth inequality. School-level wealth inequality was estimated using the Gini index of inequality in family affluence using the *fastgini* command in Stata/SE v16.1 (College Station, TX). The Gini index represents 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-level income inequality. National income inequality was measured in post-taxation income inequality (Gini index) in 2018 Standardised World Income Inequality Database (Solt, 2019).

Social support was measured by two of the three subscales of the Multidimensional Scale of Perceived Social Support (Zimet et al., 1990). Four items measured peer support (four items describing the 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 (four items describing the degree of help from family,

availability of emotional help and support, ability to talk about problems, and willingness to help make decisions; α = 0.94).

Control variables

At the individual level, family affluence, gender and age were included as control variables. In addition, we controlled for *Preference for Online Social Interactions* (POSI), measured by three items (α = 0.83) that describe the extent to which an adolescent prefer online social interaction over offline communication in order to self-disclose intimate information (Caplan, 2010; Peter & Valkenburg, 2006): "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 specifically selected as a plausible control variable because it is commonly considered one of the features putting people at greater risk to engage in problematic online behaviors, including PSMU (Caplan, 2010; Fioravanti et al., 2013; Fioravanti et al., 2020; Marino et al., 2020).

At the country level, we included data on national gross domestic product per capita, as measured in thousands of international dollars in 2018 (World Bank, 2021). Finally, to control country differences in access to social media, we controlled for the percentage of the national population that use the internet using data from the International Telecommunication Union's (2020) World Telecommunication/ICT Indicators Database.

Data Analysis

Descriptive statistics are weighted and incorporated standard errors that adjusted for school-level and country-level clustering in the data. Associations with PSMU were tested using 3-level bivariate and multiple logistic regression and reported as odds ratios. These models

included our three main variables of interest (relative deprivation, school wealth inequality, and country wealth inequality) and controls for absolute deprivation, school deprivation, country wealth, gender, age, POSI, and percent of internet users at the country level. Effect modification by friend support and family support were tested by adding interactions to this model. We also used *margins* and *marginsplot* in Stata to graphically show unmoderated and moderated associations with PSMU.

Results

Descriptive statistics about the sample are shown in Table 1. The weighted prevalence of PSMU in our sample was 7.45%. The sample was evenly distributed between gender groups and the average age was 13.6 years. As shown in Table 2, PSMU was more common in females than males and in older adolescents and was positively associated with POSI. Family and friend support were both negatively related to PSMU whereas school deprivation and school wealth inequality positively related. In crude bivariate regressions (model 1), neither absolute nor relative deprivation was associated with PSMU, however in a mutually controlled regression (model 2), absolute deprivation negatively related (odds ratio = 0.43, $p < 0.001$) whilst relative deprivation was positively related (odds ratio = 1.68, $p = 0.003$). The positive association with school wealth inequality also held to these additional controls. Country income inequality was not related to PSMU. Figure 1 shows the adjusted predicted prevalence of PSMU in relation to relative deprivation and school wealth inequality, which were significant, and country income inequality which was not significant.

The inclusion of interactions to the model revealed two significant moderators. First, the association with relative deprivation was moderated by friend support. The association was stronger in adolescents who reported less friend support (1 SD below the mean, Figure 2).

Second, there was a positive association between country income inequality in adolescents who reported less family support (Figure 2).

Discussion

The aim of this study was to investigate the associations between socioeconomic inequalities, measured at the school and country level, and adolescents' PSMU. More specifically, the association between school relative deprivation, school wealth inequality and country-level income inequality and PSMU was explored in a cross-national sample of adolescents. In addition, we evaluated the role of peer and family support as moderators in these associations. Our findings showed that, with differences in absolute deprivation and school deprivation controlled, adolescents relatively more deprived than their schoolmates and those attending more economically unequal schools were more likely to report PSMU. The association between school wealth inequality and PSMU was stronger for adolescents reporting low levels of peer support. A similar effect of country income inequality was found, but only in adolescent who reported low family support. Together these findings indicate the potentially negative influences of inequality and relative deprivation on adolescents' PSMU.

