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The Association of Mental and Physical Health Problems in High-Risk Adolescents: A Longitudinal Study

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Abstract

Purpose—This longitudinal study examined the relationship between mental and physical health problems in a sample of high-risk youth served in the public sector.

Methods—Participants included youth ages 9 to 18 at baseline, randomly sampled from one of five public service sectors in San Diego County, California and youths may have been active to more than one sector. Diagnoses for mood, anxiety, and disruptive disorders based on structured diagnostic interviews were determined at baseline and data regarding health-related problems were collected two years post-baseline.

Results—Mood and disruptive behavior disorders were related to cumulative health problem incidence, as well as aggregate measures of health problems and severe health problems. Additionally, mood disorder diagnosis was associated with higher rates of infectious diseases, respiratory problems, and weight problems. Disruptive disorder diagnosis was related to higher rates of risk-behavior related health problems.

Conclusions—The present work extends the research on the relationship between mental and physical health problems to adolescents served in the public sector, who are at especially high risk for behavioral and emotional problems. Potential mechanisms by which mental health problems may impact health problems are discussed. We suggest the development of effective interagency cooperation between medical and mental health systems in order to improve the care of youth with comorbid mental and physical disorders.

There is increasing concern and attention to the relation of mental health disorders and physical health problems as evidenced by published studies and by the National Institutes of Health (NIH) support for research addressing this issue. Adults with mental illness are at higher risk for physical health problems than those without mental illness [1-3], but less is known about

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the prevalence and nature of mental health disorders and physical health problems in adolescents, and particularly in adolescents at high risk for behavioral and emotional problems. Research has shown that the mental disorders most likely to be related to physical disorders in adolescents include depression [3-8], anxiety [4,6,9,10], oppositional defiant disorder (ODD), and conduct disorder (CD) [4,11,12]. However, studies of adolescents tend to be either cross-sectional or conducted in clinical samples focused only on one type of disorder.

Mental illness may have a direct or indirect impact on physical health. For instance, mental disorders, such as depression, may directly lead to physical illness by weakening and/or altering the immune response. There is extensive evidence suggesting that stress can lead to decreased immune functioning [13,14] and depression in particular has been linked to changes in cellular immunity [15] often resulting in reduced immune response. These changes may lead to an increase in viral and bacterial infections, including influenza and the common cold [8,16]. By impairing immune response, mood disorders may also increase the severity of allergies and asthma which can be triggered by viral illnesses [17-19].

In addition to directly impacting immune functioning, individuals with mental illness may be more likely to engage in behaviors that lead to physical illness. For instance, depression is associated with poor self-care [20], and people with depression often sleep less, exercise less, have poorer diets, smoke more, and use more alcohol and other drugs than those who are not depressed [15]. Research has also shown that psychiatric disorders in adolescents are often related to risky behaviors, including substance abuse, unsafe sex, and suicide attempts resulting in health problems [4,11,12]. Finally, anxiety, depression, and disruptive disorders have been linked to poor eating habits and lack of exercise, leading to elevated weight status that is maintained from childhood into adulthood [21,22]. Given the paucity of longitudinal studies of comorbid mental and physical health problems in adolescents from community populations, we chose to examine the associations of mental and physical health problems in a high-risk sample of youth served in public sector settings. Previous research has confirmed high rates of mental illness and high risk behaviors among these youths [23-25].

Consistent with our earlier work [23], we hypothesized that mental health diagnosis (depression, anxiety, or ODD/CD) assessed at baseline, would be associated with health problems assessed two years post-diagnosis. We also specifically examined the relationship between each mental disorder and four categories of health problems: infectious diseases, respiratory problems, health problems stemming from risky behaviors, and weight problems. We hypothesized that infectious diseases would be positively associated with mood disorder diagnosis and that respiratory problems would be positively associated with anxiety disorder diagnosis. We also hypothesized that risk-behavior related health problems would be positively associated with disruptive disorder diagnosis and that weight problems would be positively associated with mood disorder diagnosis. We focus on health problems shown to be related both directly and indirectly to mental health problems, by either a direct impact on the immune system or through altered health behaviors. These disorders also tend to be more common in adolescents, as opposed to physical health problems shown to be related to mental health problems in adults, such as cardiovascular disorders or Type II diabetes [1-3].

Method

Participants

The sample for the present study was drawn from youth in a larger study of prevalence of mental health disorders and service utilization in publicly funded youth service sectors in San Diego County, California [25]. Youth who received services from one or more of five public service sectors (Alcohol and Drug, Juvenile Justice, Mental Health, school/Serious Emotional

Disturbance, Child Welfare) serving youth at risk for mental health or substance use problems and who were between the ages of 6 and 17 years at baseline were eligible for study.

