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Article

Mental health problems among economically disadvantaged adolescents in an increasingly unequal society: A Swedish study using repeated cross-sectional data from 1995 to 2011

Yunhwan Kim*, Curt Hagquist

Centre for Research on Child and Adolescent Mental Health, Karlstad University, Universitetsgatan 2, SE-651 88 Karlstad, Sweden

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ABSTRACT

Increasing inequality in many societies highlights the importance of paying attention to differences in mental health between the economically disadvantaged adolescents and the non-disadvantaged adolescents. Also important is to understand how changing inequality in society over time influences adolescents' mental health at the population- and individual-level. The current study examined to what extent increased societal-level income inequality over time, individual-level experiences of economic disadvantage and the cross-level interaction between the two explained Swedish adolescents' mental health problems from 1995 to 2011. We used repeated cross-sectional data collected 6 times between 1995 and 2011 in Sweden. Each time, approximately 2500 students in grade 9 completed a questionnaire during the spring semester. The adolescents provided self-report data on the frequency of their experiences of unaffordability of daily leisure activities (concert, movie, sports, and dance). They also reported their psychosomatic symptoms, which was used as a measure of mental health problems. We used the household equalised disposable income Gini coefficient as an indicator of societal income inequality. A real gross domestic product (GDP) per capita was controlled for in order to rule out potential effects of economic growth in the society over time. Multilevel regression analyses were conducted in which students were nested in years of investigations. Adolescents who experienced unaffordability of daily leisure activities reported more mental health problems. Societal income inequality was not directly associated with the adolescents' mental health. However, among girls the effects of experiences of unaffordability on mental health were stronger for all but one (sports) activities, and among boys for one activity (sports) when societal-level inequality was greater. Individual-level economic disadvantage are detrimental for adolescents' mental health, both directly and interactively with societal-level economic inequality. Some suggestions for practice and future studies are made for mental health among adolescents in societies where increasing inequality is observed.

1. Background

Mental health problems have increased according to both self-reports and clinical observations (Bor, Dean, Najman, & Hayatbakhsh, 2014; Collishaw, 2015). Adolescents' mental health problems accompany a myriad of negative consequences both in the short and long run, and affect both individuals and the society overall (van Geelen & Hagquist, 2016; Eckersley, 2008; Mojtabai et al., 2015). Consequently, understanding adolescents' mental health problems has become an important challenge.

Two perpetual concerns are the difference in mental health problems between economically disadvantaged adolescents (hereafter, disadvantaged adolescents) and non-disadvantaged adolescents given numerous additional burdens that disadvantaged adolescents have to contend within their daily lives as well as a widening mental health gap during adolescence continuing through adulthood (Due et al., 2011; Moor et al., 2015). Also the increasing income inequality in many societies over the past few decades leaves an imminent question about its potential impact on adolescents' mental health directly and in interaction with individual economic status. Responding to these questions would provide useful information for identifying groups in need of support as well as for evaluating how successful societal efforts to address this issue have been (Moor et al., 2015). There is however a lack of studies that contribute to uncovering how adolescents' mental health problems are influenced by individual-level economic disadvantage (Currie et al., 2008; Moor et al., 2015), societal-level economic inequality (Collishaw, 2015), and their interaction (McLaughlin, Costello, Leblanc, Sampson, & Kessler, 2012; Subramanian & Kawachi, 2004).

* Corresponding author.
E-mail address: yunhwan.kim@kau.se (Y. Kim).

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The current study aimed to examine the effects of societal-level income inequality and individual-level experience of economic disadvantage on mental health problems among adolescents. Special attention was also given to a cross-level interaction, i.e., potential variations in the effects of individual-level experience of economic disadvantage on mental health problems according to changing societal-level income inequality over time. We used repeated cross-sectional data collected 6 times from 1995 to 2011 in Sweden during which time period the overall income inequality in the society increased (Atkinson & Morelli, 2014).

1.1. Mental health problems among economically disadvantaged vs. non-disadvantaged adolescents

Disadvantaged adolescents often report more mental health problems than their non-disadvantaged peers. Economic disadvantage has both direct and indirect effects on mental health (Dashiff, DiMicco, Myers, & Sheppard, 2009; Reiss, 2013; Yoshikawa, Aber, & Beardslee, 2012). First, disadvantaged adolescents lack the resources necessary to meet their needs. The stress and frustration that derive from such an economic strain may cause mental health problems (Hagquist, 1998). Also, they usually do not have sufficient access to benefits for favorable health (Sweet, 2011). Second, as the theory of relative deprivation suggests, it is important how disadvantaged adolescents perceive their situation relative to others (Adjaye-Gbewonyo & Kawachi, 2012). That is, it may be consequential for one's mental health to be unable to afford goods or activities that are considered to be affordable to most (Sweet, 2011). This may be particularly true for adolescents, given their strong tendency to value and conform to peer norms (Berndt, 1979). The consequences of having a disadvantaged position may thus influence adolescents' mental health by negatively affecting their social-self (e.g., self-worth and self-esteem) (Mossakowski, 2015; Wilkinson & Pickett, 2009).

Empirical evidence to support these claims is relatively well-established in the literature (e.g., Hagquist, 1998; Bremberg, 2011; Denny et al., 2016; Torikka et al., 2014; Östberg, Alfven, & Hjern, 2006). These studies cover various aspects of the subject matter in terms of, for example, the country under investigation, the various ways to measure adolescents' economic disadvantage (e.g., objective measures of socioeconomic status/position or actual experiences of financial strains; parent-report or adolescent self-report), the outcome of interest (e.g., depression/anxiety, health complaints, and psychosomatic problems). A common conclusion from these empirical studies conducted in varying conditions is that economically disadvantaged adolescents generally report more mental health problems than non-disadvantaged adolescents do.

