

Research Article

FAMILY INCOME AND YOUTHS' SYMPTOMS OF DEPRESSION AND ANXIETY: A LONGITUDINAL STUDY OF THE FRENCH GAZEL YOUTH COHORT

Maria Melchior, Sc.D.,^{1,2*} Jean-François Chastang, Ph.D.,^{1,2} Vera Walburg, Ph.D.,^{1,2} Louise Arseneault, Ph.D.,³ Cédric Galéra, M.D. Sc.M.,⁴ and Eric Fombonne, M.D. FRCP⁵

Background: *It is not clear whether socioeconomic inequalities with regard to depression and anxiety are present in adolescence and young adulthood. We tested the hypothesis that in the community, youths growing up in families with low income have elevated rates of such psychological difficulties.* **Methods:** *We used data from participants of the GAZEL Youth study, a French community-based cohort assessed in 1991 and 1999 (n = 941 youths, 4–18 years of age at baseline). Measures of family income and youths' symptoms of depression and anxiety (assessed using the ASEBA family of instruments) were obtained from parents and youths at study baseline and follow-up. Covariates included family characteristics (parental divorce, parental unemployment or labor force exit, parental health difficulties including psychopathology and the quality of family relations) and youths' characteristics (sex, age, stressful life events, history of internalizing and externalizing problems).* **Results:** *Youths from families with low income during the study period had elevated odds of symptoms of depression and anxiety at follow-up (compared to youths from families with intermediate/high income, age-adjusted OR: 1.74, 95% CI 1.17–2.57; fully adjusted OR: 1.94, 95% CI: 1.27–2.97). In particular, the likelihood of psychological difficulties was elevated among youths from families that experienced decreasing and persistently low income over time (fully adjusted ORs, respectively: 2.44, 95% CI 1.24–4.81 and 1.83, 95% CI 1.10–3.06).* **Conclusions:** *Clinicians need to be aware that youths growing up in low-income families in the community may be at risk of depression and anxiety during the period of transition to adulthood.* *Depression and Anxiety 27:1095–1103, 2010.* © 2010 Wiley-Liss, Inc.

Key words: *depression; anxiety; socioeconomic position; adolescents; young adults; epidemiology*

¹Epidemiology of Occupational and Social Determinants of Health, Inserm U1018, CESP, YMRS1018, Villejuif, France

²University Versailles Saint-Quentin, Villejuif, France

³MRC Centre for Social, Genetic and Developmental Psychiatry, Institute of Psychiatry, King's College, London, United Kingdom

⁴Service de Pédopsychiatrie universitaire, Hôpital Charles-Perrens, Université Victor Ségalen Bordeaux 2, Bordeaux, France

⁵McGill University, Montreal Children's Hospital, Child Psychiatry, Montreal, Canada

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*Correspondence to: Maria Melchior, Inserm U1018, CESP, Epidemiology of Occupational and Social Determinants of Health, Hôpital Paul Brousse, 16, avenue Paul Vaillant-Couturier, 94800 Villejuif, France. E-mail: maria.melchior@inserm.fr

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INTRODUCTION

Research suggests that depression, the most frequent mental disorder and second cause of morbidity in industrialized countries,^[1] is especially likely among individuals who belong to socioeconomically disadvantaged groups.^[2] These inequalities are observed using various socioeconomic indicators past and current, such as parental socioeconomic position,^[3] educational level, employment status, income level, and neighbourhood socioeconomic disadvantage.^[2,4,5] Low socioeconomic position predicts the risk of depression and anxiety in adults;^[2,6,7] however, studies conducted in youths have yielded inconsistent findings.^[8–14]

It is important to note that, with notable exceptions,^[8,12,14] past studies on socioeconomic factors and youths' symptoms of depression and anxiety were based on low-income samples, and it is not clear whether low socioeconomic position is related to internalizing symptoms in more varied populations. Moreover, the use of different measures of socioeconomic position (family income,^[9,12] compound indices of family socioeconomic position^[8,10,13] or neighbourhood socioeconomic characteristics^[14]) raises the possibility that past study results varied with the socioeconomic indicator used.^[15] In order to better understand and possibly prevent youths' internalizing symptoms, it is important to gain better knowledge of the role of socioeconomic circumstances from early on in life.