Participants were identified by creating an integrated database from administrative records provided by the five different county sectors of care for youth. After unduplicating records across sectors and agencies, 12,662 youth were identified who received services during the specified time period and were thus eligible to participate in the study. Youth within the sampling frame were stratified based on their service sector involvement during the 1996-1997 fiscal year, highest level of restrictiveness of care, and race/ethnicity. From this pool, 3,402 eligible cases were randomly selected for recruitment. Of these cases, 793 could not be located and 54 could not be recruited for other reasons (e.g., unable to obtain ex-parte order for permission to participate) leaving 2,555 cases available for recruitment. At least one interview was completed (with either the youth or the adult respondent) in 1,715 cases and most of these included both a youth and adult caregiver report.

It was possible to compare study participants along a number of dimensions with the entire population from which individuals were sampled. Characteristics of the sample (e.g., reason for arrest in the Juvenile Justice sector; reason for removal from the home in the Child Welfare sector) were within 2-3 percentage points of data available in administrative records for the entire service system population. We found no differences between participants and non-participants with regard to age or gender. Asian-Americans were somewhat less likely to participate than other ethnic groups; however, analyses are weighted to account for such differences.

The sub-sample for the present study included youth 9 to 18 years of age at baseline ($n=1,332$, $M=14.96$, $SD=2.38$). The sample was ethnically diverse: 38.2% were Caucasian, 27.1% Latino, 19.2% African-American, 7.4% Asian/Pacific-Islander, 5.2% bi-racial, and 2.9% were classified as "other." Two-thirds (67%) of the participants were male. The majority of the parent/caregiver informants were biological parents (73%). Others included close relatives, foster caregivers, adoptive/step parents, and professional caregivers.

Procedure

Youth and their caregivers were interviewed at baseline and two years post-baseline as part of a comprehensive computer assisted interview about their need for and use of mental health services. This study was approved by the appropriate institutional review boards. Informed consent was obtained from caregivers and assent from youth, each being assured of confidentiality verbally and through consent/assent procedures, and with a federal Certificate of Confidentiality for any information reported in the interview. Parent and youth interviews were conducted by different interviewers. Parents received \$40 for participation and youth received between \$10 and \$40 depending on their age, which was related to length of interview.

Interviewers were non-clinicians with an undergraduate college degree who completed approximately 100 hours of training on the specific instruments (including Diagnostic Interview Schedule for Children (DISC) training by a member of the DISC editorial board). Quality assurance mechanisms are described in Garland and colleagues [25]. Follow-up at two years was 93%.

Measures

Demographics—Age, gender, and race/ethnicity (i.e., white/non-white) data were obtained from baseline youth interviews. Annual household income was obtained from baseline caregiver interviews.

Mental Health Diagnoses—The computer assisted version of the Diagnostic Interview Schedule for Children - IV (C-DISC-IV) [26] was administered to parents and youth during the baseline interview by lay interviewers trained on the instrument by a member of the NIMH DISC Editorial Board (AG). The DISC-IV is a highly structured diagnostic interview designed to yield DSM-IV based diagnoses through computer algorithm scoring. The DISC has demonstrated reliability and validity comparable to that of other diagnostic measures [26]. Two-week test-retest reliabilities range from $r=.70$ to $r=.80$. Kappa coefficients for combined parent and youth report and clinician diagnosis range from .40-.80 [27] and diagnostic sensitivity ranges from .73 to 1.0 [28].

To reduce interview duration and respondent burden, not all DISC modules were administered, and some modules were administered to only one informant (parent or youth), while others were administered to both informants. Garland and colleagues reported these procedures in greater detail [25]. Table 1 identifies which diagnostic modules were administered to each informant, depending on the child's age (i.e., 9-10 vs. 11-18 years). These decisions were based on previous literature indicating that, (a) youth younger than 11 years may have especially low reliability in diagnostic reporting; and (b) youth are generally the most comprehensive reporters of internalizing (mood and anxiety) symptoms [29-32] whereas parents are good reporters of disruptive behavior symptoms [29,31-33]. Procedures used were based on the most practical and rigorous approach given the population, the ages of the youth involved, and guidelines for use of the diagnostic measure.

Health Problems—Our measure of health problems was based on a scale created by Brown and colleagues and applied in a study of the impact of substance use disorders on physical health [23]. The validity of the health problem measures is supported by demonstrated associations with gender differences and level of substance use [23]. Our previous study using this measure predicted health problems as a function of adolescent substance abuse resulting in bias corrected effect sizes ranging from .46-.80 [23].

