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Poverty in adolescence and later drug use disorders: understanding the mediation and interaction effects of other psychiatric disorders

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Background

Poverty in adolescence is associated with later drug use. Few studies have evaluated the role of adolescent psychiatric disorders in this association.

Aims

This study aimed to investigate mediation and interaction simultaneously, enabling the disentanglement of the role of adolescent psychiatric disorders in the association between poverty in adolescent and later drug use disorders.

Method

A national cohort study of 634 223 individuals born in 1985–1990, residing in Sweden between the ages of 13 and 18 years, was followed from age 19 years until the first in-patient or out-patient care visit with a diagnosis of drug use disorder. A four-way decomposition method was used to determine the total effect of the association with poverty and possible mediation by and/or interaction with diagnosis of adolescent psychiatric disorders.

Results

The hazard ratios for drug use disorders among those experiencing poverty compared with those 'never in poverty' were 1.40 (95% CI, 1.32–1.63) in females and 1.43 (95% CI, 1.37–1.49) in males, after adjusting for domicile, origin and parental psychiatric disorders. Twenty-four per cent of this association in females, and 13% in males, was explained by interaction with and/or mediation by adolescent psychiatric disorders.

Conclusions

Part of the association between poverty in adolescence and later drug use disorders was due to mediation by and/or interaction with psychiatric disorders. Narrowing socioeconomic inequalities in adolescence might help to reduce the risks of later drug use disorders. Interventions aimed at adolescents with psychiatric disorders might be especially important.

Keywords

Poverty; adolescence; psychiatric disorders; mediation; drug use disorders.

The importance of socioeconomic inequalities on mental health has been well established, indicating that economic deprivation across the life course might affect drug use and drug use disorders.[1,2] Whereas several studies suggest that children from socioeconomically poor households are more likely to have poorer mental health than their non-poor counterparts,[3–6] with higher prevalence in girls than boys,[7,8] others have reported early mental health status to be a risk factor for later drug misuse.[9]

Several studies have shown that individuals with mental health problems are at increased risk of drug use and subsequent disorders. This is in line with the 'self-medication hypothesis'.[10,11] Furthermore, individuals with drug use problems, in turn, are at higher risk of developing psychiatric disorders.[12] In addition, adverse childhood experiences, such as parental psychiatric disorders, maltreatment or having experienced violence, increase the risk of drug use, drug use disorders and other psychiatric disorders.[13] However, less is known about the role of childhood poverty in this chain of associations. Previous studies have shown poverty exposure during childhood to be associated with increased risks of psychiatric disorders, including mood disorders, anxiety, attention-deficit hyperactivity disorder, and drug use disorders, in adulthood.[14,15] In a previous study, we also showed childhood poverty to be associated with later drug use disorders and drug crime convictions.[15] However, the influence of adolescent psychiatric disorders remains to be understood.

From the mid-1970s onwards, Sweden has received increasing numbers of non-European migrants, mostly refugees and their families originating from the Middle East and the Horn of Africa.[16] Childhood poverty in migrant households is approximately twice as high as that in native Swedish households.[17] Drug use disorders may be influenced negatively by different socioeconomic and psychosocial factors. For example, research has shown that drug use is influenced by the origin of the migrant population, e.g. via the acculturation process, which can be stressful,[18] resulting in migrants using drugs as a coping mechanism,[19] and less utilisation of psychiatric care.[20] Previous studies have also shown drug use to be particularly prevalent among urban youths, especially among those living in deprived areas.[21,22] Furthermore, many psychiatric disorders, not least drug use disorders, demonstrate sex differences,[23] highlighting the importance of studying males and females separately.