1.2. Mental health problems among adolescents living in a more equal society vs. a less equal society

Societal-level income equality also matters for adolescents' mental health problems. A key hypothesis is that people living in more equal societies report better mental health than people living in less equal societies. This may be explained by the eroded social cohesion and solidarity and increased individualism and materialism in less equal societies; in these societies, social comparison may have increasing implications for people's mental health (Aneshensel & Sucoff, 1996; Eckersley, 2006; Marmot & Wilkinson, 2001; Wilkinson, 1997; Wilkinson & Pickett, 2009). Social comparison matters for all individuals, not only for those who are on the lower end of the social strata; regardless of where they are located on the social strata, people tend to compare themselves to those who are in a higher strata than themselves (Runciman, 1966; Veblen, 1899). Also, more unequal societies are characterized by higher rates of violence and crimes and lower levels of social trust (Elgar, 2010; Walberg, McKee, Shkolnikov, Chenet, & Leon, 1998; Wilkinson & Pickett, 2009), creating social environments that may contribute to mental health problems for all members of the society (Kawachi, Kennedy, & Wilkinson, 1999; Yoshikawa et al., 2012). Therefore, at a population level, people living in more unequal societies may experience less favorable mental health than people living in more equal societies.

In one of the most seminal works on the subject of societal-level inequality, Wilkinson and Pickett (2009) compared countries with different levels of inequality and observed that more equal societies had more favorable mental health than less equal societies. Although still at its initial stage, empirical evidence on this topic obtained from adolescent samples are increasingly available in the literature, both for physical health (Torsheim, Currie, Boyce, & Samdal, 2006) and, more recently, for mental health (Elgar et al., 2015; Holstein et al., 2009; McLaughlin et al., 2012; Ottová-Jordan et al., 2015). Regarding mental health, all but one study were based on data from the international Health Behaviours in School-aged Children (HBSC) study. These studies compared adolescents' mental health among different countries with different levels of societal income inequality. The results showed that students living in countries with higher income inequality reported higher levels of mental health problems than those living in countries with lower income inequality (Elgar et al., 2015; Holstein et al., 2009; Ottová-Jordan et al., 2015). One exception is a study conducted in the U.S. that compared different communities within the U.S. and did not reveal a relation between income inequality and mental disorders in adolescents (McLaughlin et al., 2012).

Overall, most of the currently available evidence indicates that more equal societies are home to adolescents with more favorable mental health than more unequal societies. Given the increasing inequality over time in many parts of the world (OECD, 2011), this raises concerns that adolescents may be experiencing increasingly less favorable mental health. However, the currently available evidence based on comparisons of different societies at a single point in time does not provide sufficient evidence to evaluate the validity of this concern. While a few exceptional studies (e.g., Walberg et al., 1998; Wilkinson, 1992) empirically connected the changes in societal-level income inequality over time to the corresponding changes in population health, those studies concern life expectancy among the entire adult population, leaving the specific issue of adolescent mental health problems yet unexplored. The present study responds to that research gap.

1.3. Interactions between individual economic disadvantage and inequality in the society

The explanations of the effects of individual-level economic disadvantage and of societal-level income inequality on mental health problems have a convergent point: social comparison. This convergent point indicates that an interaction is likely to exist between individual-level economic disadvantage and societal-level income inequality. Specifically, if social comparison is one operating mechanism leading to worse mental health, such an effect would be stronger where the gap between the advantaged and the disadvantaged is wider (i.e., in a more unequal society).

Two lines of evidence indirectly support this hypothesis. First, some studies reported an interaction between individuals' disadvantaged position and the larger societal economic context in which those individuals were situated. Denny et al. (2016) reported that students living in poverty experienced more depression when they lived in more affluent areas than when they lived in less affluent areas. Also, Elgar et al. (2015) provided the most direct support for an interaction, showing that country-level income inequality explained the difference in adolescent mental health between the disadvantaged and the advantaged across 34 countries.

The second line of proximal evidence concerns observations of an increasing gap over time in mental health problems between disadvantaged adolescents and non-disadvantaged adolescents. These studies focused on the interaction between time and individual-level

economic situation, which is not identical to the focus of the current study (i.e., the interaction between societal inequality and individual-level economic disadvantage). However, those studies and the current study share a similar view and rationale for looking at this interaction: the gaps in mental health problems between the disadvantaged and the advantaged are expected to widen as society becomes more unequal and as materialism and individualism are more pervasive in the society (Eckersley, 2006; Wilkinson & Pickett, 2009). Indeed, many studies reported an increasing gap in mental health problems between the advantaged and disadvantaged over time (Langton, Collishaw, Goodman, Pickles, & Maughan, 2011; Levin, Currie, & Muldoon, 2009; Ottová-Jordan et al., 2015; Torikka et al., 2014). This led to a call for future studies to directly test the hypothesis that the diverging gaps in mental health over time were due to an interaction between inequality and individual-level disadvantage on mental health (Torikka et al., 2014).

In sum, the currently available evidence justifies studies examining the interaction between individual-level economic disadvantage and societal-level inequality. However, no empirical study to date has directly tested this interaction hypothesis by taking into account the increase in income inequality in a single society over time. The present study aims to fill this gap.

1.4. The current study

The current study aimed to examine the effects of individual-level economic disadvantage, societal-level income inequality, and the cross-level interaction between the two on adolescents' mental health. Regarding individual-level economic disadvantage, the current study focused on how often adolescents were not able to afford daily leisure activities, i.e., their experiences of unaffordability of concert-, movie-, sports-, and dance-related activities. Many previous studies reported the effects of socioeconomic status/position measures such as parent employment status, income and education level, and perceived family affluence. However, Östberg et al. (2006) showed that a measure that reflects the stress of having a disadvantaged status/position more appropriately represents the effects of economic disadvantage on adolescents' mental health. In addition, stress research suggests that stress from daily life causes a commensurate, if not greater, amount of distress compared to major life events (Lazarus & Folkman, 1984). Moreover, the literature on relative deprivation indicates that it could be relevant to focus on consumption patterns rather than non-observable socioeconomic status (such as income) if the operating mechanism under consideration is social comparison (Sweet, 2011). Therefore, the current study used adolescents' experiences of unaffordability of daily leisure activities (i.e., concert, movies, sports, and dance) as an indicator of their economic disadvantage.

In their comprehensive review study, Wilkinson and Pickett (2006) pointed out that the effects of income inequality on health at the population level is clearer when inequality is measured in larger rather than smaller areas. The authors suggested that this is because people are influenced by societal inequality by relating their position to the broader society as a whole, rather than to their more proximal surroundings. In line with this, we used the country-level Gini coefficient as a measure of societal income inequality in the present study.