Thirty-six potentially significant health problems were assessed by structured interview with youth respondents at two years post-baseline. For each identified problem, a chronicity rating (1=acute: less than two weeks duration, or 2=chronic: greater than 2 weeks duration) and severity rating were collected. Severity scores were based on objective anchors as follows: 1) no significant disruption (e.g. did not stay home sick or see a doctor), 2) some disruption (e.g. saw a doctor and/or stayed home), 3) moderate disruption (e.g. stayed home for at least one week), 4) serious disruption but not life threatening (e.g. hospitalization for surgery or accident), and 5) life-threatening. Table 2 provides a list of health problems assessed during the interview and included in the analyses.

Three summary health problem measures were calculated for each participant. Cumulative Health Problem Incidence was calculated by summing all health problems reported by each participant. Because of the low base-rate of individual health problems reported and to avoid undue influence of single cases in statistical tests, two aggregate measures were also included and are described below. Incidence and the two aggregate measures were used in the present study because they were found in a previous study to be sensitive to differing predictors and levels of psychosocial problems among youths and young adults.

A Health Problem Index (HPI) was calculated as the sum of the 36 potential health problems reported as the product of problem chronicity (1=acute and 2=chronic) and severity (1=least severe to 5=life-threatening or most severe). Thus, the possible range for this index was 0 to 360 ($36 \times 2 \times 5$). To assess health problems with greatest impact on functioning, a Severe Health Problem Index (SHPI) was also calculated to represent cumulative severe health problems experienced by youth. This variable was computed as the sum of identified health

problems that caused moderate to most severe disruption (severity rating ≥ 2) and weighted for chronicity and severity.

Scales also reflected four categories of health problems, including infectious diseases (e.g. flu, colds, and other contagious diseases), respiratory (e.g. asthma, allergies), risk-behavior related (e.g. sexually transmitted diseases, drug overdose, suicide attempt), and weight problems (e.g. over or under weight). The health problems category variables were computed as the sum of the health problems in each category divided by the total number of the health problems in the category, and weighted for chronicity and severity. Finally, five additional scales were created for severe health problems in each of the categories by computing the sum of the health problems in each category causing moderate to severe disruption (severity rating ≥ 2), dividing by the total number of the health problems in the category, and weighting for chronicity and severity.

Analyses

We conducted 2-step hierarchical regression analyses with summary health problem measures and scales representing categories of health problems as the dependent variables. Demographic variables (age, race/ethnicity, gender, family income, and insurance statuses) were entered at step 1, and mental health diagnosis (mood disorders, disruptive disorders, and anxiety disorders) were entered at step 2. Insurance status was coded as “0” (no insurance) or “1” (had insurance coverage).

Results

The percentage of participants who reported each type of health problem are presented in Table 3. Results from the final step of the hierarchical regression analyses for the summary health problem variables are presented in Table 4.

Health Problem Incidence

We first examined Cumulative Health Problem Incidence. Shown in Table 4, gender, race/ethnicity, and insurance status were significantly related to Health Problem Incidence, after controlling for other variables in the model; participants who were white, female, and insured reported experiencing a higher number of health problems ($F(8,970) = 16.50, p < .001, R^2 = .120$). There was also a small but significant negative relationship between household income and Health Problem Incidence. Finally, presence of a mood or disruptive disorder on the DISC at Wave I predicted a higher number of health problems at Wave II.

Health Problem Index (HPI) and Severe Health Problem Index (SHPI)

For the HPI, demographic variables and mental health problem variables accounted for a significant amount of overall variance ($F(8,970) = 18.26, p < .001, R^2 = .131$), and the mental health problem variables accounted for a significant increase in explained variance ($F(3,970) = 10.82, p < .001, \Delta R^2 = .029$). For the SHPI, demographic variables and mental health problem variables accounted for a significant amount of overall variance ($F(8,970) = 15.24, p < .001, R^2 = .112$), and the mental health problem variables accounted for a significant increase in explained variance ($F(3,970) = 8.98, p < .001, \Delta R^2 = .025$). The pattern of results was similar for the HPI and the SHPI; gender (female), race/ethnicity (Caucasian), low household income, and insurance status (insured) were all significantly related to higher scores on the two scales, as was presence of a mood or disruptive disorder on the DISC.