From a clinical and public health perspective, it is important to explore the extent to which poverty in adolescence might interact with mental health status in adolescence in predicting drug use disorders in young adulthood, and the extent to which mental health status in adolescence mediates the relationship between poverty in adolescence and later drug use disorders. If poverty in adolescence is more strongly associated with drug use disorders in early adulthood in those who have a psychiatric disorder (interaction), then the implication would be to target adolescents with psychiatric disorders in an effort to screen for and reduce drug use disorders. If instead poverty in adolescence increases the risk of poor mental health, which in turn increases the risk of drug use disorders in early adulthood (mediation), then treating psychiatric disorders could help to reduce the incidence of drug use disorders in low-income individuals.

Aims

This study aimed to examine mediation and interaction simultaneously, enabling disentanglement of the role of adolescent psychiatric disorders in the association between poverty in adolescence and drug use disorders in adulthood. We also aimed to examine to what extent any association differed by sex, origin, domicile and parental psychiatric disorders.

Method

Study population

The study population comprised all individuals ($n = 634\,233$) born between 1985 and 1990, alive and residing in Sweden between January 1998 and December 2008, between the ages of 13 and 18 years, based on the Register of the Swedish Total Population.

Exposure variable

We created an indicator of adolescent relative income poverty (hereafter referred to as 'poverty'), that is, living in a household with a disposable income per consumption unit after taxes below 60% of the median value of the national median disposable income. Statistics Sweden uses weights to adjust for household composition and size. This means that the individual disposable income was obtained by multiplying the sum of all disposable income of each family member by each individual's consumption weight and dividing by the family's total consumption weights. The criteria for poverty were based on a national measurement of economic standards that does not consider the size of the municipality and the cost of living per city for its calculation.[24] This relative measure of poverty is often used by various scholars, both in Sweden and the EU.[25,26] Adolescent poverty was classified as being below the poverty threshold (1) or not (0), each year from age 13 years to 18 years. Those who did not have any indication of poverty were categorised as 'never in poverty,' whereas those with one or more years in poverty were categorised as 'experienced poverty.'

Outcome

The outcome variable referred to the first visit to in-patient or out-patient care, including cases presenting to emergency departments with a diagnosis of a drug use disorder, following the definitions in the ICD-10 (F11–F16 and F17–F19), according to the Swedish national in-patient and out-patient registers held by the Swedish National Board of Health and Welfare. These were defined as follows: mental and behavioural disorders due to use of opioids (F11), cannabinoids (F12), sedatives or hypnotics (F13), or cocaine (F14), other stimulant-related disorders (F15), hallucinogens (F16), volatile solvents (F18), and other psychoactive substance-related disorders and unspecified psychoactive substance-induced disorders (F19). All digits of the ICD coding for drug use disorders after the decimal point that further specify the nature and severity of the problem were considered in this study. This was measured from between 2004 and 2009 (at age 19) to whichever of the following occurred first: the first recorded hospital admission due to drug use disorder, death, or the end of the follow-up period on 31 December 2016.

Potential mediator/interaction variable

Psychiatric diagnosis was captured between 13 and 18 years of age. This was defined as having at least one registered entry with the hospital-affiliated psychiatric care services with a main diagnosis of mental or behavioural disorder, following the definitions in the ICD-10 (F01–F10), and categorised as 0 (no psychiatric disorder) or 1 (psychiatric disorder in adolescence). Individuals with drug use disorders ($n = 1603$) between the ages of 13 and 18 years were excluded from the analyses.

Covariates

Origin was based on country of birth, using information from the Multi-Generation Register: (a) Native Swedish: youths born in Sweden with both parents born in Sweden; or (b) youth with a migrant background: Swedish-born with at least one parent born abroad, and youths born outside Sweden with both parents born abroad.

Sociodemographic indicators were retrieved from the LISA register. Domicile indicated the place of residence at the age of 18 years, following the definition of the Swedish Association of Local Authorities and Regions.[27] This was classified as 1 (big city) or 2 (town or rural area).

Sex was classified as female or male. Birth year ranged from 1985 to 1990. Parental psychiatric disorder was based on at least one parent having a history of in-patient or out-patient care with any psychiatric diagnosis (ICD-9: 290–319; ICD-10: F00–F99) from the child's birth up to age 18 years.