In this study, we use data from the Gazel Youth Study, a community sample based in France, to examine the association between long-term socioeconomic position, thought to be a precise measure of socioeconomic disadvantage,^[16] and youths' symptoms of depression and anxiety.

Specifically, we test the hypothesis that socioeconomic circumstances, as assessed by family income over time, are associated with internalizing symptoms (anxious/depressed syndrome, withdrawn behavior, somatic complaints) in adolescence and young adulthood, that is during the period when most mental disorders onset.^[17,18] Our analysis accounts for factors potentially related both to family income and youths' mental health, including family characteristics (parental divorce, parental unemployment or labor force exit, parental health difficulties including psychopathology, the quality of family relations) and youths' characteristics (sex, age, exposure to stressful life events, mental health difficulties at study baseline). We include these characteristics in our statistical models in order to estimate the association between our main variable of interest and youths' mental health net of their influence.

MATERIALS AND METHODS

STUDY POPULATION

Participants were drawn from the GAZEL Youth study set up in 1991. Study youths were recruited via a parent who takes part in the GAZEL cohort study, an ongoing epidemiological cohort which

began in 1989 among employees of France's National Electricity and Gas Company (abbreviated EDF-GDF).^[19,20] GAZEL cohort volunteers work in a variety of blue-collar and office jobs throughout France and benefited from high job stability and occupational mobility throughout their career. Since 1989, GAZEL study participants complete a yearly study questionnaire assessing health and associated factors (participation rate: approximately 75% each year, <1% loss to follow-up since study inception).

The GAZEL Youth study sample was stratified by family size and socioeconomic status according to 1991 census data to represent the socio-demographic characteristics of French youths.^[19] Data were collected through postal questionnaires in 1991 (parental questionnaire) and at follow-up in 1999 (parental and youth questionnaires). At study baseline, 2,582 youths aged 4–18 years were included (62.2% participation rate). 1,268 parents (49.1%) and 1148 youths (44.5%) took part in the follow-up. These response rates are comparable to other mental health surveys conducted in France.^[21] As previously reported, baseline participants were somewhat older than nonparticipants, more likely to have parents who were married, single, or widowed rather than divorced, and more likely to work in a high- rather than low-occupational grade. Follow-up participants were more likely than nonparticipants to be female, younger than 18 years of age, and to have parents who were nonsmokers and had high socioeconomic position; other socio-demographic or health characteristics, including parental and youth psychopathology, were not associated with study participation.^[22,23]

The present analysis is based on all 941 families with complete data on income and mental health. Secondary analyses for which we conducted multiple imputations (Proc MIAnalyze) yielded results similar to our main findings hence we only report results on complete cases.

The GAZEL Youth study was approved by the French National Committee for data protection (CNIL: Commission Nationale Informatique et Liberté).

MEASURES

Family income. Family income data were obtained from participants' parents through GAZEL study questionnaires in 1989 and 2002. Median family income in the study was <1,981 euros/month at baseline and <2,592 euros/month at follow-up, as compared with 2,250 and 2,730 euros/month in the French population of the same age during the same period.^[24] Estimated mean family income in the study was 2,408 euros/month at baseline and 3,329 euros/month at follow-up, as compared with 2,695 and 3,516 euros/month in the French population of the same age during the same period.^[25]

Following previous research,^[26] we dichotomized family income using the sample median (baseline: low: <1,981 euros/month, high/intermediate: ≥1,981 euros/month; follow-up: low: <2,592 euros/month, high/intermediate: ≥2,592 euros/month). Baseline and follow-up measures were then combined into a longitudinal indicator of family income (Ever low versus Always high/intermediate income). In additional analyses, we subdivided these two groups into four specific trajectories of family income (Always High/intermediate, Low to High/intermediate, High/intermediate to Low, Always Low) and studied their association with youths' mental health. In 40 cases, data were missing on one of the two family income measures; we then used the measure available to us as a proxy of longitudinal family income (in all cases, participants were exposed to low income and therefore classified in the "ever low income" group). In additional analyses of specific income trajectories, these missing data were excluded, yielding a sample of 901.

