Examining the link between socio-economic position and mental health in early adolescents
Amone, Kennedy P'Olak

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Socio-economic Position and Mental Health Problems
In Pre- and Early-adolescents:
The TRAILS study

‘Poverty is the greatest risk factor of all’ Schorr (1988)

Kennedy Amone-P’Olak 1 2
Huibert Burger 1 3
Johan Ormel 1 2
Martijn Huisman 1
Frank C. Verhulst 4
Albertine J. Oldehinkel 1 2 4

1 Interdisciplinary Centre for Psychiatric Epidemiology (ICPE),
2 Graduate School of Behavioural and Cognitive Neurosciences (BCN),
3 Department of Epidemiology at University Medical Centre Groningen, University of Groningen.
4 Department of Child and Adolescent Psychiatry, Erasmus Medical Centre, Erasmus University, Rotterdam

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ABSTRACT

Background: Family socio-economic position (SEP) is known to be associated with adolescent mental health. Whether the relationship is different for different mental health dimensions is unknown.

Methods: Using a cross-sectional design, we investigated the differential effects of family SEP on multiple mental health dimensions in preadolescents (N = 2230, baseline age 10–12, 51% girls) using reports from multiple informants (parent, self, and teachers). A score equal to or higher than the 85th percentile (averaged across informants) defined mental health problems. Results: SEP was inversely associated with all dimensions. Compared to high SEP, the odds ratios (OR) for externalizing problems were 3.88 (95% confidence interval (CI): 2.56, 5.90) and 2.05 (CI: 1.34, 3.14) for low and intermediate SEP, respectively. For internalizing problems, they were 1.86 (CI: 1.28, 2.70) and 1.37 (CI: 0.94, 2.00), respectively. When adjusted for externalizing problems, SEP effects on internalizing problems materially attenuated (OR: 1.47, CI: 0.78, 1.68 and OR: 1.34, CI: 0.91, 1.96) while the converse was less pronounced (OR: 3.39, CI: 2.24, 5.15) and (OR: 1.91, CI: 1.25, 2.94). Conclusion: In early adolescence, the risk of mental health problems increases with decreasing SEP, particularly for externalizing problems. Further, the SEP-internalizing problems relationship may be partly explained by shared aspects with externalizing problems.

Key words: socioeconomic position – adolescents – gender – mental health problems.
INTRODUCTION

In children and adolescents, mental health disorders form a major public health problem because they are common, are associated with considerable impairment, and form the basis for later mental disorders (Hofstra, Van de Ende, Verhulst, 2001; WHO, 2005). Apart from being a public health problem, mental health problems, especially externalizing problem behaviors, constitute an increasing burden to the criminal justice system (Due, Lynch, Holstein, Modvig, 2003). Available epidemiological data estimate a worldwide prevalence of child and adolescent mental health disorders at 23% (WHO, 2005).

Psychobiological, environmental and social factors, among which is family socio-economic position (SEP); contribute to differences in mental health (WHO, 2003). Family SEP may be particularly important for mental health in children and adolescents because of the influential role of the family at this stage of development (Conger, Conger, Elder, Lorenz, et al. 1992).

Most previous studies concentrated on the association between SEP and mental health problems as a group, without considering the possibility that SEP may affect different mental health dimensions differently. Indeed, social factors such as SEP have been attributed more frequently to the etiology of externalizing than internalizing problems (Kapi, Veltisista, Kavadias, Lekea, Bakoula, 2007; Loeber, Farrington, Stouthamer-Loeber, Van Kammen, 1998; Mcleod, Shanahan, 1993). For example, influences from deviant peers, common in low SEP category, are known to promote aggressive and delinquent behaviors (Chen, Mathews, Boyce, 2002). Conversely, personality characteristics such as temperament (Fendrich, Warner, Weissman, 1990) and the experience of stressful life events, especially those characterized by loss, humiliation, and entrapment are known to be risk factors for internalizing problems (Brown, Harris, 1989; Kendler, Hettema, Butera, Gardner, Prescott, 2003). As the distribution or influence of these risk factors vary with SEP, different mental health dimensions may have different relationships with SEP. Research on the differential effects of SEP on mental health problems may shed light on differences in etiology or course and provide clues for prevention and intervention.