Statistical analyses

We used the four-way decomposition method (med4way package in Stata)[28] to determine the total or direct effect of the association between poverty in adolescence and later drug use disorders, and interaction with or mediation by adolescent psychiatric disorders.

The four-way decomposition method used in this study was a unification of interaction and mediation. The four components, respectively, correspond to the portion of the effect that is due to neither mediation nor interaction, to interaction only (not mediation), to both mediation and interaction, and to mediation only (not interaction). In other words, it provides a decomposition of the total effect that indicates how much of that effect is due to mediation only (pure indirect effect), how much is due to only the interaction between the exposure and the mediator (reference interaction), how much is due to both mediation and interaction (mediated interaction), and how much is due to neither mediation nor interaction (controlled direct effect). This decomposition provides maximum insight for clarifying the contribution of interactive and mediating mechanisms in a given observed effect.[28] Two regression models are fitted: a model for the outcome (as a function of the exposure, the mediator, their interaction and confounders) and a model for the mediator (as a function of the exposure and confounders). The causal effects are automatically computed by the command as a function of the regression parameters estimated from the above specified models.

The med4way command allowed fitting of the hazard ratios (HRs) in person-years for drug use disorders measured from the age of 19 years until the first visit to in-patient or out-patient care with a drug use diagnosis, emigration, death, or end of follow-up (31 December 2016). A logistic model was specified for the mediator (i.e. binary variable of psychiatric disorders) and a survival model for the outcome. The four-way decomposition involves decomposing the excess relative risk for the exposed (relative risk − 1) into neither mediation nor moderation, interaction only, mediation and interaction, and mediation only, where the interaction measure is based on the excess relative risk due to interaction, i.e. additive interaction on the ratio scale. Additive interaction implies that that the combined effect of exposures is larger than the expected sum of the two (unlike multiplicative interaction, where the combined effect must be larger than the product of two exposures).

An overview of the conceptual model applied in this paper is provided in Supplement A.

Although we present the full output in the regression table, the discussion of the results mainly focuses on the total effect and the proportion explained by adolescent psychiatric disorders (i.e. interaction and/or mediation) of the association between adolescent poverty and drug use disorders. Estimated results are presented in two different models with 95% confidence intervals: model 1 (unadjusted model) and model 2 (adjusted for origin, parental psychiatric disorders and domicile). The covariates were the potential confounders of the examined association that were available in our register data. Given the theoretical justifications presented, the models were stratified by sex.

Sensitivity analyses

First, we determined the distribution of years spent in poverty and the outcome. Further, we assessed whether the risk of drug use disorders differed by years spent in poverty. (Supplementary Tables 1 and 2 available at https://doi.org/10.1192/bjo.2022.37). Second, we assessed whether the effect of adolescent psychiatric disorders on adult drug use disorders differed between internalising and externalising disorders in males and females, respectively. Internalising diagnoses were more common among females, as were externalising diagnoses among males (Supplementary Table 3 and Table 4). Comparing the effects of internalising and externalising diagnoses, respectively, yielded fairly similar results to those of our main analysis (Supplementary Tables 5 and 6). Third, we contrasted the unadjusted and adjusted models by computing the Cox regression of the association between exposure (poverty) and outcome (drug use disorders) in the presence of the mediator (psychiatric disorders) nesting model 1 to model 2. Then, we performed a likelihood ratio test to evaluate whether the inclusion of origin, parental psychiatric disorders and domicile significantly improved the model fitting (Supplementary B: likelihood ratio test for the main analyses presented in Supplementary Table 2). Fourth, we conducted a Wald test to verify whether the proportion explained by mediation was statistically different from the proportion explained by interaction. The Wald test suggested that these proportions were not significantly different.

Ethical approval

The Regional Ethics Committee in Stockholm approved the study before any records were linked (decision number: 2010-1185-31-5).

Results

Among the 634 233 individuals included in the analyses, about 26% experienced poverty in adolescence (Table 1). Nearly 49% of our study population were females. The majority were native Swedish (82%), whereas 18% had a migrant background. About 70% lived in a medium-sized town or rural area, and about 10% had at least one parent with a psychiatric disorder.