Youths' mental health. Youths' psychopathology was assessed using the ASEBA (Achenbach System of Empirically Based Assessment) family of instruments: the Child Behaviour Checklist

administered to parents at study baseline and follow-up and the Youth Self-Report (YSR) administered to participating youths at follow-up.^[27,28] This largely used psychometric instrument comprises 118 items on youths' behavior problems over a 6 months period, summed into symptom scales (internalizing and externalizing) and has previously been validated in French.^[29–31] Youths' internalizing score (at baseline and follow-up) was based on three syndrome subscales: "anxious/depressed syndrome" (13 items), "withdrawn behavior" (8 items), and "somatic complaints" (10 items). Because mental health information from multiple informants is considered most valid, internalizing symptoms at follow-up were assessed combining parental and youths' own reports.^[27] Symptom scores obtained from parents and youths were summed and dichotomized at the 85th percentile score to determine the presence of clinically significant internalizing symptoms.^[8] Consistent with other research, in our study the correlation between parents' and youths' ratings of youths' internalizing symptoms was .5.^[32] By combining information collected from parents and youths we were able to identify participants with the highest overall internalizing scores.^[32,33] As suggested by the ASEBA manual, critical scores were calculated separately for each subscale.^[28] In six cases, information from either parent or youth was missing; we then used the single measure available to us (the parent in one case and the youth in five cases). Due to high comorbidity between internalizing and externalizing symptoms, our analysis accounts for youths' externalizing symptoms at baseline, as assessed by two ASEBA subscales: "aggressive behavior" and "rule-breaking behavior".^[34]

Family characteristics. Family characteristics were obtained from GAZEL study data files. At baseline, parents reported their family situation (parents divorced/separated versus two-parent family) and the number of children in the household (1, 2, or ≥ 3). Every year during follow-up (1991–1999), parents reported on their own and their spouse's important life events; this information was used to assess the baseline to follow-up occurrence of parental divorce (yes versus no), parental unemployment (yes versus no), parental labor force exit (yes versus no), parental health problems severe enough to result in hospitalization (yes versus no), parental psychopathology (i.e. the reference parent's depressive symptoms (yes versus no), treated depression (yes versus no) or treated sleep problems (yes versus no)). At follow-up, parents rated the quality of family relations on three scales (mother–father, youth–mother, youth–father), each scored 1–5 (from poor to excellent). To assess overall family relations, these three subscales were summed and divided into tertiles (good, intermediate, poor family relations).

Youths' characteristics. Youths' sociodemographic characteristics included youths' sex (male versus female) and age (4–10 years versus 11–18 years at baseline). At follow-up, youths were asked to report on five important life events in the preceding 12 months (lack of participation in group activities such as clubs or social groups, school change, death of a family member or close friend, severe health problems in a close person, loss of contact with close friends). Life events were summed and studied as a dichotomous variable (≥ 1 versus 0).

STATISTICAL ANALYSIS

We studied the association between family income and youths' clinically significant internalizing symptoms at follow-up (coded as dichotomous variables) (a) adjusting for youths' age, (b) additionally controlling the analysis for all covariates associated with youths' internalizing symptoms at a statistical significance level $P < .20$ in age-adjusted models. Youths' age and sex, which influence rates of mental health difficulties,^[35] were automatically included in the multivariate model. In additional analyses, we tested whether associations varied across different subscales of internalizing symptoms (anxious/depressed syndrome, withdrawn behaviour, and somatic complaints).

All analyses were carried out using logistic regression implemented with the SAS statistical software.