Infectious Diseases

Table 5 presents the final step of the hierarchical regression analyses for the 5 categories of health and severe health problems. For the HPI for infectious diseases, demographic variables and mental health problem variables accounted for a significant amount of overall variance ($F(8,970) = 5.02, p < .001, R^2 = .040$), and the mental health problem variables accounted for a significant increase in explained variance ($F(3,970) = 3.04, p = .028, \Delta R^2 = .009$). The regression for the SHPI for infectious diseases accounted for a significant amount of overall variance ($F(8,970) = 4.60, p < .001, R^2 = .036$). However, the mental health problems variables did not account for a significant increase in explained variance. Participants who were female and Caucasian reported higher scores on both the HPI and the SHPI for infectious diseases. Identification of a mood disorder was related to higher scores on HPI, but not the SHPI.

Respiratory Problems

For respiratory problems, the regression for the HPI accounted for a significant amount of the overall variance ($F(8,970) = 7.25, p < .001, R^2 = .056$), and the mental health problem variables accounted for a significant increase in explained variance ($F(3,970) = 5.15, p = .002, \Delta R^2 = .015$). The regression for SHPI for respiratory problems also accounted for a significant amount of the overall variance ($F(8,970) = 4.20, p < .001, R^2 = .050$), and the mental health problem variables accounted for a significant increase in explained variance ($F(3,970) = 7.50, p < .001, \Delta R^2 = .022$). Female gender and identification of a mood disorder on the DISC were related to higher scores for both the HPI and the SHPI for respiratory problems. Caucasian race/ethnicity was related to scores on the HPI for the respiratory problems, but not the SHPI. Surprisingly, there was a significant, negative relationship between anxiety disorders and SHPI for respiratory problems. It is important to note that there was a moderate correlation between mood and anxiety disorders ($r = .297$), and the negative relationship between anxiety disorders and SHPI may be an artifact of this relationship. Correlations between independent variables can result in suppressor effects in which the direction of effect can unexpectedly reverse [34].

Risk behavior-related Health Problems

For risk behavior-related health problems, the regression for HPI accounted for a significant amount of the overall variance ($F(8,970) = 6.83, p < .001, R^2 = .053$), and the mental health problems variables accounted for a significant increase in explained variance ($F(3,970) = 4.44, p = .004, \Delta R^2 = .013$). For the regression for the SHPI ($F(8,970) = 6.34, p < .001, R^2 = .042$), and the mental health variables accounted for a significant increase in explained variance ($F(3,970) = 4.65, p = .003, R^2 = .014$). For both the HPI and the SHPI, participants who were older, female, and Caucasian with lower household incomes and identification of a disruptive disorder on the DISC reported higher scores for risk behavior-related health problems.

Weight Problems

For weight problems, the regression for the HPI accounted for a significant amount of overall variance ($F(8,970) = 6.36, p < .001, R^2 = .050$), and the mental health problem variables accounted for a significant increase in explained variance ($F(3,970) = 4.65, p = .003, \Delta R^2 = .014$). Predictor variables in the regression for the SHPI, accounted for a significant amount of variance ($F(8,970) = 6.04, p < .001, R^2 = .047$), and the mental health variables accounted for a significant increase in explained variance ($F(3,970) = 3.86, p = .009, R^2 = .011$). Female gender, lower household income, and identification of a mood disorder on the DISC were all predictive of HPI and SHPI for weight problems.

Discussion

This longitudinal study investigated the association of mental health problems and physical health of youth sampled from a large public sector community service setting. The main finding in this study is that mood and disruptive behavior disorders were significantly associated with cumulative health problem incidence, as well as our aggregate measures of health problems (i.e. HPI) and severe health problems (i.e. SHPI). In addition, effects were consistent for mood disorder diagnosis association with infectious disease, respiratory problems, and weight problems. The association of mood disorder diagnosis and infectious disease is consistent with findings that immune system suppression is found in depressed patients. Also as expected, disruptive behavior disorders were associated with increased risk behavior-related health problems. The negative association of anxiety disorder with respiratory problems is surprising, but is likely a statistical “suppressor effect” [34], an artifact of a moderate correlation between mood and anxiety disorders. We expected a positive association between these variables given characteristic symptoms of anxiety and panic attacks and these results warrant further study. Overall, these findings add to the growing literature suggesting a link between mental and physical health problems in adolescents, and extend the finding to a high-risk population.