Adolescents occupying lower socioeconomic positions compared to their classmates might be at greater risk of engaging in PSMU due to amplified upward social comparisons (Cheung & Lucas, 2016) and increased status preoccupation, resulting in status anxiety and feelings of inferiority. The use of social media may represent a mean to attenuate the negative consequences of being relatively deprived, by venting negative emotions or escaping from negative feelings thanks to online activities. In this vein, adolescent 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 high levels of inequalities, 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 with negative emotions might lead to an unregulated use of social media, which is a crucial feature of PSMU.

These associations might also be interpreted in light of more specific processes making social media a critical context for experiencing different social comparisons. One of the most popular aspect of social media is represented by visual interactive tools allowing to create, modify and share images or videos (Haferkamp, Eimler, Papadakis, & Kruck, 2012). The possibility to share visual images is very engaging, especially for adolescents, who have a strong tendency to be involved in appearance-based social comparison (de Vries, Peter, de Graaf, & Nikken, 2016). For this reason, these platforms are often used as a place to compare physical appearance, but also lifestyle and socioeconomic status (as they can be inferred from shared images and videos) with other people, especially by adolescents who are relatively more deprived compared to their classmates or attend highly unequal schools. Indeed, these adolescents might be more motivated to use social media as a tool for social comparison, in order to find more advantageous comparisons or inspiring role models. Moreover, adolescents who are exposed to high levels of inequalities at school (both at an individual and contextual-level) 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). Another mechanism that might explain the association between school RD and wealth inequality and PSMU has to do with the possibility of shaping one's own image on social media. Adolescents who are relative more deprived than their classmates and attend

schools characterized by strong inequalities might use social media as a tool to deal with their status preoccupation, by engaging in selective self-presentation online. The possibility to select and modify the content to be shared online, which gives the opportunity to display an enhanced version of their identities and lives (Brown & Tiggemann, 2016; Cohen, Newton-John, & Slater, 2017; Kim & Chock, 2015; Kim & Park, 2016; Nesi et al., 2018; Subrahmanyam & Šmahel, 2011), may be one of the processes underlying the higher levels of PSMU in adolescents exposed to pronounced inequalities in schools (both at the individual and contextual-level).

In line with previous studies (Elgar et al., 2018), our findings also show that friends' support seems to protect adolescents' from the negative consequences of relative deprivation: youths perceiving their friends as more supportive might be less worried about their status, thus reducing the harms of relative deprivation. Also, 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, Adams, & Gold, 2009) and be less sensitive to hierarchies that are based on socioeconomic status.

Contrary to our hypotheses, country-level income inequalities were not associated with adolescents' PSMU. Differently from studies showing the detrimental effects of socioeconomic inequalities on a wide range of adolescent health indicators (Elgar et al., 2015; Odgers, 2015; Pickett & Wilkinson, 2015), PSMU does not seem to increase in highly unequal countries. It is possible that inequalities are reflected in PSMU only when they are experienced in more proximal settings, such as the school context, where differences in status and socioeconomic circumstances might be more salient. However, future studies are needed in order to confirm

and shed light on these findings. It is worth noting that adolescents living in more unequal countries had a greater likelihood of reporting PSMU when perceiving low family support. The lack 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.

Conclusions

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 mainly refer to European countries and further studies are needed in order to replicate these results in other continents where inequalities may play a different role. As an 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 could not be the case of Asia or Africa (Statista, 2021). Third, the assessment of two key variables (i.e. PSMU and socio-economic status) relies on self-report questionnaires that may be not accurate and provide potentially under- or overestimated scores. Fourth, the underlying mechanism linking multiple levels of inequalities to PSMU can be only hypothesized in accordance with the literature in the field. Indeed, the HBSC protocol did not include measures of explicit social comparison and self-presentation processes nor of actual social media frequency of use and types of specific social media activities (e.g., video/photo editing, posting, content of photos and videos, reaction-seeking strategies, etc.). This limitation precludes the possibility to test a comprehensive model of the potential mechanisms of influence, thus making the results of the present study only suggestive of the potential negative role of inequalities in PSMU.