RESULTS

Characteristics of study participants and their families are presented in Table 1. Cross-sectional correlations between family income and youths' internalizing symptoms were .06 (P -value = .03) at baseline and .09 (P -value = .003) at follow-up. Youths' internalizing symptoms were associated with longitudinal family income (age-adjusted OR for ever low versus always high/intermediate: 1.74, 95% CI 1.17–2.57). Additionally, youths' internalizing symptoms were predicted by parental health problems, parental psychopathology, family relations, important life events, as well as internalizing and externalizing symptoms. These factors were not strongly associated with family income; nevertheless, we adjusted for them in multivariate regression models to estimate odds of youths' internalizing symptoms net of their influence.

In multivariate regression analysis controlled for parental labor force exit, parental health problems, parental psychopathology, family relations, youth's sex, youth's age, youth's important life events, youth's internalizing and externalizing symptoms (Table 2), the association between longitudinal family income and internalizing symptoms at follow-up remained statistically significant, such that in youths from families that experienced low income during follow-up the odds of significant internalizing symptoms were 1.96 times higher (95% CI 1.27–3.04) than in youths from families with high/intermediate income level. Additional analyses revealed that the association between family income and internalizing symptoms was stronger in male than in female participants (fully adjusted ORs, respectively: 2.67, 95% CI: 1.40–5.11 and 1.53, 95% CI 0.83–2.89) and in youths ≤ 18 years of age than in youths > 19 years of age (fully adjusted ORs, respectively: 2.22, 95% CI: 1.18–4.19 and 1.73, 95% CI 0.93–3.21); however, interaction terms between family income and youths' sex and youths' age were not statistically significant. Testing for statistical interactions between income trajectories and family relations we found no evidence of an additive effect of these two exposures (not shown).

As shown in Table 3, our age-adjusted analyses examining specific trajectories of family income and youths' mental health revealed that participants whose families experienced decreasing income (i.e. high/intermediate income at baseline and low income at follow-up) and those who experienced persistently low income from baseline to follow-up were more likely to have internalizing symptoms at follow-up than participants from families that had high/intermediate income throughout the study period (respectively, age-adjusted ORs: 2.35, 95% CI 1.26–4.39 and 1.71, 95% CI 1.07–2.75). In multivariate analyses, these ORs remained statistically significant (fully adjusted

TABLE 1. Characteristics of adolescents and young adults in relation to internalizing symptoms: 8-year follow-up of the GAZEL Youth study (% , n, age-adjusted ORs, P-value)

	% (n)	Age-adjusted OR (95% CI)	P-value
<i>Family characteristics</i>			
Longitudinal family income			
Always high/intermediate	52.1 (490)	1.0	0.006
Ever low	47.9 (451)	1.74 (1.17–2.57)	
Family situation			
Two-parent family	96.2 (891)	1.0	0.41
Parents divorced/separated	3.4 (35)	1.46 (0.59–3.60)	
Number of children in the household			
1	16.0 (151)	1.0	0.55
2	36.9 (347)	1.00 (0.57–1.73)	
≥3	47.1 (443)	0.80 (0.47–1.39)	
Parental divorce			
No	84.2 (792)	1.0	0.59
Yes	15.8 (149)	1.15 (0.69–1.91)	
Parental unemployment			
No	90.1 (848)	1.0	0.35
Yes	9.9 (93)	0.71 (0.35–1.45)	
Parental labor force exit			
No	73.3 (690)	1.0	0.097
Yes	26.7 (251)	1.42 (0.94–2.14)	
Parental health problems			
No	46.8 (440)	1.0	0.017
Yes	53.2 (501)	1.62 (1.09–2.41)	
Parental psychopathology			
No	67.8 (638)	1.0	0.0066
Yes	32.2 (303)	1.73 (1.16–2.56)	
Family relations			
Good	34.6 (326)	1.0	
Intermediate	37.2 (350)	2.69 (1.56–4.64)	<0.0001
Poor	28.2 (265)	3.69 (1.56–4.64)	
Referent parent's sex			
Male	69.5 (654)	1	0.62
Female	30.5 (287)	1.11 (0.73–1.69)	
<i>Youths' characteristics</i>			
Sex			
Male	47.5 (447)	1.0	0.53
Female	52.5 (494)	0.88 (0.60–1.30)	
Age at baseline ^a			
4–10 years	50.1 (471)	1.0	0.24
11–18 years	49.9 (470)	1.26 (0.86–1.85)	
Important life events			
0	20.1 (189)	1.0	0.0014
≥1	79.9 (752)	2.99 (1.53–5.86)	
Baseline internalizing symptoms			
Absent	86.2 (811)	1.0	<0.0001
Present	13.8 (130)	6.24 (4.05–9.62)	
Baseline externalizing symptoms			
Absent	86.5 (814)	1.0	<0.0001
Present	13.5 (127)	5.43 (3.49–8.44)	

