The Great Smoky Mountains Study of Youth: Goals, Design, Methods, and the Prevalence of DSM-III-R Disorders

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Outline

- Abstract
- SUBJECTS AND METHODS
  - SETTING
  - SAMPLING
  - American Indian Participants
  - MEASURES
    - Construct 1: Risk for Mental Health Service Use
    - Construct 2: Service Use, Access, and Barriers to Care
    - Construct 3: Family Resources
    - Construct 4: Family Functioning, Psychiatric Symptoms, and Family Burden
    - Construct 5: Child's Physical Health and Development
    - Construct 6: Adversity and Traumatic Events
    - Construct 7: Community Resources
  - INTERVIEWERS AND INTERVIEWER TRAINING
  - PROCEDURES FOR THE FIRST WAVE
  - FOLLOW-UP TELEPHONE CONTACTS AND INTERVIEWS
- RESULTS
  - PREVALENCE OF PSYCHIATRIC DISORDERS
  - COMORBIDITY
  - DEMOGRAPHIC CORRELATES OF DIAGNOSIS
    - Sex
    - Age
    - Race
    - Income
    - Place of Residence
- COMMENT
  - LIMITATIONS
  - PREVALENCE
  - CORRELATES OF PSYCHIATRIC DISORDER
- REFERENCES

Graphics

- Table 1
- Figure 1
- Table 2
- Figure 2
Abstract

Background: The Great Smoky Mountains Study of youth focuses on the relationship between the development of psychiatric disorder and the need for and use of mental health services.

Methods: A multistage, overlapping cohorts design was used, in which 4500 of the 11,758 children aged 9, 11, and 13 years in an 11-county area of the southeastern United States were randomly selected for screening for psychiatric symptoms. Children who scored in the top 25% on the screening questionnaire, together with a 1 in 10 random sample of the rest, were recruited for 4 waves of intensive, annual interviews (n=1015 at wave 1). In a parallel study, all American Indian children aged 9, 11, and 13 years were recruited (N=323 at wave 1).

Results: The 3-month prevalence (+/-SE) of any DSM-III-R axis I disorder in the main sample, weighted to reflect population prevalence rates, was 20.3%+/-1.7%. The most common diagnoses were anxiety disorders (5.7%+/-1.0%), enuresis (5.1%+/-1.0%), tic disorders (4.2%+/-0.9%), conduct disorder (3.3%+/-0.6%), oppositional defiant disorder (2.7%+/-0.4%), and hyperactivity (1.9%+/-0.4%).

Conclusions: The prevalence of psychiatric disorder in this rural sample was similar to rates reported in other recent studies. Poverty was the strongest demographic correlate of diagnosis, in both urban and rural children.

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The Great Smoky Mountains Study (GSMS) was designed to examine the development of, need for, and use of mental health services in children and adolescents in an area of the southeastern United States. The study addresses the extent of met and unmet need for mental health care; the role played by education, primary care, child welfare, and juvenile justice in the provision of mental health care for children; the interrelationship of diagnosis and functional impairment; individual, family, and community predictors of need for mental health care; the impact of different service delivery systems in urban and rural communities; and the interplay of individual development and the development of need for and use of services.

In this and companion articles [1-3] we present the baseline findings on these topics from the first wave of data collection. Analyses across later waves of data collection will address the developmental goals of the study. This article presents the sampling design and procedures common to the entire study, the baseline estimates of rates of psychiatric disorder in 9-, 11-, and 13-year-olds, and the impact of sex, race, income, and rural or urban residence on those rates.

SUBJECTS AND METHODS

SETTING

The southern Appalachian mountain region of North Carolina was chosen as the study site for the following reasons. (1) This sparsely populated area, with its 180,000 inhabitants spread over 12,194 km², is representative of an understudied section of the United States: the rural areas of the south and southeast. (2) Almost all children attend public schools, which means that school records could be used to provide the initial sampling frame for the study. (3) Half the population live in the only sizable town in the area, while the rest live in the rural areas, providing the opportunity to compare psychiatric disorder and service provision in rural and urban settings. (4) The area contains the Qualla Boundary, a federal reservation that is home to the 8000-strong Eastern Band of the Cherokee Nation, a community with
different traditions of dealing with mental illness and its own mental health service system.