Limitations

Several limitations of the present study should be noted. First, youth were sampled from a single county and results may not generalize to other geographic areas. Youth came from five different public service sectors and this may have had an influence on outcomes. However, roughly 35% of youths were active to more than one sector at the time of sampling reducing the likelihood of single sector effects. Second, parent corroboration of health problems and some mental health problems was not available. Third, possible unobserved variables not available to the researchers may have an additional influence on the nature of the relationship between mental health and physical health (e.g., living situations that add stress and influence poor nutrition). Finally, a measure of health problems was only available at Wave 2, preventing conclusive evidence of causality or direction of effects. While the longitudinal nature of this study suggests that mental health problems can lead to physical health problems, effects may be bi-directional. For example, it is possible that acute or chronic health problems lead to mental health problems such as depression or anxiety. It is less likely, however, that disease or injuries sustained through risk behaviors would lead to disruptive behavior disorders. The onset and sequencing of types of mental health and physical health problems should be examined in longer prospective studies in this population.

Implications

The findings in this study that mental health is associated with physical health in high-risk youths suggest the need for a closer look at this population and their risk for health problems. A number of studies have indicated that mental health problems may worsen symptoms of physical health problems and the present study supports this concern. Research also suggests that comorbid physical and mental health problems persist into adulthood [8,22]. Finally, a recent study by Chen and colleagues [35] found that teens with both physical and mental health disorders were more likely to have very low quality of life as adults, in comparison with teens who suffered from only one form of disorder. Fortunately, some studies also suggest that childhood and adolescent mental health interventions may improve physical health outcomes. For instance, early treatment of comorbid depressive disorder has been shown to prevent obesity in overweight adolescents [21] and to improve outcomes and even reduce mortality in adolescents with asthma [36]. Interventions for conduct disorder may reduce the incidence of health problems related to risky behaviors including substance use and STDs [4]. Thus, early identification and management of mental health problems has major benefits for both mental and physical well-being.

Managing both mental and physical health problems leads to the need to negotiate multiple healthcare systems, particularly among youth in the often complex community health care system. It is important that youths with co-occurring problems understand the separate systems and linkages between them. However, systems can also enact policies, structures and processes to support service access. For example, a study by Hurlburt and colleagues [37] suggests that linkages between child welfare and mental health agencies leads to stronger associations between mental health needs and mental health service use and reduces race/ethnic disparities in service utilization. The study's characterization of linkages was adapted from the Access to Community Care and Effective Services and Supports program [38] and was defined as the ties existing between the two agencies at the local level, including co-location of services, interagency client tracking systems, and integrated service-delivery teams. A similar theoretical approach could be applied in the investigation of the impact of linkages between medical and mental health systems on adolescents suffering from comorbid physical and mental health problems seen in community mental health settings.

Consideration of physical health as a consequence of mental health problems will become especially important as we work to understand the long-term consequences of mental health disorders both on patient quality of life and long-range costs of care across service systems. In order to more comprehensively examine these issues, future studies of mental health problems and treatment in community populations should include measures of physical health in addition to traditional mental health and psychosocial outcome variables.

Finally, it is important for clinicians to be alert to potential co-occurring problems. Such co-occurrence increases the complexity of diagnosis and treatment for high-risk youths. Because a given public sector of care typically focuses on a particular set of issues and problems (e.g. substance use disorders, mental health disorders, or medical problems), attention to co-occurring problems may appear to be less of an imperative. However, such compartmentalization does a disservice to the children and families engaged in services as critical identification and intervention opportunities may be missed, allowing problems to go untreated. It is likely that untreated problems in one domain may exacerbate problems in another domain, and clinicians have the opportunity to help to interrupt such negative cycles.

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Reference List

1. Dickey B, Normand SL, Weiss RD, et al. Medical morbidity, mental illness, and substance use disorders. *Psychiatr Serv* 2002;53:861–867. [PubMed: 12096170]
2. Jones DR, Macias C, Barreira PJ, et al. Prevalence, severity, and co-occurrence of chronic physical health problems of persons with serious mental illness. *Psychiatr Serv* 2004;55:1250–1257. [PubMed: 15534013]
3. Murphy JM, Monson RR, Olivier DC, et al. Relations over time between psychiatric and somatic disorders: the Stirling County Study. *Am J Epidemiol* 1992;136:95–105. [PubMed: 1415135]
4. Bardone AM, Moffitt TE, Caspi A, et al. Adult physical health outcomes of adolescent girls with conduct disorder, depression, and anxiety. *J Am Acad Child Adolesc Psychiatry* 1998;37:594–601. [PubMed: 9628079]
5. Rohde P, Lewinsohn PM, Seeley JR. Are adolescents changed by an episode of major depression? *J Am Acad Child Adolesc Psychiatry* 1994;33:1289–1298. [PubMed: 7995795]
6. Goodwin RD, Lewinsohn PM, Seeley JR. Respiratory symptoms and mental disorders among youth: results from a prospective, longitudinal study. *Psychosom Med* 2004;66:943–949. [PubMed: 15564362]