^aThe association between age and youths' internalizing symptoms at follow-up was tested in a univariate regression model.

TABLE 2. Longitudinal family income and internalizing symptoms among adolescents and young adults of the GAZEL Youth study over an 8-year follow-up period: multivariate regression (*n* = 941, OR, 95% CI)

	OR (95% CI)
<i>Family characteristics</i>	
Longitudinal family income	
Always high/intermediate	1.0
Ever low	1.96 (1.27–3.04)
Parental labor force exit	
No	1.0
Yes	1.16 (0.73–1.86)
Parental health problems	
No	1.0
Yes	1.38 (0.88–2.15)
Parental psychopathology	
No	1.0
Yes	1.39 (0.89–2.16)
Family relations	
Good	1.0
Intermediate	2.25 (1.22–4.16)
Poor	2.54 (1.41–4.58)
<i>Youths' characteristics</i>	
Sex	
Male	1.0
Female	0.81 (0.53–1.25)
Age at baseline	
4–10 years	1.0
11–18 years	1.31 (0.84–2.05)
Important life events	
0	1.0
≥ 1	2.07 (1.02–4.20)
Baseline internalizing symptoms	
Absent	1.0
Present	5.37 (3.35–8.60)
Baseline externalizing symptoms	
Absent	1.0
Present	4.05 (2.46–6.66)

ORs: decreasing income: 2.44, 95% CI 1.24–4.81, persistently low income: 1.83, 95% 1.10–3.06).

Overall, the role of longitudinal family income appeared comparable with regard to the three subscales of internalizing symptoms (anxious/depressed symptoms, withdrawn behavior, and somatic complaints) (Fig. 1). In multivariate regression analyses, family income predicted youths' depressed/anxious syndrome as well as withdrawn behavior, but not somatic complaints (not shown).

DISCUSSION

Studying a community sample of adolescents and young adults, we found that youths from families that

TABLE 3. Trajectories of family income in relation to internalizing symptoms among adolescents and young adults of the GAZEL Youth study over an 8-year follow-up period (*n* = 901, OR, 95% CI)

	<i>n</i>	OR (95% CI)
<i>Age-adjusted regression model</i>		
Family income trajectory		
High/intermediate–High/intermediate	490	1.0
Low–high/Intermediate	117	1.43 (0.78–2.63)
High/Intermediate–low	79	2.35 (1.26–4.39)
Low–Low	215	1.71 (1.07–2.75)
<i>Multivariate regression model^a</i>		
Family income trajectory		
High/intermediate–High/intermediate	490	1
Low–High/intermediate	117	1.65 (0.85–3.17)
High/intermediate–Low	79	2.44 (1.24–4.81)
Low–Low	215	1.83 (1.10–3.06)

^aThe multivariate regression model is adjusted for parental labor force exit, parental health problems, parental psychopathology, family relations, youth's sex, youth's age, youth's important life events, youth's internalizing at baseline and externalizing problems at baseline.