In females, the HR for drug use disorder was higher among those who had experienced poverty in adolescence, compared with those who were 'never in poverty': HR = 1.54 (95% CI, 1.45–1.63; Table 2, model 1). About 32% of the association was explained by interaction with or mediation by psychiatric disorder in adolescence ('Overall proportion eliminated'). The proportion explained by interaction with adolescent psychiatric disorder was higher than the proportion explained by mediation: 17% and 11%, respectively. However, the difference between the proportions was not statistically significant. When adjusting for domicile, origin and parental psychiatric disorder, the HR for drug use disorders decreased to 1.40 (95% CI, 1.32–1.63; Table 2, model 2). Furthermore, the proportion explained by interaction with or mediation by psychiatric disorder in adolescence decreased to 24%. The proportions explained by interaction only and mediation only decreased to 12% and 10%, respectively.

Table 1 Sociodemographic characteristics

Sociodemographic characteristics at baseline	Study population (N = 634 223) %
Poverty in adolescence	
Never in poverty	73.4
Experienced poverty	26.6
Origin	
Native Swedish	81.6
Youth with a migrant background	18.4
Domicile	
Big city	29.6
Town or rural area	70.4
Parental psychiatric disorder	
No	90.2
Yes	9.8

In males, the HR for drug use disorders was higher among those who had experienced poverty in adolescence, compared with the 'never in poverty' group: HR = 1.60 (95% CI, 1.53–1.67; Table 2, model 1). About 17% of the association was explained by interaction with or mediation by adolescent psychiatric disorder. Adjusting for domicile, origin and parental psychiatric disorder (Table 2, model 2) decreased the HR for drug use disorders: HR = 1.43 (95% CI, 1.37–1.49). The overall proportion explained by interaction and/or mediation decreased to 13%. The overall proportions explained by interaction only and mediation only were similar at around 6%.

Discussion

Our study showed that the risk of drug use disorders in adulthood was higher among males and females who had experienced poverty in adolescence. About 24% and 13% of this association (for females and males, respectively) was explained by psychiatric disorders in adolescence. This suggests that having a psychiatric disorder in adolescence might exacerbate the effect of early poverty on drug use disorders in adulthood (interaction), but also that adolescents who experienced poverty were more likely to have a psychiatric disorder and subsequent drug use disorders in adulthood (mediation).

Our findings that poverty in adolescence predicts drug use disorders in young adulthood are in line with a previous Swedish study showing that low socioeconomic position in childhood was associated with drug misuse later in life.[29] Our results suggested that adjusting for confounders, particularly parental psychiatric disorders, attenuated the estimates. Parental mental health problems might lead to negative parenting practices, exposing their offspring to social environments that lead to a greater propensity to engage in drug use behaviour.[30] Despite the clear relationship between socioeconomically disadvantaged conditions and either psychiatric disorder in adolescence,[31] or drug use disorder in adulthood,[29,32] there is a lack of evidence of the role of adolescent psychiatric disorders on the pathway (i.e. mediation) of inequalities in drug use disorders in adulthood, and the effect (i.e. interaction) of psychiatric disorders in adolescence in this association. One previous study from the USA, using cross-sectional data, reported that depression might have a role in mediating some of the relationships between socioeconomic status and drug use behaviours among teenagers. However, this mediating role of depression was found to be neither consistent nor powerful.[33]

Table 2 Association between poverty in adolescence and drug use disorder in young adulthood. Results from Cox regression analysis with four-way decomposition by presence of adolescent psychiatric diagnosis