7. Lewinsohn PM, Seeley JR, Hibbard J, et al. Cross-sectional and prospective relationships between physical morbidity and depression in older adolescents. *J Am Acad Child Adolesc Psychiatry* 1996;35:1120–1129. [PubMed: 8824055]
8. Cohen P, Pine DS, Must A, et al. Prospective associations between somatic illness and mental illness from childhood to adulthood. *Am J Epidemiol* 1998;147:232–239. [PubMed: 9482497]
9. Jolly JB, Wherry JN, Wiesner DC, et al. The mediating role of anxiety in self-reported somatic complaints of depressed adolescents. *J Abnorm Child Psychol* 1994;22:691–702. [PubMed: 7876457]
10. Sareen J, Cox BJ, Clara I, et al. The relationship between anxiety disorders and physical disorders in the U.S. National Comorbidity Survey. *Depress Anxiety* 2005;21:193–202. [PubMed: 16075453]
11. Dobkin P, Tremblay R, McDuff P. Can childhood behavioural characteristics predict adolescent boys' health? A nine-year longitudinal study. *J Health Psychol* 1997;2:445–456.
12. Delligatti N, Akin-Little A, Little S. Conduct disorder in girls: Diagnostic and intervention issues. *Psychology in the Schools* 2003;40:183–192.
13. Kiecolt-Glaser JK, Glaser R. Psychoneuroimmunology: can psychological interventions modulate immunity? *J Consult Clin Psychol* 1992;60:569–575. [PubMed: 1506504]
14. Miller GE, Chen E, Zhou ES. If it goes up, must it come down? Chronic stress and the hypothalamic-pituitary-adrenocortical axis in humans. *Psychol Bull* 2007;133:25–45. [PubMed: 17201569]
15. Herbert TB, Cohen S. Depression and immunity: a meta-analytic review. *Psychol Bull* 1993;113:472–486. [PubMed: 8316610]
16. Takkouche B, Regueira C, Gestal-Otero JJ. A cohort study of stress and the common cold. *Epidemiology* 2001;12:345–349. [PubMed: 11338315]
17. Bell IR, Jasnoski ML, Kagan J, et al. Depression and allergies: survey of a nonclinical population. *Psychother Psychosom* 1991;55:24–31. [PubMed: 1866437]
18. Richardson LP, Lozano P, Russo J, et al. Asthma symptom burden: relationship to asthma severity and anxiety and depression symptoms. *Pediatrics* 2006;118:1042–1051. [PubMed: 16950996]
19. Goodwin RD, Castro M, Kovacs M. Major depression and allergy: does neuroticism explain the relationship? *Psychosom Med* 2006;68:94–98. [PubMed: 16449417]
20. Katon W, Sullivan MD. Depression and chronic medical illness. *J Clin Psychiatry* 1990;51:12–14.
21. Anderson SE, Cohen P, Naumova EN, et al. Relationship of childhood behavior disorders to weight gain from childhood into adulthood. *Ambul Pediatr* 2006;6:297–301. [PubMed: 17000421]
22. Anderson SE, Cohen P, Naumova EN, et al. Association of depression and anxiety disorders with weight change in a prospective community-based study of children followed up into adulthood. *Arch Pediatr Adolesc Med* 2006;160:285–91. [PubMed: 16520448]
23. Aarons GA, Brown SA, Coe MT, et al. Adolescent alcohol and drug abuse and health. *J Adolesc Health* 1999;24:412–421. [PubMed: 10401969]
24. Tapert SF, Aarons GA, Sedlar GR, et al. Adolescent Substance Use and Sexual Risk-Taking Behavior. *J Adolesc Health* 2001;28:181–189. [PubMed: 11226840]
25. Garland AF, Hough RL, McCabe KM, et al. Prevalence of psychiatric disorders in youths across five sectors of care. *J Am Acad Child Adolesc Psychiatry* 2001;40:409–18. [PubMed: 11314566]
26. Shaffer D, Fisher P, Lucas CP, et al. NIMH Diagnostic Interview Schedule for Children Version IV (NIMH DISC-IV): description, differences from previous versions, and reliability of some common diagnoses. *J Am Acad Child Adolesc Psychiatry* 2000;39:28–38. [PubMed: 10638065]
27. Schwab-Stone ME, Shaffer D, Dulcan MK, et al. Criterion validity of the NIMH Diagnostic Interview Schedule for Children Version 2.3 (DISC-2.3). *J Am Acad Child Adolesc Psychiatry* 1996;35:878–88. [PubMed: 8768347]
28. Fisher PW, Shaffer D, Piacentini JC, et al. Sensitivity of the Diagnostic Interview Schedule, 2nd edition (DISC-2.1) for specific diagnoses of children and adolescents. *J Am Acad Child Adolesc Psychiatry* 1993;32:666–73. [PubMed: 8496131]
29. Cantwell DP, Lewinsohn PM, Rohde P, et al. Correspondence between adolescent report and parent report of psychiatric diagnostic data. *J Am Acad Child Adolesc Psychiatry* 1997;36:610–619. [PubMed: 9136495]
30. Edelbrock C, Costello AJ, Dulcan MK, et al. Parent-child agreement on child psychiatric symptoms assessed via structured interview. *J Child Psychol Psychiatry* 1986;27:181–90. [PubMed: 3958075]