experienced low income had elevated rates of internalizing symptoms. In particular, youths whose families had persistently low or decreasing income were especially vulnerable. After accounting for parental divorce, parental unemployment or labor force exit, parental health difficulties including psychopathology and the quality of family relations and youths' sex, age, exposure to stressful life events as well as prior history of internalizing and externalizing problems, the odds of significant symptoms of depression and anxiety among youths from families with low income were up to 96%. These multiple factors predicted youths' internalizing symptoms but were not strongly associated with family income. Further research is needed to test whether this is also observed in other community samples, in Europe as well as in the United States. Although socioeconomic factors have been found to predict internalizing symptoms among adults, ours is one of few studies to suggest that such socioeconomic inequalities can already be observed in youths.^[8–11]

STRENGTHS AND LIMITATIONS

Our study presents several strengths: (1) a sample of community-based adolescents and young adults prospectively followed over a period of 8 years, (2) ascertainment of youths' psychological difficulties through combined self- and parent reports, which allowed us to identify youths' with high levels of distress as observed by multiple informants,^[32,36] (3) data on family income and life events collected from parents independently of assessments of youths' characteristics and mental health, (4) data on family events related to income variation and youths' mental health collected yearly during the study period, which

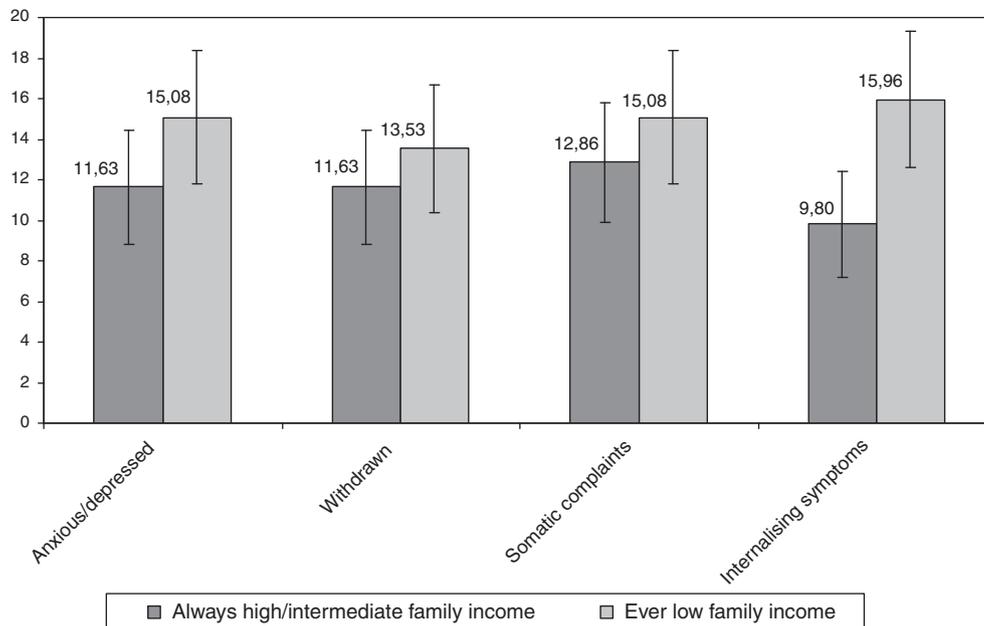


Figure 1. Longitudinal family income in relation to internalizing symptoms among adolescents and young adults: an 8-year follow-up of the GAZEL Youth Study ($n = 941$, % with symptoms, 95% CI).

made it possible to account for youths' changing circumstances and to study the association between youths' characteristics and mental health prospectively.

Before interpreting our findings, we need to acknowledge potential study limitations. First, our analysis was based on a sample of youths whose father or mother participated in an ongoing epidemiological study recruited among employees of a large national company. Therefore, although the GAZEL Youth study sample was selected to represent the socio-demographic and family characteristics of French youths, we could not study individuals experiencing the harshest forms of socioeconomic disadvantage. Prior research from the GAZEL cohort shows that socioeconomic factors are related to mental health in this population,^[26,37] which implies that this sample is well suited to study social inequalities in health. Nevertheless, in the population at large, the association between low family income and youths' internalizing problems may be stronger than we report. Second, at follow-up, study participation rate was approximately 50% and youths from lower socioeconomic backgrounds were less likely to participate. Yet participants and nonparticipants did not differ in terms of baseline mental health, and our sample appears representative of the entire cohort in terms of health. Third, our follow-up measure of family income was obtained after the assessment of youths' mental health, raising the possibility of exposure misclassification. Reassuringly, during the short interval between income and mental health measurements, follow-up income groups did not differ with regard to the prevalence of events likely to influence both family income and mental health