Notwithstanding these limitations, this is the first study investigating the association between inequalities at multiple levels and adolescent PSMU in a cross-national perspective. Overall, our findings underline the detrimental influences of being exposed to highly unequal settings on adolescents' PSMU, above and beyond differences in individual absolute and school deprivation. The socioeconomic hierarchies characterizing the school context, in particular, appear critical in influencing the likelihood of engaging in PSMU in adolescence.

Policy implications

Despite not officially recognized as a proper 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 has been considered as a potential health issue, especially for youths. Taken together, the results of the current study also suggest that policy makers should develop actions in reducing inequalities at country and school levels, in order to reduce the engagement in maladaptive patterns of social media use for unhealthy reasons. Indeed, whereas the gap in digital divide seems to slowly decrease in some countries, inequalities persist in several areas (e.g., Haight et al., 2014). In this context, schools – and especially unequal schools - might represent a favorable place to develop positive practices for mitigating the effects of inequalities and PSMU, targeting students, peers, parents, and overall school culture. Previous studies (Throuvala et al., 2019; Vondráčková & Gabrhelik, 2016) indicated that preventive strategies and school-based interventions might be important in tackling the negative consequences of problematic Internet uses. The present results might inform practitioners in the field of adolescents' technology use who should take into account the distal antecedents of PSMU, in addition to individual factors. For example, future preventive interventions at school might aim

at: (i) addressing both objective and perceived inequalities among adolescents at school, which can have a wide range of positive effects on well-being beyond social media use; (ii) increasing peer support, which was found as a protective factor in the relationship between relative deprivation and PSMU; and (iii) improving adolescents' social and emotional skills in order to improve the quality of social media use, for example using social and emotional learning (SEL; Durlak et al., 2011; Marino et al., 2020).

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Table 1

Descriptive statistics on key variables.

	n	%
Individual level (n= 188,354)		
Gender		
Male	96,457	47.02
Female	103,966	51.98
Problematic SMU	14,669	7.45
	mean	SD
Age (years)	13.61	13.58
Absolute deprivation	0.38	0.21
Relative deprivation	0.30	0.17
Preference for online comm.	2.30	1.19
Friend support	5.34	1.73
Family support	5.71	1.72
School level (n=6,454)		
School deprivation	0.39	0.14

School wealth inequality	0.13	0.05
Country level (n=44)		
Country wealth, GDP pc $000s	42.27	21.27
Income inequality, Gini index	0.32	0.04
Internet users, proportion	0.83	0.10

Table 2

Logistic regression of problematic social media use in adolescents (n= 188,354).

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 (female)	1.21**	(1.17, 1.25)	1.29***	(1.24, 1.34)	1.29***	(1.24, 1.34)
Age (years)	1.12**	(1.11, 1.13)	1.07***	(1.06, 1.08)	1.07***	(1.06, 1.08)
Pref. for online social interactions	1.64**	(1.62, 1.66)	1.60***	(1.57, 1.62)	1.59***	(1.57, 1.62)
Absolute deprivation	1.00	(0.90, 1.10)	0.43***	(0.30, 0.62)	0.42***	(0.29, 0.61)
Relative deprivation (RD)	0.98	(0.88, 1.08)	1.68**	(1.19, 2.38)	2.42***	(1.48, 3.97)
Family support	0.83**	(0.82, 0.84)	0.86***	(0.85, 0.87)	0.94	(0.86, 1.02)
Friend support	0.91**	(0.90, 0.92)	0.97***	(0.96, 0.99)	0.96	(0.88, 1.05)
School deprivation	2.33**	(1.75, 3.11)	3.42***	(1.89, 6.18)	3.53***	(1.95, 6.38)
School wealth inequality (WI)	14.39**	(6.72, 30.80)	4.50**	(1.52, 13.28)	3.53	(0.56, 22.41)
Country wealth	1.00	(0.99, 1.00)	1.01	(1.00, 1.02)	1.01	(1.00, 1.02)
Country income inequality (II)	12.32	(0.60, 251.60)	13.16	(0.50, 343.98)	35.74	(0.99, 1284.76)
Internet users, % of pop.	0.49	(0.14, 1.74)	0.24	(0.03, 1.88)	0.24	(0.03, 1.87)
Interactions						
RD * Friend support					0.93*	(0.87, 0.99)
RD * Family support					1.00	(0.94, 1.06)
WI * Friend support					0.85	(0.66, 1.09)
WI * Family support					1.22	(0.95, 1.55)
II * Friend support					1.21	(0.92, 1.58)
II * Family support					0.69**	(0.54, 0.88)
Random components						
Country variance	0.18†		0.18		0.18	
School variance	0.23†		0.13		0.13	