Studies on the differential effects of SEP on a range of mental health dimensions simultaneously in a single cohort are scarce (Wadsworth, Achenbach, 2005). Available studies have focused on one or two narrowband (e.g. aggression, delinquency, anxiety, etc.) or broadband problem domains (e.g. internalizing, externalizing, and total problems) and have yielded inconsistent results (Bradley, Corwyn, 2002). These inconsistencies may be due to the use of different methodologies (Chen, Berdan, 2006), different indicators of SEP used and varying sources of information on family SEP.
Using a cross-sectional design, we report on an analysis of data from a large population-based study of early adolescents using a robust measure of SEP that includes parents’ education, occupation, and family income. Our study investigated the differential effects of family SEP on a variety of mental health dimensions. We hypothesized that SEP is more strongly associated with problems in the externalizing domain than with problems in the internalizing domain. Additionally, gender differences in the relationships between family SEP and various mental health dimensions have been suggested in previous studies (Bolger, Patterson, Thompson, Kupersmidt, 1995). For example, low SEP is known to generate family conflicts, and boys more than girls respond to family conflicts with aggressive and disruptive behaviors, which in turn, will elicit punitive responses from parents (Bolger, Patterson, Thompson, Kupersmidt, 1995). For this reason, we studied gender differences in our sample.

MATERIALS AND METHODS

Sample

Subjects were participants in the ‘TRacking Adolescents’ Individual Lives Survey’ (TRAILS), a prospective cohort study of Dutch (pre) adolescents, aimed at charting and explaining the development of mental health problems from childhood into early adulthood. TRAILS was approved by the Central Committee on Research Involving Human Subjects. Sample selection involved two steps. First, five municipalities in the North of the Netherlands, including both urban and rural areas, were requested to give names and addresses of all inhabitants born between 10-01-1989 and 09-30-1990 (first two municipalities) or 10-01-1990 and 09-30-1991 (last three municipalities). Of all the children approached for enrolment in the study (N = 3145), 6.7% were excluded because of mental or physical incapability or language problems. Finally, 76.0% (N = 2230, mean age = 11.09, SD = 0.56, 50.8% girls) were enrolled in the study of which 96.4% (N = 2149, 51.0% girls) participated in the first follow-
up assessment (T2-Mean age = 13.6, SD = 0.53, range = 12–15), held about two years after baseline assessment (T1-Mean = 11.1, SD 0.55, range 10–12). The present study involves data from the first and second assessment waves (T1 and T2 respectively). Responders and non-responders did not differ with respect to problem behaviors, socio-demographic variables or mental health problems (De Winter, Oldehinkel, Veenstra, et al., 2005; Huisman, Oldehinkel, De Winter, et al. 2008).

Data collection

At T1, well-trained interviewers visited parents or guardians (preferably mothers, 95.6%) at their homes to administer interviews covering a wide range of topics, including SEP and their children’s mental health. Children filled out questionnaires at school under the supervision of TRAILS assistants. Teachers were asked to fill out a brief questionnaire for all TRAILS-children in their class. T2 involved only questionnaires, to be filled out by the participants, their parents and teachers. As in T1, the adolescents completed their questionnaires at school. Interviews were conducted and questionnaires filled after complete description of the study to participants. Thereafter, written informed consent and assent were obtained from the parents and participants respectively.