	Drug use disorder in young adulthood (19–31 years of age)			
	Female		Male	
	Estimate (95% CI)		Estimate (95% CI)	
Four-way decomposition by presence of psychiatric diagnosis in adolescence	Model 1	Model 2	Model 1	Model 2
Total effects				
Total excess relative risk (*tereri*[a])	0.54 (0.45–0.63)	0.40 (0.32–0.63)	0.60 (0.53–0.67)	0.43 (0.37–0.49)
Excess relative risk due to neither mediation nor interaction (*ereri_cde*[a])	0.37 (0.29–0.44)	0.31 (0.23–0.45)	0.50 (0.44–0.56)	0.38 (0.31–0.43)
Excess relative risk due to interaction only (*ereri_intref*[a])	0.09 (0.05–0.14)	0.05 (0.02–0.13)	0.05 (0.02–0.07)	0.03 (0.01–0.04)
Excess relative risk due to mediated interaction (*ereri_intmed*[a])	0.02 (0.01–0.03)	0.01 (0.01–0.03)	0.01 (0.01–0.02)	0.01 (0.01–0.01)
Excess relative risk due to mediation only (*ereri_pie*[a])	0.06 (0.05–0.07)	0.04 (0.02–0.07)	0.04 (0.03–0.04)	0.03 (0.02–0.03)
Total effect relative risk ratio (*tereria*[a])	1.54 (1.45–1.63)	1.40 (1.32–1.63)	1.60 (1.53–1.67)	1.43 (1.37–1.49)
Effects of proportion				
Proportion due to neither mediation nor interaction (*p_cde*[a])	0.68 (0.60–0.75)	0.76 (0.68–0.85)	0.83 (0.78–0.88)	0.87 (0.82–0.91)
Proportion due to interaction only (*p_intref*[a])	0.17 (0.10–0.24)	0.12 (0.05–0.20)	0.08 (0.04–0.11)	0.06 (0.02–0.10)
Proportion due to mediated interaction (*p_intmed*[a])	0.04 (0.02–0.05)	0.02 (0.01–0.03)	0.02 (0.01–0.03)	0.01 (0.00–0.02)
Proportion due to mediation only (*p_pie*[a])	0.11 (0.09–0.14)	0.10 (0.07–0.12)	0.07 (0.05–0.08)	0.06 (0.04–0.07)
Overall proportion due to mediation (*op_m*[a])	0.15 (0.12–0.17)	0.11 (0.08–0.14)	0.09 (0.07–0.10)	0.07 (0.05–0.09)
Overall proportion due to interaction (*op_ati*[a])	0.21 (0.13–0.29)	0.14 (0.05–0.23)	0.10 (0.05–0.15)	0.07 (0.02–0.12)
Overall proportion eliminated (*op_e*[a])	0.32 (0.25–0.39)	0.24 (0.15–0.32)	0.17 (0.12–0.21)	0.13 (0.08–0.18)

Model 1, unadjusted model; model 2, adjusted for domicile, origin and parental psychiatric disorder. The upper part of the table (total effects) describes the relative risks. The lower part of the table (effects of proportion) describes the proportion of the association due to psychiatric disorders diagnosis.
a. Terms assigned by the Stata command.

Our findings suggest that young females who had experienced poverty and had a psychiatric diagnosis in adolescence were at greater risk of developing later drug use disorders. Although our results suggest that part of the relationship between poverty during adolescence and drug use disorders in adulthood was due to mediation by and/or interaction with psychiatric disorders, other confounding factors in this relationship are likely to be involved. For one thing, family poverty is likely to comprise many different risk factors (for example, adverse early life experiences, employment status, family structures, school performance and neighbourhood deprivation) that are linked to both drug use disorders and other psychiatric disorders. Moreover, in our study, adolescent psychiatric disorders, as well as adult drug use disorders, refer to individuals who have been in contact with specialised healthcare and received a diagnosis. Consequently, individuals facing barriers to seeking healthcare were not captured in the registers nor in our study, which limits the generalisability of our findings.