Lastly, during the investigation period, many other profound social changes have occurred in Sweden. Among others, economic growth may relate to all the variables of interest in this study. Therefore, in answering our research questions below, we controlled for potential confounding effects of economic growth in the society measured by a real gross domestic product (GDP) per capita.

The research questions of the current study were as follows:

RQ1. Are mental health problems more prevalent among Swedish adolescents who experienced economic disadvantage at the individual level (i.e., unaffordability of daily leisure activities) than those who did not?

RQ2. Do Swedish adolescents living in a more socially unequal time era have more mental health problems than those living in a more equal time era?

RQ3. Are the effects of unaffordability on mental health problems stronger in a more socially unequal time era than in a more equal time era?

2. Method

2.1. Participants

The sample was obtained from the Young in Värmland (YiV) study. The YiV study was designed to understand adolescents' mental health in light of changes in living conditions over time. Data were collected 8 times between 1988 and 2011 from all compulsory school students in grade 9 (aged 15–16) from the 16 municipalities of a county in Sweden. Because of data availability, the current study only included participants from 14 municipalities for the 1995–2011 time period, comprising 6 years of investigations. Each time, between 2246 and 2664 students participated in the study, comprising 14,809 students in total (participation rates were between 83.3% and 93.7%). Approximately the same number of boys and girls participated in the study.

2.2. Procedure

The data collection was conducted in the spring semester during regular school hours. School personnel distributed a self-report questionnaire and informed the students that participation was voluntary. The students completed the questionnaire anonymously, and handed it over to the school personnel in a sealed envelope in the classroom. The data collection procedure followed the research ethics principles in humanistic-social science research stipulated by the Swedish Research Council. The questionnaire and the principles guiding the data collections from 2005 onwards were reviewed by a local Ethics Committee at Karlstad University, Sweden.

2.3. Measures

2.3.1. Psychosomatic symptoms

The participants' levels of mental health problems were measured using the psychosomatic problems (PSP) scale (Hagquist, 2008). The scale is comprised of 8 items about difficulty in concentrating, problems in sleeping, headaches, stomachaches, feeling tense, poor appetite, feeling sad, and feeling giddy. The participants responded how often they experienced each symptom during the current school year on a 5-point frequency scale with the response categories (1) *never*, (2) *seldom*, (3) *sometimes*, (4) *often* and (5) *always*. The validity and reliability of the scale were previously reported (Hagquist, 2008). Based on a psychometric analysis using the Rasch model, a few items were resolved for differential item functioning (DIF) across genders (Hagquist, 2008). The summed score of the 8 items was transformed to a linear scale using the Rasch model. This assigns each participant a person location value on a logit scale where lower values indicate a lower degree of psychosomatic problems.

2.3.2. Inequality

The indicator of societal income inequality used in the current study was the country-level Gini coefficient of equalised household disposable income provided by the Statistics Sweden (www.scb.se). The Gini coefficient is one of the most widely-used indicators of income inequality, ranging from 0 to 1, where 0 indicates complete equality and 1 indicates complete inequality. In order to obtain the equalised household disposable income, the total of all incomes (including capital gains) and transfer payments minus taxes was first calculated, and then the calculated total was adjusted for household size and composition.

The values from different years were adjusted for prices in the year 2016. The values for the investigation period of the current study are illustrated in Fig. 1.

2.3.3. Economic growth

The indicator of economic growth in the society used in the current study was the country-level real gross domestic product (GDP) per capita provided by the Statistics Sweden (www.scb.se). In order to obtain the real GDP per capita, nominal GDP was first adjusted according to volume change index with the year 2010 being a baseline year. Then, the adjusted values were divided by the number of population of each corresponding year. The values for the investigation period of the current study are illustrated in Fig. 1. The unit of the values is million in a local currency (Swedish kronor; SEK).

2.3.4. Unaffordability

The participants provided information on their experiences of unaffordability of daily leisure-time activities. The adolescents responded to the question "Have you, in the past month, not been able to do things that you wanted to do in your spare time because you could not afford them?" The leisure time activities included "go to a concert and listen to live music" "go to a movie" "go to a sports event", and "visit a disco or dance club." The response options were (1) *never*, (2) *yes, occasionally*, and (3) *yes, several times*.

2.4. Analysis

A multilevel analysis was conducted with students (level 1) nested in years of investigation (level 2). Given the previously reported gender difference in the level of psychosomatic problems at each year (girls being higher) and in the trend over time (increase among girls; no change among boys) in this sample (Hagquist, 2009), all analyses were conducted separately for girls and boys. The analyses were also conducted separately for the different leisure activities (concert, movie, sports, and dance). Students not responding on the gender question (n = 50) or unaffordability of concert, movie, sports, and dance (n = 527, 333, 540, and 542, respectively) were excluded in each analysis. The total number of adolescents in each set of gender-and-activity separated analysis ranged from 7047 to 7219.

In each gender-and-activity separated analysis, two models were consecutively tested: a main effect model and an interaction effect model. In the main effect model, we included the Gini coefficient, the real GDP per capita and adolescents' experiences of unaffordability of daily leisure activities. In the interaction effect model, also a cross-level interaction between the Gini coefficient and the experiences of unaffordability was included. Considering the small unit number at the level 2 of the multilevel modeling, all the models were estimated using restricted maximum likelihood. The equation of the interaction effect model is as follows:

$$\text{Psychosomatic problems}_{it} = \beta_{0t} + \beta_{1t}\,(\text{experiences of unaffordability})_{it} + \varepsilon_{it}$$

$$\beta_{0t} = \gamma_{00} + \gamma_{01}(\textit{Gini coefficient})_t + \gamma_{02}(\textit{GDP per capita})_t + u_{0t}$$
$$\beta_{1t} = \gamma_{10} + \gamma_{11}(\textit{Gini coefficient})_t + \gamma_{12}(\textit{GDP per capita})_t + u_{1t}$$

where i indicates individual, and t year of investigation. Experiences of unaffordability were entered as a categorical variable with the response of never as the reference category. All the analyses were conducted using the statistical package STATA version 14.