Measures

Mental health outcomes: Mental health dimensions of pre- and early adolescents were measured at both T1 and T2 by Child Behavior Checklist (CBCL), Youth Self-Report (YSR), (Achenbach, 1991a; 1991b), and Teacher’s Checklist of Psychopathology (TCP) based on the Teacher Report Form (TRF) (Achenbach, 1991c). The CBCL questionnaire and the self-report version (YSR), are designed to be completed by parents of children aged 4–18 years and by adolescents aged 11–18 years, respectively. The time frame for CBCL and YSR is previous six months and for TCP is the previous 2 months. The TCP was developed to reduce the respondent burden for teachers, as each had multiple participants to report on. This measure contains descriptions (vignettes) of problem behaviors corresponding to the syndrome scales of the CBCL and YSR (vignettes available on request). Response options for each description of the TCP ranged from 0 (not applicable) to 4 (very clearly or frequently applicable). The TCP vignettes correlated around 0.60 with the full Teacher Report Form syndrome scales filled out by a small sample of teachers (Ferdinand, 2003, internal report available on request). Besides a total problems score, both questionnaires contain eight syndrome subscales each: “anxious depressed”, “withdrawn behavior”, “somatic complaints”, “aggressive behavior”, “delinquent behavior”, “social problems”, “thought problems”, and “attention problems”. The questions regard the past six months and are scored as follows: 0 = not true, 1 = somewhat or sometimes true, 2 = very true or often true. The validity of these scales have been
documented (Achenbach, 1991a; 1991b; 1991c) and reiterated in a Dutch sample (Verhulst, Van der Ende, Koot, 1997). In our sample, the reliability statistics are as follows: CBCL-Internalizing (32 items, Cronbach $\alpha = .85$), CBCL-Externalizing (35 items, $\alpha = .90$), YSR-Internalizing (31 items, $\alpha = .87$), YSR-Externalizing (32 items, $\alpha = .85$); TCP-Internalizing (3 vignettes, $\alpha = .71$), and TCP-Externalizing (2 vignettes, $\alpha = .78$).

The percentage of missing data was 1.9% for SEP and between 2 and 13% and 6 and 31% for mental health dimensions at T1 and T2, respectively. We used multiple imputations to estimate values for missing data under the assumption that the missing values only depended on observed values (missing at random). This technique has been shown to produce more valid results than complete case analysis, overall mean imputation and the missing-indicator method when data are not missing completely at random (Donders, Heijndenvd, Stijnen, Moons, 2006). We created five complete datasets using the NORM computer software. Usually, the number of data sets to be created depends on the percentage of missing data, however, 3–5 imputations are known to be adequate to realize superior results (Schafer, 1998, 1999). All five data sets were analyzed in an identical way and their results were pooled.

In this study, information on mental health dimensions was obtained from multiple informants (parents, teachers, and adolescents themselves). Information from different sources is known to be a better predictor of disorder and the best estimate of diagnosis rather than a single source because it reduces rater bias (Achenbach, McConaughy, Howell, 1987; Verhulst, Koot, Van der Ende, 1994). We computed a combined estimate of mental health using the scores given by the different informants. In order to place the same weight on information from different informants, the scores on YSR, CBCL and TCP were all standardized to a zero to one scale by dividing the scores on each scale by its range before averaging over informants. Given our interest in levels of psychopathology rather than age related development and because preliminary analyses showed no major differences between T1 and T2 scores (Cohen’s $d$ denoting effect size for all dimensions $<0.2$), we averaged the scores on CBCL, YSR, and TCP obtained at T1 and T2.

We dichotomized the mental health dimensions prior to the analyses by choosing the 85th percentile to demarcate the presence or absence of a mental health problem. Previous studies showed that scores greater than or equal to the 85th percentile on the CBCL and TRF Total Problems predicted poor outcomes. Scores over the 85th percentile also denote the borderline clinical mental health disorders (De Winter, Oldehinkel, Veenstra, et al., 2005; Huisman, Oldehinkel, De Winter, et al., 2008; Verhulst, Koot, Van der Ende, 1994), thus making the possible clinical implication of our study of
greater public health relevance. Furthermore, there is often high cross informants agreement on adolescents with high scores (Achenbach, Rescorla, 2001).

**Socio-economic position:** SEP was assessed at baseline using five indicators: family income, educational level (father and mother), and occupational level (father and mother) using the International Standard Classification of Occupations (ISCO) (Ganzeboom, Treiman, 1996). We averaged the five SEP indices after standardization (z-scores). The lowest 25%, intermediate 50% and highest 25% of the scores were considered to represent low, intermediate and high SEP, respectively. The SEP index captured 61.2 per cent of the variance in the five indicators with an internal consistency of 0.84 in the TRAILS population. Missing values (e.g. when there is only one parent in the family) did not affect the association of the SEP variable with other variables (Veenstra, Lindenberg, Oldehinkel, De Winter, Verhulst, Ormel, 2005).