Implications

Our findings that poverty in adolescence was associated with drug use disorders in adulthood underscore the importance of policies aimed at narrowing socioeconomic inequalities in adolescence. Such policies should address wider areas of inequalities, for example, housing, parental and offspring's labour market participation, education, income support and access to healthcare. Our findings also suggest that interventions targeting adolescents with psychiatric disorders might reduce the risk of these individuals developing drug use disorders in adulthood. At the same time, social policies, and programmes to address socioeconomically disadvantaged families might help to counteract the effects of adolescent poverty on later drug use behaviours. Owing to the lack of longitudinal studies using robust methods in this field, it is still too early to make strong assumptions on the strategies needed. Nevertheless, our findings on the interaction of poverty and psychiatric disorders, especially in the female population, can help build a solid body of knowledge to provide input to future policy.

Strengths and limitations

A major strength of our study was that it was based on data from a combination of national registers covering the entire population living in Sweden. To our knowledge, this is the first longitudinal study to formally test the mediating and/or interacting role of adolescent psychiatric disorders in the association between poverty in adolescence and drug use disorders in adulthood using counterfactual methods. We were able to analyse females and males separately and adjust for important confounding variables.

Our study also had some limitations. Although we used modern methods for causal mediation analysis and adjusted for the potential confounders available in the register data, complete adjustment for confounding (e.g. schools, neighbourhood deprivation, family history of divorce or marital conflict) is still required to establish a causal relationship between poverty during adolescence and subsequent drug use disorders. Caution also needs to be made in how these findings are interpreted. Adolescent psychiatric disorders refer only to mental health problems requiring treatment. Also, drug-related disorders refer to individuals receiving an ICD diagnosis related to drug use, such as harmful drug use or drug dependence. The proportion of hidden individuals suffering from their drug use is likely to be high. Our registers only capture psychiatric and drug use disorders resulting in medical care. Consequently, these measurements are also measures of access to and utilisation of healthcare services. Individuals facing barriers to seeking care are captured neither in the registers nor in our study. This could have led to an underestimation of actual cases of individuals with psychiatric and drug use disorders. However, we have no way of knowing whether including more individuals would have strengthened our findings.

Despite the large data-set, the proportions of some diagnoses of the mediator/interaction variable (adolescent psychiatric disorders) and the outcome variable (drug use disorders) were too small to allow for a more detailed analysis. Moreover, it may be that individuals from a certain socioeconomic background are more prone to seek treatment, which would bias our results. For example, in Sweden, despite the healthcare system being free of charge for people under the age of 18, there is a gap between care needs and the utilisation of psychiatric care services, especially among those in socioeconomically disadvantaged and immigrant-dense neighbourhoods.[34] At the same time, about 50% of young adults aged 18–24 who had previously had contact with specialised psychiatric care were also diagnosed with substance use disorders.[35] A prior Danish study reported that patients in low socioeconomic positions

had relatively lower utilisation of mental health services,[36] which also would have led to an underestimation of actual cases.

In summary, poverty in adolescence was associated with drug use disorders in young adulthood. Part of this association (24% in females and 13% in males) was due to mediation by and/or interaction with psychiatric disorders. Narrowing socioeconomic inequalities in adolescence might help to reduce these risks. Interventions targeting adolescents facing poverty and psychiatric disorders might be especially important.

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Supplementary material

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Data availability

The data-sets analysed during the current study are not publicly available owing to the Swedish data protection laws that restrict public sharing of data. However, we are happy to answer any questions about the data used in this study and to share the statistical codes and unpublished results. The Swedish national registers are protected by special legislation that makes it possible for researchers to collect certain information without personal consent. The data-set used in this study is based on multiple linked data from national routine registers. The data-sets are anonymous and the researchers have no access to any personal information that could identify individuals included in the data-sets.

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Author contributions

H.M. had full access to all of the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis. Concept and design: all authors. Acquisition, analysis, or interpretation of data: A.L., V.S.S., H.M. and A.-K.D. Drafting of the manuscript: H.M., V.S.S. and A.-K.D. Critical revision of the manuscript for important intellectual content: all authors. Statistical analysis: H.M. and V.S.S. Obtained funding: A.-K.D.

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Declaration of interest

None.

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