Goodness-of-fit			
AIC	102491.40†	84988.66	84646.07
BIC	102522.00†	85150.19	84857.97
LR test (vs. intercept only)		17864.47**	17881.32**
LR test (vs. mutually adjusted)			16.85**

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

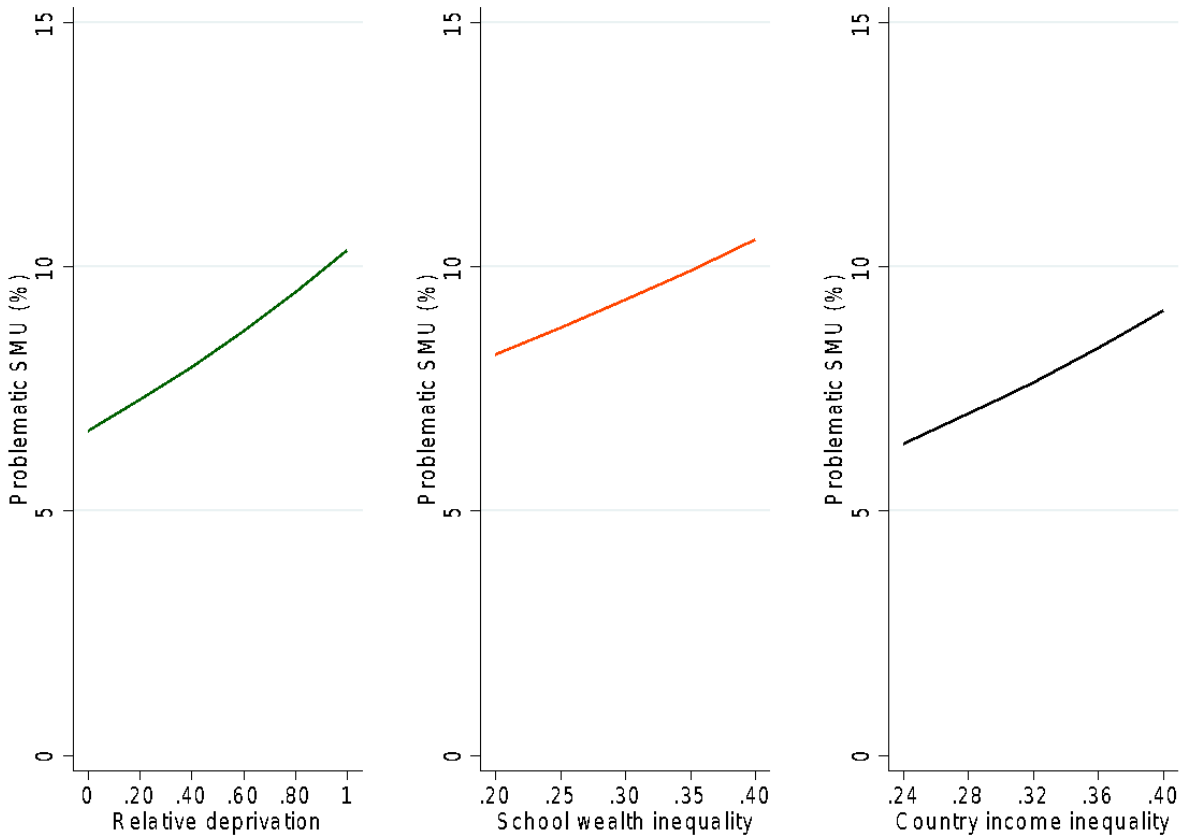

Figure 1. Associations of relative deprivation (left), school wealth inequality (centre) and country income inequality (right) with