31. Herjanic B, Reich W. Development of a structured psychiatric interview for children: agreement between child and parent on individual symptoms. *J Abnorm Child Psychol* 1997;25:21–31. [PubMed: 9093897]
32. Kashani JH, Orvaschel H, Burk JP, et al. Informant variance: the issue of parent-child disagreement. *J Am Acad Child Psychiatry* 1985;24:437–441. [PubMed: 4019971]
33. Jensen PS, Rubio-Stipec M, Canino G, et al. Parent and child contributions to diagnosis of mental disorder: are both informants always necessary? *J Am Acad Child Adolesc Psychiatry* 1999;38:1569–1579. [PubMed: 10596258]
34. Tabachnick, BG.; Fidell, LS. *Using Multivariate Statistics*. Vol. 4th. Boston: Allyn and Bacon; 2001.
35. Chen H, Cohen P, Kasen S, Johnson JG. Adolescent axis I and personality disorders predict quality of life during young adulthood. *J Adolesc Health* 2006;39:14–19. [PubMed: 16781956]
36. Galil N. Depression and asthma in children. *Curr Opin Pediatr* 2000;12:331–5. [PubMed: 10943812]
37. Hurlburt MS, Leslie LK, Landsverk J, et al. Contextual predictors of mental health service use among children open to child welfare. *Arch Gen Psychiatry* 2004;61:1217–1224. [PubMed: 15583113]
38. Cocozza JJ, Steadman HJ, Dennis MB, et al. Successful systems integration strategies: The ACCESS program for persons who are homeless and mentally ill. *Adm Policy Ment Health* 2000;27:395–407. [PubMed: 11077703]

Table 1
Diagnostic Interview Schedule for Children-IV - Informant Information

Diagnosis	Adult Respondent- DISC		Youth Respondent-DISC	
	Youth 9-10	Youth 11+ yrs	Youth 9-10	Youth 11+ yrs
Disruptive Disorders Module				
Conduct disorder	•	•		•
Oppositional defiant disorder	•	•		•
Mood Disorders Module				
Dysthymia	•			•
Major depression	•			•
Mania	•			•
Hypomania	•			•
Anxiety Disorders Module				
Generalized Anxiety	•			•
Obsessive Compulsive	•			•
Panic	•			•
Post Traumatic Stress	•	•		•
Separation Anxiety	•			•
Social Phobia	•			•

Table 2
Health Problems Assessed at 2 Years Post-Baseline

1	Allergies
2	Flu, throat infection, cold
3	Contagious diseases
4	Cuts, scrapes, bruises
5	Puncture wounds
6	Dental
7	Dermatological
8	Eye problems
9	Neurological
10	Reproductive organs
11	Sexually transmitted diseases (not HIV/AIDS)
12	Respiratory tract (pneumonia, bronchitis)
13	Cardiovascular
14	Other organ problems (kidney, liver, appendix)
15	Pregnancy, childbirth
16	Drug or alcohol overdose
17	Urological
18	Tumor; cysts; cancer
19	Bone damage
20	Joint, muscle, ligament, cartilage (includes trauma injuries)
21	Gastrointestinal problems
22	Elective surgery
23	Rape
24	Blood disorders
25	Other (e.g. medical reaction, thyroid)
26	Suicide attempt
27	Problems due to non-medically necessitated abortion
28	Weight problems
29	Hypertension
30	Emphysema
31	Asthma
32	Ulcers
33	Diabetes
34	Pain (e.g. neck, back, leg, jaw)
35	Hearing or ear

Table 3
Percent of sample that experienced health problems and severe health problems within the past 6 months

	Health Problem Index (%)	Severe Health Problem Index (%)
Any health problems	73.1	50.9
Infectious diseases	36.8	22.3
Respiratory	23.5	10.9
Risk behavior-related	5.1	3.4
Weight problems	2.6	1.3