**Data analyses**

Although TRAILS is a prospective cohort study, the design for our analysis was cross-sectional because mental health outcomes from the two assessment waves were averaged to a single value. First we assessed the potential of age and gender to confound the associations between SEP and mental health dimensions by studying their distribution across categories of SEP. To examine whether SEP was associated with poor mental health, the prevalence of each specific dimension (narrow-band problems: e.g. aggression, anxious depressed, attention problems, etc.) as well as the broadband problem domains (e.g. externalizing, internalizing, and total problems), was calculated according to SEP categories. Next, binary logistic regression analyses were performed to obtain odds ratios and 95% confidence intervals (95% CI) of mental health problems for the lowest and the intermediate SEP categories, relative to the high SEP category. In these analyses the presence of each separate mental health problem was the dependent variable and SEP (low, intermediate, and high) was entered as a categorical independent variable. Considered a potential confounder, gender was additionally entered into the model. To assess the trends of the relationships between SEP and prevalence of various mental health problems, SEP was entered as a continuous variable (non-categorical) in the logistic regression model. To explore the extent of the associations of the broadband problem domains with SEP were due to a shared component (co-occurrence) of these domains rather than a unique component of each domain, we studied the association between SEP and externalizing problems while additionally adjusting for internalizing problems and vice versa, and compared the results to those of the analyses in which we adjusted only for gender. Finally, to examine the possible modifying effect of gender, we repeated the analyses for boys and girls separately and assessed the interaction between SEP as a continuous variable and gender. All statistical analyses were conducted using
Correlations between the variables and means, standard deviations and range of scores are presented in Table 2.1. All the mental health dimensions were correlated with each other and all correlations were statistically significant. There were high correlations among variables within each broadband domain of externalizing problems (aggression and delinquency) and internalizing problems (anxious/depressed and withdrawn/depressed). The correlation between internalizing and externalizing problems was moderate: $r = 0.29$, $p < 0.01$. 
Table 2.1. Bivariate correlations between continuous measures of different dimensions of mental health problems and their mean values

<table>
<thead>
<tr>
<th>Variables</th>
<th>M (SD)</th>
<th>Range</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aggression</td>
<td>0.15 (0.11)</td>
<td>0.00 - 0.69</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Delinquency</td>
<td>0.08 (0.07)</td>
<td>0.00 - 0.60</td>
<td>0.75</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Anxious/depressed</td>
<td>0.15 (0.10)</td>
<td>0.00 - 0.67</td>
<td>0.31</td>
<td>0.18</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Withdrawn/depressed</td>
<td>0.17 (0.11)</td>
<td>0.00 - 0.72</td>
<td>0.21</td>
<td>0.13</td>
<td>0.63</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Somatic complaints</td>
<td>0.15 (0.09)</td>
<td>0.00 - 0.64</td>
<td>0.26</td>
<td>0.22</td>
<td>0.54</td>
<td>0.41</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Social problems</td>
<td>0.15 (0.10)</td>
<td>0.00 - 0.59</td>
<td>0.48</td>
<td>0.33</td>
<td>0.67</td>
<td>0.60</td>
<td>0.42</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Attention problems</td>
<td>0.25 (0.14)</td>
<td>0.00 - 0.81</td>
<td>0.64</td>
<td>0.52</td>
<td>0.36</td>
<td>0.30</td>
<td>0.33</td>
<td>0.53</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Thought problems</td>
<td>0.09 (0.07)</td>
<td>0.00 - 0.53</td>
<td>0.42</td>
<td>0.35</td>
<td>0.58</td>
<td>0.43</td>
<td>0.47</td>
<td>0.57</td>
<td>0.47</td>
<td>1</td>
</tr>
</tbody>
</table>