(parental divorce, unemployment, labor market exit). Moreover, only 9.4% of study participants in the ever low income group were exposed to low income only at follow-up. Fourth, parental psychopathology was assessed using a global measure of depressive symptomatology obtained from the reference parent. To strengthen our assessment, we combined parental reports of psychological problems every year during the 8-year follow-up period. Moreover, we additionally controlled the analyses for health problems severe enough to result in hospitalization in both parents during the entire follow-up period, which allowed us to account for the most severe forms of parental psychopathology. Importantly, prior research reported that parental mental illness does not entirely explain the association between socioeconomic circumstances and youths' internalizing symptoms,^[8,38,39] which is consistent with our results.

SOCIOECONOMIC FACTORS AND YOUTHS' INTERNALIZING SYMPTOMS

Compared to youths whose families had high/intermediate income, those whose families experienced low income were more likely to have significant symptoms of depression and anxiety. Our detailed analyses revealed that this pattern was primarily driven by elevated levels of depression and anxiety among youths whose families experienced low income persistently from childhood on or when the youths were in their late teens or early twenties. This suggests that at the time when youths are especially vulnerable to internalizing symptoms, concomitant socioeconomic

difficulties, whether they are long-lasting or recent, constitute relevant risk markers. Among symptoms included in the overall internalizing score, family income was associated with a depressed/anxious syndrome and with withdrawn behavior but not with somatic complaints, suggesting that these different dimensions of youths' psychological well-being have different risk factors.^[40]

Socioeconomic disadvantage may shape youths' mental health in several ways: (1) through the lasting effects of early life experiences, (2) through influences on academic and socioeconomic attainment, (3) through direct biological mechanisms. In this study, we accounted for the first mechanism by controlling the analyses for family disruption,^[3,41] parental physical and mental illness,^[42] and family conflict.^[43] Our results indicated that, with the exception of family disruption which previously has not been consistently associated with long-term patterns of mental health,^[42] these factors were associated with youths' mental health in univariate analyses, but did not explain the effect of longitudinal family income. Additional risk factors that could contribute to socioeconomic inequalities in youths' mental health difficulties but which we were not able to control for in this study include acute financial difficulties,^[42] malnutrition,^[44] harsh parenting, and childhood maltreatment.^[41,45-49]

Family socioeconomic position could also influence long-term mental health through youths' own academic and socioeconomic attainment.^[50] Thus, as suggested by prior research, low socioeconomic position could set into motion a cycle of persistent disadvantage with long-term mental health consequences.^[51,52] We could not examine this question in detail because participants were aged 12–26 years at the time of follow-up and most had not yet achieved significant educational milestones. However, participants are currently in their 20s and early 30s, and owing to a new wave of data collection currently under way, in the future we will be able to study the impact of health status on socioeconomic attainment and the ways in which educational achievement mediates this relationship.

Finally, socioeconomic adversity may result in a heightened biological response to stress.^[53] Relevant to the occurrence of internalizing disorders such as depression and anxiety, this may become manifest through elevated stress-hormone levels,^[54] an increased inflammatory response,^[55,56] and changes in brain morphology and functioning at the level of the hippocampus.^[57] Current evidence suggests that brain development is most sensitive to sustained adversity; however, this hypothesis is still under study.^[58]

CONCLUSIONS

Reducing socioeconomic inequalities with regard to mental health may entail addressing the needs of

youths whose families experience low income and who appear especially vulnerable to significant internalizing symptoms upon entering adulthood. For instance, income support programs such as the US-based New Hope intervention [<http://www.mdrc.org/publications/488/overview.html>] have shown to benefit families and improve children's outcomes; such preventive strategies should be disseminated more widely.

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