Table 4
Hierarchical Regression Analyses Predicting Summary Health Problem Variables

	Cumulative Health Problem Incidence			Health Problem Index			Severe Health Problem Index		
	<i>B</i>	<i>SE B</i>	β	<i>B</i>	<i>SE B</i>	β	<i>B</i>	<i>SE B</i>	β
Age	-.01	.03		.07	.09	.03	.06	.08	.02
Gender	.93	.14	.21 [†]	3.65	.47	.24 [†]	3.20	.42	.24 [†]
Race/ethnicity	-.76	.13	-.18 [†]	-2.25	.46	-.15 [†]	-1.54	.41	-.12 [†]
Household income	-.02	.01	-.07 [*]	-.09	.03	-.09 [†]	-.08	.03	-.08 [†]
Insurance status	.65	.21	.10 [†]	2.04	.71	.09 [†]	1.52	.64	.07 [*]
Mood disorder	.97	.27	.12 [†]	3.89	.91	.13 [†]	3.13	.82	.12 [†]
Disruptive disorder	.28	.13	.07 [*]	1.29	.44	.09 [†]	1.11	.39	.09 [†]
Anxiety disorder	.16	.22	.02	.10	.76	.00	.02	.68	.00

Note: Note: Race/ethnicity = white/non-white; Gender = female; Insurance status 0=no insurance, 1=insurance.

* $p < .05$;

[†] $p < .01$;

[‡] $p < .001$.

Hierarchical Regression Analyses Predicting the Health Problems Index and Severe Health Problems Index for Five Categories of Health Problems

Table 5

	Health Problem Index			Severe Health Problem Index		
	B	SE B	β	B	SE B	β
Infectious diseases						
Age	-.00	.01	-.01 [†]	-.00	.01	-.02
Gender	.12	.04	.10 [†]	.13	.04	.10 [†]
Race/ethnicity	-.16	.04	-.14 [†]	-.15	.04	-.13 [†]
Household income	.00	.00	.01	.00	.00	.02
Insurance status	-.06	.06	-.03	-.04	.06	-.02
Mood disorder diagnosis	.16	.01	.07 [*]	.14	.08	.06
Disruptive disorder diagnosis	.03	.04	.02	.02	.04	.02
Anxiety disorder diagnosis	.07	.06	.04	.08	.06	.04
Respiratory						
Age	.01	.01	.01	.00	.01	.00
Gender	.30	.06	.16 [†]	.24	.06	.14 [†]
Race/ethnicity	-.14	.03	-.08 [*]	-.07	.06	-.04
Household income	-.00	.00	-.01	-.00	.00	-.01
Insurance status	.22	.09	.08 [*]	.16	.09	.06
Mood disorder diagnosis	.43	.12	.12 [†]	.48	.11	.14 [†]
Disruptive disorder diagnosis	.06	.06	.03	.06	.05	.04
Anxiety disorder diagnosis	-.17	.10	-.06	-.20	.09	-.07 [*]
Risk behavior-related						
Age	.01	.01	.09 [†]	.01	.01	.08 [*]
Gender	.12	.03	.14 [†]	.11	.03	.13 [†]
Race/ethnicity	-.07	.03	-.08 [*]	-.06	.03	-.07 [*]
Household income	-.01	.00	-.11 [†]	-.01	.00	-.10 [†]
Insurance status	.06	.04	.04	.05	.04	.04
Mood disorder diagnosis	-.02	.05	-.01	-.00	.05	-.00
Disruptive disorder diagnosis	.08	.03	.10 [†]	.08	.03	.10 [†]
Anxiety disorder diagnosis	.08	.04	.06	.08	.04	.06
Weight problems						
Age	.00	.01	.02	.00	.01	.02
Gender	.20	.04	.15 [†]	.19	.04	.15 [†]
Race/ethnicity	-.05	.04	-.04	-.07	.04	-.06
Household income	-.01	.00	-.08 [*]	-.01	.00	-.08 [*]
Insurance status	.07	.06	.04	.05	.06	.03
Mood disorder diagnosis	.26	.08	.11 [†]	.22	.08	.09 [†]
Disruptive disorder diagnosis	.03	.04	.02	.03	.04	.02
Anxiety disorder diagnosis	-.02	.07	-.01	.06	.07	-.03

Note: Race/ethnicity = white/non-white; Gender = female; Insurance status, 0=no insurance, 1=insurance.

* $p < .05$;

[†] $p < .01$;

[‡] $p < .001$.