All correlation coefficients $p < 0.01$
Gender distribution varied slightly across SEP categories with a lower prevalence of female gender in low SEP group (n = 259, 46.8%) and a higher prevalence in intermediate SEP category (n = 585, 54.0%). Average age at T1 (mean = 11.1, SD 0.55, range 10–12) and at T2 (mean = 13.6, SD 0.53, range 12–15) was similar across SEP categories. The prevalence of mental health problems according to SEP is presented in figure 2.1. Generally, a higher level of SEP was gradually associated with a lower prevalence of all mental health problems. However, the gradient was steeper for aggressive, delinquent behaviors (externalizing domain), attention, and total problems, than for anxious/depressed, withdrawn/depressed and thought problems (internalizing domain).
Fig. 2.1 Prevalence rates of mental health outcomes in different levels of SEP
Table 2.2 presents three levels of SEP regressed on the eleven dimensions of mental health while adjusting for gender. As age was equally distributed across SEP categories and preliminary adjustment for it had not changed the results, it was removed from the final analyses.

As compared to high SEP, low SEP and to a lesser extent also intermediate SEP was associated with an increased risk of all mental health problems and most associations were statistically significant. The strongest increases were found for aggression, delinquency, attention, and externalizing problems. When additionally adjusting for internalizing problems, the association between low SEP and externalizing problems hardly attenuated and remained statistically significant. The association between low SEP and internalizing problems, however, markedly attenuated when we additionally adjusted for externalizing problems and the odds ratio was no longer statistically significant.

Due to the monotonously decreasing relationship between SEP and mental health dimensions, we computed the trend of the relationship using a continuous (non-categorical) measure of SEP and the results were statistically significant for all dimensions. After repeating the analyses while stratifying for gender, no material gender differences were observed. Accordingly, effect modification of the prevalence trend with SEP by gender was non-significant for all dimensions.
Table 2.2. Logistic regression analyses: attributable risks of family SEP on mental health dimensions- adjusted for gender (N = 2230).

<table>
<thead>
<tr>
<th>Outcome dimensions</th>
<th>(N ≥ 85th percentile)</th>
<th>Socio-economic position</th>
<th>Trend</th>
<th>Effect modification of trend by gender</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>High</td>
<td>Intermediate</td>
<td>Low</td>
</tr>
<tr>
<td>Aggression</td>
<td>323</td>
<td>1</td>
<td>2.28 (1.62, 3.37)</td>
<td>4.12 (2.69, 6.30)</td>
</tr>
<tr>
<td>Delinquency</td>
<td>323</td>
<td>1</td>
<td>1.74 (1.24, 2.44)</td>
<td>2.90 (2.03, 4.14)</td>
</tr>
<tr>
<td>Anxious/depressed</td>
<td>332</td>
<td>1</td>
<td>1.30 (0.90, 1.87)</td>
<td>1.56 (0.98, 2.48)</td>
</tr>
<tr>
<td>Withdrawn/depressed</td>
<td>372</td>
<td>1</td>
<td>1.09 (0.80, 1.49)</td>
<td>1.42 (0.99, 1.98)</td>
</tr>
<tr>
<td>Somatic Complaints</td>
<td>319</td>
<td>1</td>
<td>1.73 (1.21, 2.47)</td>
<td>2.65 (1.73, 3.78)</td>
</tr>
<tr>
<td>Social problems</td>
<td>366</td>
<td>1</td>
<td>1.66 (1.16, 2.37)</td>
<td>2.41 (1.63, 3.56)</td>
</tr>
<tr>
<td>Attention problems</td>
<td>347</td>
<td>1</td>
<td>1.81 (1.28, 2.56)</td>
<td>2.91 (1.85, 4.60)</td>
</tr>
<tr>
<td>Thought problems</td>
<td>349</td>
<td>1</td>
<td>1.35 (0.95, 1.90)</td>
<td>1.98 (1.38, 2.84)</td>
</tr>
<tr>
<td>Internalizing problems</td>
<td>343</td>
<td>1</td>
<td>1.37 (0.94, 2.00)</td>
<td>1.86 (1.28, 2.70)</td>
</tr>
<tr>
<td>Externalizing problems</td>
<td>334</td>
<td>1</td>
<td>2.05 (1.34, 3.14)</td>
<td>3.68 (2.56, 5.90)</td>
</tr>
<tr>
<td>Total problems</td>
<td>341</td>
<td>1</td>
<td>1.83 (1.24, 2.72)</td>
<td>3.34 (2.12, 5.24)</td>
</tr>
<tr>
<td>Internalizing problems †</td>
<td>343</td>
<td>1</td>
<td>1.34 (0.91, 1.96)</td>
<td>1.47 (0.78, 1.68)</td>
</tr>
<tr>
<td>Externalizing problems ††</td>
<td>334</td>
<td>1</td>
<td>1.91 (1.25, 2.94)</td>
<td>3.39 (2.24, 5.16)</td>
</tr>
</tbody>
</table>