predicted prevalence of problematic social media use in adolescents (*n* = 188,354).

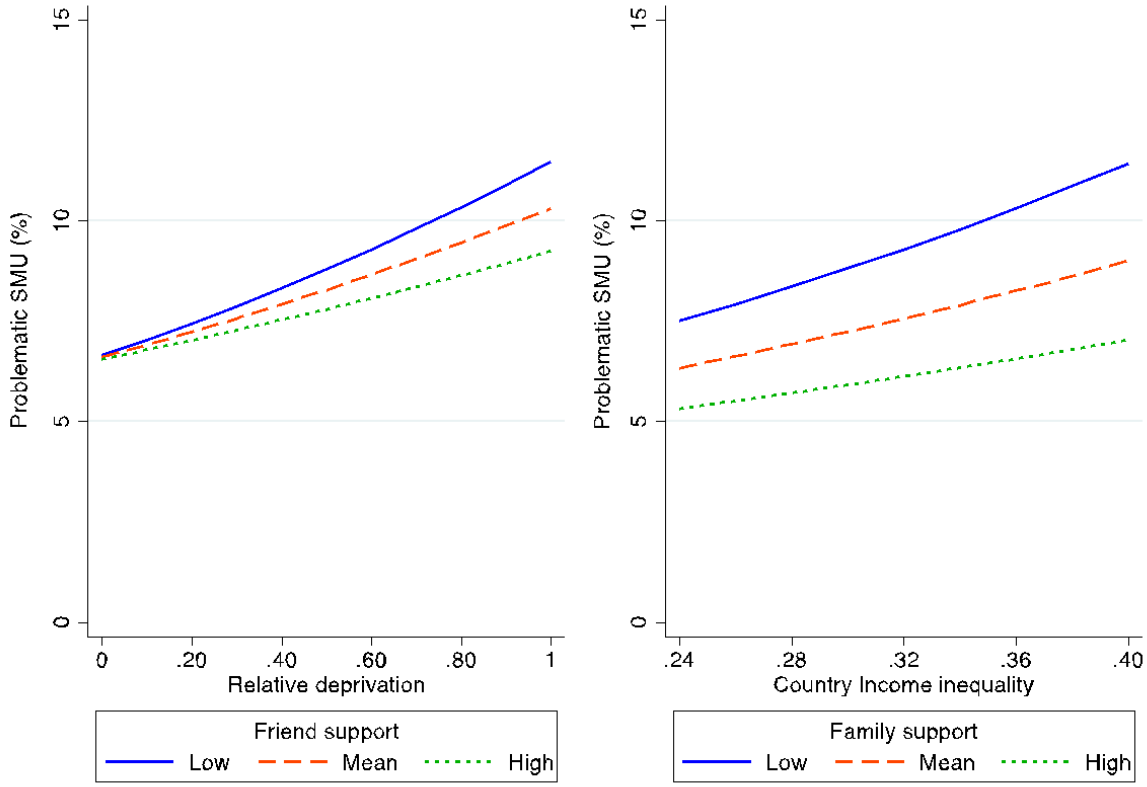

Figure 2. *Left panel*: moderated effects of relative deprivation on problematic SMU at low and high (mean +/- 1 SD) friend support. *Right panel*: moderated effects of country income inequality on problematic SMU at low and high (mean +/- 1 SD) family support (*n* = 188,354).