3. Results

3.1. Experiences of unaffordability among adolescents over time

Descriptive statistics of adolescents' experiences of unaffordability of daily leisure activities are presented in Table 1. First to notice is that, while societal income inequality in Sweden has been generally increasing during the investigation period (Fig. 1), the number of students who reported experiences of unaffordability decreased. This change is largely overlapped with the economic growth in the society over time (Fig. 1). Across all four leisure activities and two gender groups, the average of those who never experienced unaffordability was 60.8% in 1995 and 79.4% in 2011. As shown in Table 1, this change over time was significant for all leisure activities among both girls and boys.

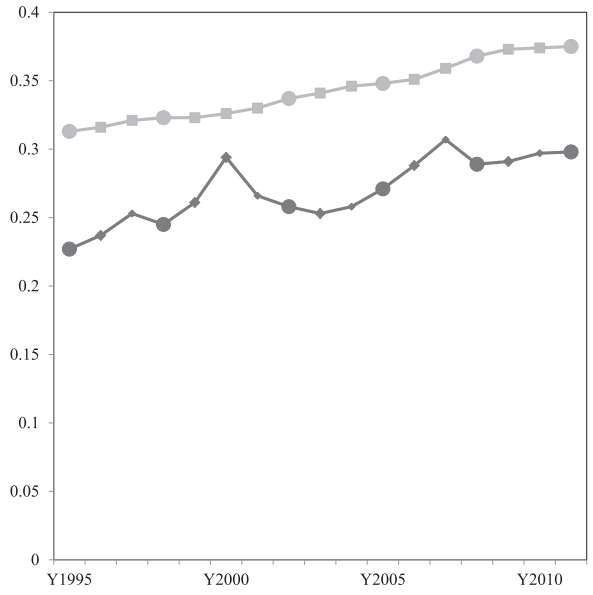

Fig. 1. Equalised household disposable income Gini coefficients (lower line) and real GDP per capita (upper line) in Sweden during the investigation time period. The values are obtained from Statistics Sweden (www.scb.se). The values used for the analysis in the current study are those from 1995, 1998, 2002, 2005, 2008 and 2011, marked as larger circles above.

3.2. Explanation of mental health problems: experiences of unaffordability, inequality and the interaction between the two

For each gender and activity, we first tested if the Gini coefficient and individual experiences of unaffordability have main effects on the adolescents' psychosomatic symptoms while accounting for the effects of the GDP per capita.[1] These results are presented in the column 'Main effect model' in Tables 2 and 3, respectively for girls and boys. First to notice is that, in all gender-and-activity separated analyses but one (i.e., movie among girls), the Gini coefficient positively predicted psychosomatic symptoms while the GDP per capita negatively predicted psychosomatic symptoms. That is, the more the society was unequal, the higher the adolescents' psychosomatic symptoms were, and the more the society was economically prosperous, the less the adolescents' psychosomatic symptoms were. None of the effects reached a statistical significance, not even to a marginally significant level.

In contrast to the societal-level indicators above, the individual-level indicator (i.e., experiences of unaffordability) significantly predicted the adolescents' psychosomatic symptoms. Specifically, in all gender-and-activity separated analyses, the more adolescents experienced the occasions of not being able to afford their daily leisure activities, the more severe their psychosomatic symptoms were.

[1] Another variable was available that can serve as the similar purpose as the GDP per capita: equalised household income from which Gini coefficient was calculated. Therefore, we ran the parallel analysis by replacing the GDP per capita with equalised household income, and the results were substantially similar to those using the GDP per capita. These results are not reported here, but available in the supplementary file.

Table 1
Experience of unaffordability among adolescents from 1995 to 2011.

		Response	*n* (%)						Statistics
			1995	1998	2002	2005	2008	2011	
Girls	Concert	Never	658 (57.9)	712 (60.2)	785 (65.1)	817 (65.1)	849 (68.4)	821 (73.8)	χ^2 (10) = 88.49
		Occasionally	271 (23.9)	263 (22.2)	243 (20.2)	246 (19.6)	249 (20.1)	178 (16.0)	
		Several times	207 (18.2)	208 (17.6)	178 (14.8)	193 (15.4)	143 (11.5)	114 (10.2)	$p <$ 0.001
	Movie	Never	456 (39.7)	460 (38.1)	619 (50.6)	689 (53.7)	820 (65.3)	746 (66.6)	χ^2 (10) = 378.48
		Occasionally	425 (37.0)	442 (36.6)	404 (33.0)	399 (31.1)	307 (24.5)	256 (22.8)	
		Several times	268 (23.3)	307 (25.4)	200 (16.4)	194 (15.1)	128 (10.2)	119 (10.6)	$p <$ 0.001
	Sports	Never	870 (77.1)	900 (75.8)	967 (80.5)	1018 (80.5)	1062 (85.5)	933 (84.0)	χ^2 (10) = 58.47
		Occasionally	166 (14.7)	187 (15.8)	158 (13.1)	166 (13.1)	104 (8.4)	109 (9.8)	
		Several times	92 (8.2)	100 (8.4)	77 (6.4)	80 (6.3)	76 (6.1)	69 (6.2)	$p <$ 0.001
	Dance	Never	618 (53.9)	724 (60.4)	825 (67.9)	903 (71.8)	1012 (81.9)	902 (81.6)	χ^2 (10) = 359.48
		Occasionally	342 (29.8)	287 (24.0)	267 (22.0)	233 (18.5)	151 (12.2)	124 (11.2)	
		Several times	187 (16.3)	187 (15.6)	123 (10.1)	121 (9.6)	72 (5.8)	79 (7.2)	$p <$ 0.001
Boys	Concert	Never	822 (68.1)	762 (71.6)	890 (75.6)	957 (74.1)	1083 (83.4)	870 (82.2)	χ^2 (10)=118.00
		Occasionally	221 (18.3)	173 (16.3)	174 (14.5)	194 (15.0)	123 (9.5)	115 (10.9)	
		Several times	165 (13.7)	129 (12.1)	113 (9.6)	140 (10.8)	93 (7.2)	73 (6.9)	$p <$ 0.001
	Movie	Never	665 (54.5)	580 (53.3)	757 (63.2)	925 (70.4)	1027 (78.0)	829 (77.5)	χ^2 (10) = 321.79
		Occasionally	355 (29.1)	333 (30.6)	308 (25.7)	239 (18.2)	197 (15.0)	161 (15.1)	
		Several times	200 (16.4)	175 (16.1)	132 (11.0)	150 (11.4)	93 (7.1)	80 (7.5)	$p <$ 0.001
	Sports	Never	872 (72.2)	771 (72.7)	904 (76.6)	1047 (80.4)	1127 (86.6)	859 (81.7)	χ^2 (10) = 117.08
		Occasionally	211 (17.5)	183 (17.3)	173 (14.7)	150 (11.5)	104 (8.0)	105 (10.0)	
		Several times	125 (10.4)	107 (10.1)	104 (8.8)	105 (8.1)	71 (5.5)	88 (8.4)	$p <$ 0.001
	Dance	Never	766 (63.2)	723 (67.3)	913 (77.2)	1056 (82.1)	1163 (89.7)	918 (87.5)	χ^2 (10) = 412.53
		Occasionally	275 (22.7)	238 (22.2)	169 (14.3)	136 (10.6)	68 (5.3)	74 (7.1)	
		Several times	172 (14.2)	113 (10.5)	101 (8.5)	95 (7.4)	65 (5.0)	57 (5.4)	$p <$ 0.001