OR = Odds Ratio; CI = Confidence Intervals; SEP = Socio-economic position
† Adjusted for gender and externalizing problem behavior; †† Adjusted for gender and internalizing problem behavior
DISCUSSION

Our study is a useful addition to the health inequality debate. We examined the differential effects of SEP on multiple dimensions of mental health problems based on a large population cohort of 2230 pre- and early adolescents. The study demonstrated a strong relationship between SEP and all dimensions of mental health problems.

The relationship was not equally pronounced for all dimensions. Associations with SEP were more substantial for externalizing problems particularly aggressive and delinquent behaviors, than for internalizing problem behaviors, especially anxious/depressed and withdrawn/depressed. These observations confirmed our hypothesis. However, the association of SEP with internalizing problems markedly attenuated when corrected for externalizing problems while the converse was not true indicating that the SEP-internalizing problems relationship may, at least in part, be due to shared components (co-occurrence) with externalizing problems. Further, our findings suggest that exposure to different levels of family SEP may not have the same effects on various dimensions of mental health. No evidence of gender modification of the relationships between SEP and mental health problems was found.

Limitations and strengths

A number of limitations need to be mentioned. First, the only sources of information on mental health dimensions in this study were behavior checklists. Some of the associations detected apply only to emotional and behavioral problems that cannot be taken to mean psychiatric disorders defined in terms of clinical diagnoses. However, the checklists may be comparable to interviews in studies involving the classification of psychiatric disorders (Boyle, Offord, Racine, Szatmari, Sanford, Fleming, 1997). Second, the SEP relationship with each dimension cannot be interpreted as independent. This became evident when we assessed the risks of internalizing problems while adjusting for externalizing problems and vice versa. Third, the cross-sectional design of this study makes it impossible to determine whether the effects of SEP regard the incidence of mental health problems, their duration, or both. Lastly, again due to the cross-sectional design, we cannot exclude the possibility that the association between family SEP and mental health problems, at least in part, may have been reciprocal. Nevertheless, in pre- and early adolescents, reciprocal effects are unlikely because their mental health problems have limited influence on family SEP (Wadsworth, Achenbach, 2005).

Our study has a number of strengths too. First, we used data from a large population cohort and a robust measure of SEP directly obtained from the parents. Additionally, data on mental health were obtained from multiple informants, thus limiting rater and information biases and increasing precision (Verhulst, Koot, Van der Ende, 1994). Second, our study is unique in that only one previous study examined the differential incidence and cumulative prevalence of mental health
problems in different socio-economic levels in 8–17 year olds (Wadsworth, Achenbach, 2005). Therefore, our study is the only other that has assessed the effects of SEP on multiple mental health dimensions concurrently in a single cohort, especially in children and adolescents. Lastly, we used multiply imputed datasets to address the problem of missing data, particularly common in longitudinal studies with multiple informants.