Presented percentages are within a given year in each gender.

Table 2
The results of the multilevel regression models predicting psychosomatic symptoms among girls (Point estimates and standard errors).

	Concert		Movie		Sports		Dance	
	Main effect model	Interaction effect model	Main effect model	Interaction effect model	Main effect model	Interaction effect model	Main effect model	Interaction effect model
Constant	−1.34(1.46)	−1.02(1.35)	−2.27(1.77)	−2.04(1.68)	−1.01(1.59)	−0.85(1.57)	−1.72(1.80)	−1.55(1.70)
Fixed effects								
Gini (household disposable income)	5.36(12.15)	3.24(11.25)	1.82(14.74)	0.32(14.01)	5.03(13.27)	4.21(13.06)	5.49(15.03)	2.98(14.21)
Real GDP per capita	−2.26(13.38)	−1.53(1.35)	3.02(16.24)	3.53(15.42)	−2.65(14.62)	−2.47(14.38)	−1.20(16.55)	0.23(15.64)
Unaffordability (Ref. Never)								
Occasionally	0.30(0.03)***	−0.07(0.36)	0.34(0.03)***	0.11(0.34)	0.24(0.04)***	−0.64(0.45)	0.39(0.03)***	−0.49(0.37)
Several times	0.69(0.04)***	−1.49(0.42)***	0.68(0.04)***	−0.56(0.41)	0.39(0.05)***	−0.55(0.56)	0.66(0.04)***	−0.69(0.47)
Gini by Unaffordability								
Occasionally	–	1.41(1.36)	–	0.85(1.27)	–	3.34(1.71)$^{0.051}$	–	3.40(1.43)*
Several times	–	8.34(1.58)***	–	4.80(1.57)**	–	3.58(2.14)$^{0.094}$	–	5.21(1.81)**
Random effects								
At level 2: intercept	0.01(0.00)	0.00(0.00)	0.01(0.01)	0.01(0.01)	0.01(0.01)	0.01(0.01)	0.01(0.01)	0.01(0.01)
At level 2: slope	–	0.00(0.00)	–	0.00(0.00)	–	0.00(0.00)	–	0.00(0.00)
At level 1: intercept	1.19(0.02)	1.19(0.02)	1.18(0.02)	1.18(0.02)	1.23(0.02)	1.23(0.02)	1.19(0.02)	1.19(0.02)

The coefficients are unstandardized beta coefficients. The interaction model regarding dance did not converge at default convergence threshold and the presented results are based on the values obtained from 16,000 iterations. We achieved the model convergence by lowering the convergence threshold and compared the results: they were almost identical in terms of its estimates and significance. Only slight differences were sometimes observed at the third decimal point level. All significant interactions are plotted in Fig. 2. *** $p < 0.001$ ** $p < 0.01$ * $p < 0.05$.

Next, a cross-level interaction between inequality and experiences of unaffordability was added to the above main effect model. These results are presented in the column 'Interaction effect model' in Tables 2 and 3, respectively for girls and boys. On four occasions (i.e., concert, movie and dance among girls and sports among boys), the cross-level interaction was significant. For these four occasions, the patterns of interactions are plotted in Fig. 2. The specific patterns of the interactions present the same message: the negative effect of individual experiences of economic disadvantage becomes stronger as societal income inequality increases. Specifically, those who never experienced unaffordability of daily leisure activities were influenced by societal inequality very little. In contrast, those who experienced unaffordability reported increasingly more mental health problems as societal inequality escalated.

4. Discussion

In the current study, we examined the effects of individual-level

Table 3
The results of the multilevel regression models predicting psychosomatic symptoms among boys (Point estimates and standard errors).

	Concert		Movie		Sports		Dance	
	Main effect model	Interaction effect model	Main effect model	Interaction	Main effect model	Interaction effect model	Main effect model effect model	Interaction effect model
Constant	−1.73(0.68)*	−1.62(0.73)*	−1.86(0.82)*	−1.68(0.82)*	−1.44(0.93)	−1.22(0.99)	−1.78(0.89)*	−1.46(0.99)
Fixed effects								
Gini (household disposable income)	2.42(5.59)	2.13(6.04)	3.63(6.76)	2.22(6.79)	3.17(7.75)	1.47(8.17)	3.57(7.40)	4.52(8.14)
Real GDP per capita	−0.46(6.18)	−.0.57(6.64)	−1.10(7.47)	−0.54(7.46)	−1.76(8.55)	−1.10(9.00)	−1.17(8.17)	−2.82(8.92)
Unaffordability (Ref. Never)								
Occasionally	0.40(0.04)***	−0.04(0.48)	0.39(0.04)***	−0.27(0.39)	0.32(0.04)***	−0.61(0.48)	0.41(0.04)***	0.21(0.60)
Several times	0.63(0.05)***	0.24(0.55)	0.57(0.05)***	−0.27(0.51)	0.40(0.05)***	−1.51(0.57)**	0.55(0.05)***	−0.62(0.66)
Gini by Unaffordability								
Occasionally	–	1.67(1.82)	–	2.52(1.51)0.095	–	3.56(1.84)0.053	–	0.78(2.30)
Several times	–	1.49(2.09)	–	3.20(1.97)	–	7.28(2.18)***	–	4.54(2.55)0.075
Random effects								
At level 2: intercept	0.00(0.00)	0.00(0.00)	0.00(0.00)	0.00(0.00)	0.00(0.00)	0.00(0.00)	0.00(0.00)	0.00(0.00)
At level 2: slope	–	0.00(0.00)	–	0.00(0.00)	–	0.00(0.00)	–	0.00(0.00)
At level 1: intercept	1.48(0.03)	1.48(0.03)	1.50(0.03)	1.50(0.03)	1.52(0.03)	1.51(0.03)	1.50(0.03)	1.50(0.03)

The coefficients are unstandardized beta coefficients. All significant interactions are plotted in Fig. 2. The final model chosen between main effect model and interaction effect model in each case is in bold. ***p < 0.001 **p < 0.01 *p < 0.05.

economic disadvantage (experiences of unaffordability of daily leisure activities), societal income inequality (Gini coefficient), and the cross-level interaction between the two on adolescents' mental health after controlling for potential effects of economic growth in the society over time (GDP per capita). Data were collected in one county in Sweden 6 times between 1995 and 2011. In general, individual-level economic disadvantage had detrimental effects on adolescents' mental health. In addition, a cross-level interaction was found among girls for three leisure activities, i.e., concert, movies, and dance. The interaction was also significant among boys but for only one activity, i.e., sports. The interaction indicated that the economically disadvantaged adolescents suffered more mental health problems when societal income equality was less favorable. The findings are discussed in light of the current situation that many societies face in which disadvantaged adolescents suffer more from mental health problems and the gap between the disadvantaged and the advantaged is growing. Note that though, given the inability of the research design to empirically confirm causal relations, any causal interpretations and implications below are only theoretically inferred.

4.1. Individual economic disadvantage and mental health

As an indicator of adolescents' economic disadvantage, we examined adolescents' actual experiences of unaffordability of daily leisure activities. Over the past two decades, the proportion of adolescents who cannot afford desired daily leisure activities has gradually decreased. This is consistent with the economic growth in the society shown by the increase in GDP per capita during the same time period; correspondingly increased standard of living and household purchase power seem to be behind the observed gradual decrease in unaffordability over time. Another possibility also includes that adolescents' life styles and daily leisure activities have changed and diversified over time (e.g., more time spent in schools, online activities becoming increasingly popular), leading to decreased time for and/or preference to the leisure activities investigated in the current study. Consequently, it seems that the majority of students at the end of the investigation period did not have to struggle to participate in such activities.

Notwithstanding the overall decrease in unaffordability among adolescents, those who had to give up daily leisure activities due to financial constraints suffered from more mental health problems than those who did not, at any time. This finding was also reported in several previous studies (Hagquist, 1998; Bremberg, 2011; Denny et al., 2016; Torikka et al., 2014; Östberg et al., 2006). Synthesizing our findings above, we suggest that continuous monitoring of and attention to disadvantaged subgroups should not be deemphasized by the overall improvements in economic standards and living conditions in society.

In the current study, we focused on everyday leisure activities. Adolescents' distress from not being able to afford these kinds of activities may be considered as trivial. However, because these are 'everyday' activities, disadvantaged adolescents who cannot afford them are likely to encounter frustrating situations repeatedly and frequently. It has been extensively emphasized in stress research that such accumulated daily stress can be harmful just as major stressful life events (e.g., Lazarus & Folkman, 1984). Furthermore, as suggested in the theory of relative deprivation, what matters most may be the actual meaning of those activities (Adjaye-Gbewonyo & Kawachi, 2012), and those who find themselves unwillingly excluded from a normative youth culture can suffer from it (Sweet, 2011). In light of this, coupled with our own findings, we suggest that this everyday unaffordability should be addressed by various support networks for adolescents such as schools and youth organizations so that no one is excluded from enjoying normative adolescent activities.

One thing that is worth noting is, however, that the unaffordability measure, despite its advantage to more closely reflect adolescents' own perspectives, also accompanies a disadvantage. Specifically, while the above interpretation assumes that one's perceived unaffordability is a predictor of mental health, the opposite is also likely. That is, one's perceived unaffordability may be an indication of poor mental health, or may be exaggerated by poor mental health. Because of the cross-sectional design the directions of these associations cannot be determined. This limitation should be carefully considered.

4.2. Societal inequality and mental health

In the current study, we did not find any evidence indicating that adolescents' mental health problems overall were worse when they