Our findings agree with previous studies that have found adolescents in low SEP category to be at risk of mental health problems (Achenbach, Bird, Canino, Phares, Gould, Rubio-Stipec, 1990; Costello, Compton, Keeler, Angold, 2003; Loeber, Farrington, Stouthamer-Loeber, Van Kammen, 1998; Mcleod, Shanahan, 1993; Miech, Caspi, Moffit, Wright, Silva, 1999). However, we observed relatively large effects while previous studies have consistently found that SEP effects on mental health were small, accounting usually for less than one percent of explained variance in total problems scores (Achenbach, Verhulst, Baron, Akkerhuis, 1987; Achenbach, Verhulst, Edelbrock, Baron, Akkerhuis, 1987). When we calculated the percentage of explained variance in all dimension-specific and total problems scores by SEP, the effects were also small (<5%), but somewhat larger than in previous studies. This could have been because we used a more robust measure of SEP based on parents’ education, occupation and family income, while previous studies relied mainly on occupation (Achenbach, Verhulst, Baron, Akkerhuis, 1987; Achenbach, Verhulst, Edelbrock, Baron, Akkerhuis, 1987), income or education levels of fathers as indicators of SEP. We also used multiple informants to report on mental health contrary to previous studies that used single informants. Furthermore, our study registered a high response rate and success in recruiting families often difficult to recruit (De Winter, Oldehinkel, Veenstra, et al., 2005).

We could not easily compare our results with other studies simultaneously addressing similar sets of varying outcome dimensions as no other study tried to examine the effects of SEP on unique aspects of internalizing and externalizing problems. Comparison with previous studies is also hampered by the use of different indices of SEP (income, occupation or education) and the fact that the outcomes in our study denoted the range comprising borderline and clinical mental health problems (scores ≥85th percentile). However, it should be noted that these outcomes implicate odds ratios as measures of the magnitude of effect rather than explained variance in the total distribution of scores.

The finding that the associations between SEP and mental health problems were stronger for externalizing than internalizing problems might be due to a differential role of contextual risk factors. Previous studies have suggested that contextual family risk factors such as low SEP that affects the immediate physical and social environment of the child are associated more with externalizing than with internalizing problems (Atzaba-Poria, Pike, Deater-Deckard, 2004; Fendrich, Warner, Weissman, 1990). Conversely, individual temperament characteristics such as
negative affectivity and fearfulness are associated with internalizing problems (Oldehinkel, Hartman, De Winter, Veenstra, Ormel, 2004).

The effects of SEP may be different for both girls and boys at different ages and developmental stages (Bolger, Patterson, Thompson, Kupersmidst, 1995). In this study, however, no gender differences were detected on any dimension. This could have been due to the young age as previous studies have found inconsistent SEP effects on mental health of pre- and early adolescents (Conger, Conger, Elder, Lorenz et al., 1992).

Several mechanisms through which SEP may be related to mental health problems have been highlighted. In particular, environmental inequities related to SEP such as goods and services essential for health, and parents' health promoting behaviors (Bradley, Corwyn, 2002; Evans, 2004) may affect adolescents' mental health. In addition, low SEP families often secure housing in deprived neighborhoods where drug and substance abuse, delinquent and deviant peer behaviors, and other social problems are known to thrive (Evans, 2004, Reijneveld, Brugman, Verhulst, Verloove-Vanhorick, 2005; Schneiders, Drukker, Van der Ende, Verhulst, Van Os, Nicolson, 2003). Moreover, low SEP is a source of chronic stress that impacts on the relationship between parents and their children, e.g. poor family functioning, child abuse, and poor rearing behaviors (Caspi, Taylor, Moffit, Plomin, 2000; Schneiders, Drukker, Van der Ende, Verhulst, Van Os, Nicolson, 2003; Stansfeld, Head, Bartley, Fonagy, 2008). Furthermore, recent findings indicate an interaction of genotype and parental negativity and low warmth, both common in low SEP families, in predicting antisocial behaviors but not depression (Feinberg, Button, Neiderhiser, Reiss, Hetherington, 2007).

Although the mental health of pre- and early adolescents is unlikely to affect family SEP, we cannot preclude the possibility that children and adolescents with a clinically relevant level of problems may prevent parents from taking a job or force parents to have reduced working hours. Additionally, low SEP of the parent may be the beginning of negative spiral, in which the children are likely to develop mental health problems, which in turn reduces their chance of gaining higher SEP themselves (Mheen van de, Stronks, Looman, et al. 1998; Kahn, Fazio, 2005). It is also possible that, aggressive and delinquent behaviors more than anxious/depressed or withdrawn depressed put one in an unfavorable SEP track due to a combination of adverse social environment and possible genetic contributions of the family that make them drift down or just fail to come out of socio-economic adversity (Dohrenwend, 1990). Furthermore, low family SEP may trigger a chain reaction that subsequently leads to poor mental health in a cumulative process (Dohrenwend, 1990).