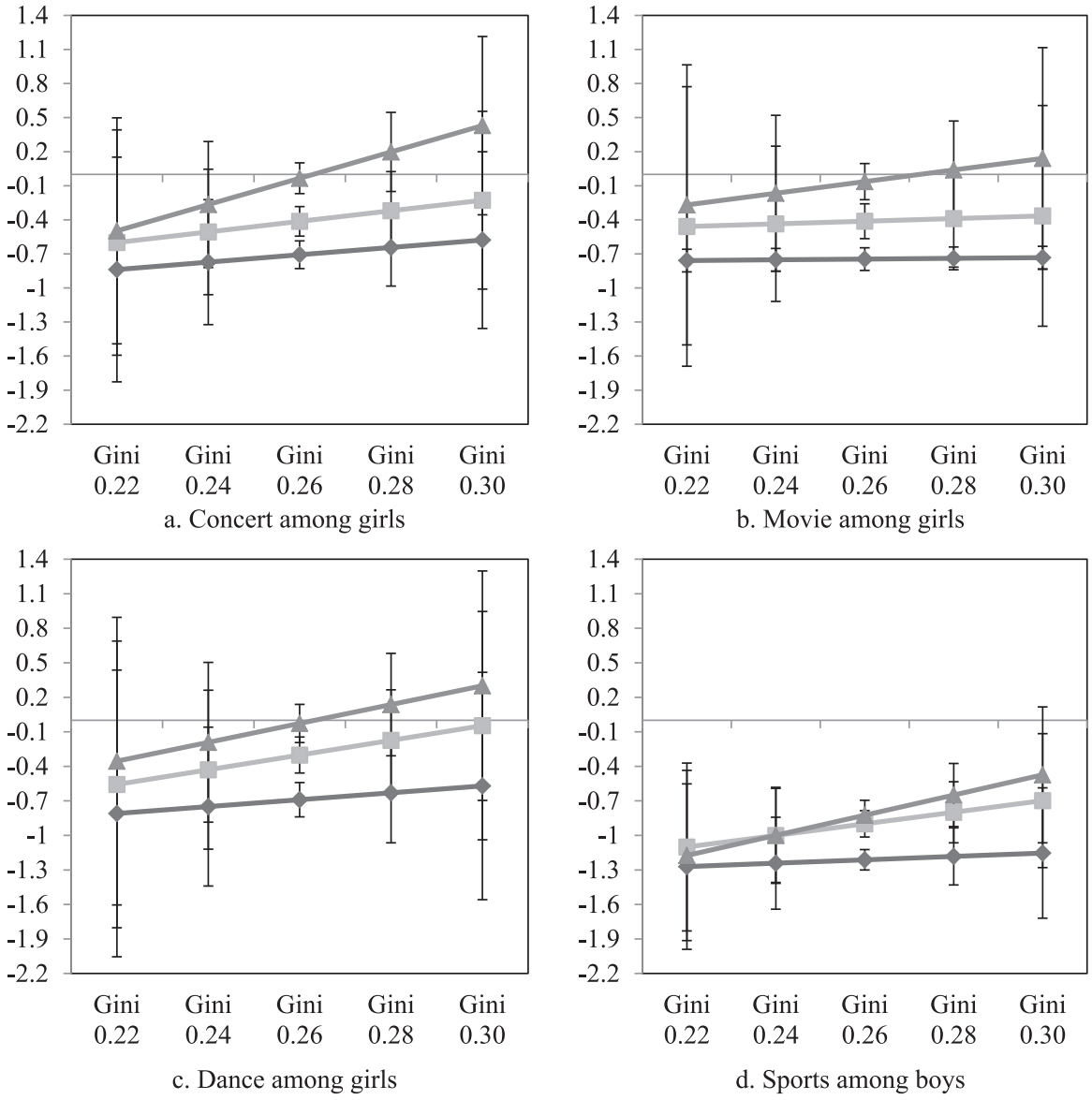

Fig. 2. Patterns of interaction between societal inequality and adolescents' experiences of unaffordability. The separate lines in the sections indicate, from above, those who experienced unaffordability several times, occasionally, and never. Note that the figure includes both point-estimates and 95% confidence intervals.

lived in a time with greater societal income inequality than when they lived in a time with greater income equality. The majority of previous studies presented such a message by comparing adolescents living in different countries (Elgar et al., 2015; Holstein et al., 2009; Ottová-Jordan et al., 2015) and by making a connection between the change in income inequality and the change in life expectancy of the adult population (Walberg et al., 1998; Wilkinson, 1992). The current study expanded these previous efforts by examining inequality in the same country repeatedly over time and by examining mental health among adolescents. The finding is inconsistent with the majority of the previous studies.

Perhaps, the unique picture of the inequality status in Sweden may provide some promising leads either to reconcile the different findings or to indicate a need for further studies on this issue. During the investigation period, two different pictures of inequality status in Sweden were presented: one showing that Sweden had a faster increase in income inequality than other countries; another showing that the equality status is still more favorable than in other countries even after such a fast increase (Atkinson & Morelli, 2014; OECD, 2011). Accordingly, despite the rapid increase in income inequality, the situation may not have gone bad enough to directly worsen adolescents' mental health as, perhaps, long-lasting high-equality cultures and social structures may have played as protective factors. Conversely, some countries could have experienced negative influences from increased income inequality over time although the increase in those countries was not as drastic as Sweden. This hypothesis is worth testing in future studies by comparing different countries in terms of the effects of changing inequality over time within each country. This is a concern that is worth paying attention to in many countries that have experienced increasing income inequality during the past few decades as is the case in many OCED countries (OECD, 2011).

Another point to consider is the magnitude of the change in income inequality. Although the increase was more pronounced in Sweden than in other countries, the total increase during the investigated period is about 30%. This variation is much smaller than what is reported in a previous study conducted by Ottová-Jordan et al. (2015). In that study, the authors compared 34 countries where the highest Gini coefficient from Russia (45.20) was more than double of the lowest Gini coefficient from Sweden (21.90) and indeed reported a significant main effect of Gini coefficient on adolescents' mental health. In addition, the number

of unit at the year-level in the current study was very small which may have prevented from uncovering the effect of Gini coefficient, which is clearly a limitation of the current study. Future studies that include a longer-term investigation with more number of observations may help tell if the small variation in income inequality was responsible for the null finding in the current study.

4.3. Individual-level economic disadvantage and societal-level inequality

A significant interaction between individual experiences of unaffordability and societal inequality was evident in four out of eight models tested in the current study. All significant interactions indicated that adolescents' experiences of unaffordability of daily leisure activities were more strongly connected to mental health when societal income distribution was more unequal. Some previous studies suggested this scenario, reporting indirect, proximal evidence such as diverging gaps over time in mental health problems between the economically disadvantaged and the non-disadvantaged (Langton et al., 2011; Levin et al., 2009; Ottová-Jordan et al., 2015; Torikka et al., 2014). Similarly, previous research indicated enhanced mental health problems among disadvantaged adolescents living in an area where they were more likely to feel relatively deprived (Denny et al., 2016). Elgar et al. (2015) moved one step further and used a direct indicator of societal inequality, showing that there was a wider gap in adolescent mental health problems between the advantaged and the disadvantaged in more unequal societies. The current study advanced this effort by empirically testing this scenario through examining one society repeatedly over time. The finding that disadvantaged adolescents increasingly suffered when they lived in a more unequal time has wide-spread implications in an era where increasing societal income inequality has been observed in many countries over the past few decades and recently improved economic situations failed to decrease income inequality (OECD, 2011, 2016).

The current study is based on the assumption that a larger income gap in a society augments the effects of an individual's disadvantaged position on mental health. While the current study partly confirmed this assumption, its underlying reason is still not explained. One hypothesis which awaits empirical examination is that disadvantaged adolescents may feel a sense of helplessness in overcoming the gap with non-disadvantaged adolescents to a greater extent in more unequal societies.