The association between SEP and externalizing problems remained nearly unaltered when we adjusted for internalizing problems while the association between SEP and internalizing problems,
however, markedly attenuated when corrected for externalizing problems. This suggests that the SEP-internalizing problems relationship may, at least in part, be due to shared components with externalizing problems. These shared components may include the co-occurrence between internalizing and externalizing problems. For example, delinquency and depression are known to co-occur in adolescents (Angold, Costello, Erkanli, 1999). It has also been suggested that externalizing problems such as disruptive behaviors may be associated with rejection and lack of social support by peers or significant others, which in turn may result in anxiety and depression (Burkes, Loeber, Lahey, Rathouz, 2005; Capaldi, Stoolmiller, 1999).

The mechanisms through which SEP affects adolescent mental health are complex and could well be different for externalizing and internalizing problems. Further research is needed to elucidate mechanisms underlying the observed patterns of associations and to distinguish the relationship between family SEP and various mental health dimensions.

**Implications**

Findings of this study have implications for both research and policy. Research efforts should be directed at unraveling mediating factors such as stressful life events, family functioning, parental psychopathology, and rearing behaviors. We acknowledge the importance of these contextual factors but considered them beyond the scope of this article. We propose that the findings in this study should lead to further research on the causal paths through which SEP and family-related factors that affect mental health. The results of such studies can inform interventions to prevent adverse mental health outcomes. For policy makers, the implication of this study is to direct interventions to low SEP families, and to design public health policies for early prevention of particularly externalizing problems in children and adolescents. For example, programs such as neighborhood social cohesion that has been shown to limit poor parental rearing practices and children’s externalizing behaviors (Silk, Sessa, Morris, Steinberg, Avenevoli, 2004).

**Conclusion**

This population-based study shows that low family SEP is associated with poor mental health for all outcomes in early adolescents. However, the effects of family SEP are stronger on externalizing problem domain, particularly aggressive and delinquent behaviors than on internalizing problem domain, notably anxious/depressed and withdrawn depressed. In addition, the smaller SEP effect on internalizing problems is partly explained by shared components with externalizing problems. This signifies that family SEP probably directly contributes to the risk of developing mental health problems in adolescents differently and varies with types of broadband problems. Policies and interventions to reduce mental health problems need to consider background SEP as an important risk or protective factor.
REFERENCES

Achenbach TM. *Manual for the child behavior checklist/ 4–18 and 1991 profile.* University of Vermont, Burlington; 1991a


Achenbach TM. Manual for the teacher’s report form and 1991 profile. University of Vermont, Burlington; 1991c


Achenbach TM, Rescorla LA. *Manual for ASEBA School Age Forms & Profiles.* Burlington VT: University of Vermont; 2001


Boyle M, Offord D, Racine Y, Szatmari P, Sanford M, Fleming J. Adequacy of interviews vs. checklists for classifying childhood psychiatric disorder based on parent reports. *Arch Gen Psychiatry, 1997;54:*793–799


Brown GW, Harris TO. *Life events and Illness.* Guildford, New York; 1989


Feinberg ME, Button TMM, Neiderhiser JM, Reiss D, Hetherington EM. Parenting and adolescent antisocial behavior and depression. *Arch Gen Psychiatry*, 2007;64:457–465


Kendler KS, Hettema JM, Butera F, Gardner CO, Prescott CA. Life events dimensions of loss, humiliation, entrapment, and danger in the prediction of onsets of major depression and generalized anxiety. *Arch Gen Psychiatry*, 2003;60:789–796


Verhulst FC, Van der Ende J, Koot HK. Handleiding voor de Youth Self-Report (YSR) (Manual for the Youth Self-Report (YSR)). Sophia Children’s Hospital, Rotterdam; 1997