In the current study the interaction between societal inequality and individual experiences of unaffordability was not consistent across genders. That is, the interaction was significant for the most of the investigated leisure activities, i.e., concert, movie, and dance among girls, but only for sports among boys. This may have to do with the different ways that boys and girls form relational bonds. Among boys, the process of establishing intimacy comes more from sharing activities, while among girls, more from sharing opinions and experiences (McNelles & Connolly, 1999). Considering that the interaction between economic disadvantage and social inequality is rooted in comparison that occurs in the context of social relationships, we suggest that the interactive mechanism may be particularly salient for popular activities among boys (i.e., sports) while the mechanism works in general among girls (i.e., for all activities – although sports was technically an exception to this in the current study, it should be considered that interaction of sports and Gini coefficient was very close to being statistically significant, $p = 0.051$). Another potential explanation may be that there is a gender difference regarding which activities adolescents consider to be the norm. Given that what is considered to be the norm is a key to understanding negative consequences (Sweet, 2011), our findings would be logical if boys consider specifically being able to afford sports activities as the norm while girls consider being able to afford leisure activities in general to be the norm. These hypotheses for a gender-specific effect need to be empirically tested in future studies.

4.4. Future directions for practice and research

The findings of the current study have implications for what needs to be done to improve the mental health of young people. The most direct and small-scale actions may be, as mentioned above, to support disadvantaged adolescents' daily leisure activities. This is in line with the suggestion in the literature to improve living conditions among disadvantaged adolescents in order to better their mental health (Bremberg, 2011). In the meantime, a more fundamental solution is needed. A common agreement is that addressing issues that appear on the surface among disadvantaged populations is only a temporary and secondary solution and therefore, that the inequality itself should be the ultimate target to focus on (Bernntsson, Ringsberg, Eriksson, & Köhler, 2016; Wilkinson & Pickett, 2009). For example, in the current study, the examined individual-level issue of unaffordability is simply one indicator of wider-scale issues that come with having a disadvantaged position.

Some directions for future studies can also stem from our findings. The current study focused on daily leisure activities that were shown to be afforded by the majority of adolescents in the more recent years under study. However, given that intensive consumerism is increasingly concentrated on young people (Buijzen & Valkenburg, 2003; Schor, 2004), affordability of costly items and activities that are afforded by only a few such as cutting-edge tech-items and luxurious hobbies needs to be examined to see if the same findings would be obtained for items and activities that the majority of adolescents cannot afford. In addition, the current study failed to include some of the favorite activities among adolescents today and which may be worth examining. For example, online gaming is one of the largest sources of expenditure among today's boys. In these games, boys' economic situation can be transferred, through their online purchase power, to their online-self and winning power in an online world. Lastly, the role that social media plays is of interest. Due to the widespread use of social media, especially among girls, many exclusivities and privileges that the advantaged groups previously enjoyed only in private can now be relayed to the eyes of the disadvantaged groups very promptly and easily, often in an exaggerated way. Given the heavy influence that social media has on adolescents today (Best, Manktelow, & Taylor, 2014; O'Keeffe & Clarke-Pearson, 2011), this issue also needs to be examined in future studies on inequality.

4.5. Limitations

The current study is based on repeated cross-sectional data. Therefore, although our interpretation of the results assumes a causal relation from economic conditions to mental health, such causality is only hypothetical. Similarly, all explanations and interpretations of the association between economic conditions and mental health problems are solely theoretical. That is, despite the postulated mechanisms which served as guides to build the hypotheses and interpret the results, none of them were actually measured or tested in the current study. Regarding generalizability, it should be considered that Sweden, as the other Nordic welfare states, belongs to the most equal countries where related social cultures and conditions may still be more favorable than in other developed countries. Therefore, to obtain a more comprehensive view of the relation between changing societal inequality and mental health problems among adolescents, future studies need to include countries with different levels of economic development and societal inequality. Except for controlling for the effects of economic growth in the society, the current study did not address other profound structural changes that also took place in Sweden during the investigation period. Other major changes include the introduction of a free school choice and governmental funded independent schools owned by private companies at the beginning of the1990s. These changes have increased the segregation in the Swedish school system, disadvantaging children from lower socioeconomic families (Carlgren,

2009; Statens-Offentliga-Utredningar, 2017). Similarly, the change to a market-oriented health care system has implied a widening of social and geographical inequities (Dahlgren, 2014). Lastly, no indicator of individual-level absolute income was included in this study due to lack of data. Although our conceptualizations and interpretations were heavily based on relative deprivation, given that the everyday activities in this study did not cost substantial burden to household economy at the general level, it is likely that it may reflect the lack of income in absolute term, which has been indicated as a crucial confounding factor (Adjaye-Gbewonyo & Kawachi, 2012). Although some studies revealed that relative deprivation has additive effects over and above the effects of the absolute income on adolescent psychosomatic symptoms (e.g., Elgar et al., 2013), our findings need to be confirmed by future studies that control for the effects of absolute income.

5. Conclusion

Using repeated cross-sectional data from 1995 to 2011 in Sweden, the current study examined the relations between individual-level economic disadvantage, societal-level income inequality, and mental health problems among adolescents after controlling for societal-level economic growth over time. We observed that individual-level disadvantage was associated with less favorable mental health among adolescents, both directly and interactively with the societal-level income inequality. This illustrates that disadvantaged adolescents may need additional resources in an era in which the societal economic redistribution structure is worsening in many societies.

Declarations of interest

None.

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Data statement

Requests for access to data should be sent to the second author.

Statement of ethical approval not required

The authors of the submitted manuscript “Mental health problems among economically disadvantaged adolescents in an increasingly unequal society: A Swedish study using repeated cross-sectional data from 1995 to 2011” state that, according to Swedish legislation, no formal ethical review is required for this study on the grounds that the survey was completed anonymously. It is not possible to identify specific individuals based on the data. We clarified in the manuscript that:

- The data collection procedure followed the research ethics principles in humanistic-social science research stipulated by the Swedish Research Council.
- The questionnaire and the principles guiding the data collections from 2005 onwards were reviewed by a local Ethics Committee at Karlstad University, Sweden.

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