SAMPLING

Like several epidemiologic studies, the GSMS used a screening-stratified sampling design to maximize 3 study goals within a reasonable budget: (1) to understand the developmental pathways of a large sample of children with a high need for mental health care (case finding); (2) to estimate the prevalence of disorders and risk factors in the population (prevalence estimation); and (3) to map the identified cases onto the general population (generalizability). A household sample would meet goal 2 but would need to be large (and expensive) to generate enough cases to meet goals 1 and 3. Recruiting from service settings might achieve goal 1, but generalizability would be hard to achieve because of referral bias and the fact that many children are seen in multiple service sectors.

The screening questionnaire was designed to identify children with a high probability of mental health service use, ie, children with psychiatric symptoms. All children with scores above a cutoff point defined from pilot testing were recruited for the main study. In addition, a 1 in 10 random sample of the remainder were also recruited. Weights inversely proportional to probability of selection were attached to each subject's data, so that estimates of population prevalence could be made. All prevalence estimates and statistical testing was carried out by means of SUDAAN, a SAS-based software package for survey data analysis, which adjusts estimates and variances for the design characteristics.

Power calculations for a range of exposure levels and outcome prevalence indicated that a household sample of 4000 would generate enough cases of the more common child psychiatric disorders (>1% prevalence) to permit, for example, tests of sex-by-age differences in rates.

Screening Sample

Children aged 9, 11, and 13 years at baseline were selected. Nine years was selected as the lowest age for 3 main reasons: (1) rates of professional mental health service use are low in younger children; (2) psychiatric epidemiologic methods for evaluating younger children are not well developed; and (3) we are interested in the impact of puberty on the onset of some psychiatric disorders. By the end of 4 annual interviews, the 9-year-olds will be 12 years old, and the 11-year-olds, 14 years old. This "overlapping cohorts" design permits us to assess and, if necessary, control for cohort effects, while examining children across an 8-year age range (9-16 years) within 4 years.

A multistep probability sampling procedure was used. The 12 000 children aged 9, 11, and 13 years in the public school's database were arranged by households and were selected with probability proportional to the total number of age-eligible children in the household. An age category (9, 11, or 13 years) was drawn from each selected household, with the probability of selection being proportional to the number of children in the age group for that household. Within the selected age category, 1 child was selected on an equiprobability basis to generate a total screening sample of 4500 children (1570 were 9-year-olds, 1590 were 11-year-olds, and 1340 were 13-year-olds). The parent or guardian of each child completed a brief screening questionnaire about the index child. If the parent could not be reached by telephone, contact was made by mail or, if necessary, by home
visits.

The screening measure consisted of the "externalizing" broad-band scale items from the Child Behavior Checklist. [13,14] The substance abuse question in the Child Behavior Checklist was expanded to cover specific substances (tobacco, cannabis, inhalants, etc), for a total of 57 questions. Previous studies have attested to the Child Behavior Checklist's reliability and ability to identify child mental health services users. [13,15] We used only parent-reported items for 3 reasons. (1) Pilot testing showed that screening 2 or more people (e.g., a parent and the child) greatly increased refusals and incomplete data without much improvement in case identification. (2) Evidence from previous studies suggested that parental reports of behavioral problems best predict most types of psychiatric symptoms and service use. [14-16] (3) It was important to keep the screen as short as possible. A potential disadvantage of this approach was that it did not screen for anxiety, depression, and other nonexternalizing disorders. However, there is evidence that parents are often poor reporters of children's anxiety and depression, and that there is a considerable amount of comorbidity with behavioral problems. [5,15-17] Thus, a screen for behavioral symptoms was likely also to identify children with emotional problems.

American Indian Participants

American Indian children were not included in the random selection process because of our interest in oversampling this group. We were given permission by the Board of Education on the Qualla Boundary to recruit all 9-, 11-, and 13-year-olds attending reservation schools, and extended the study to include all American Indian children attending public schools, to obtain a 100% sample of age-appropriate enrolled members of any American Indian tribe. Because extra funding is available for American Indian students in public schools under Public Law 874, or Title V of the Indian Education Act, records of ethnicity are carefully maintained by the schools. A total of 450 American Indian children were identified in either public or reservation schools. Apart from the sampling procedures, data collection and methods were identical for all ethnic groups. Results from the American Indian children will be reported in a separate article.

MEASURES

(Table 1) shows the measures, their content area, the informant, and the occasions on which they are used. [18-30] The measures of each area are reviewed briefly below; further details may be obtained from the first author (E.J.C.).
Table 1. Content Areas and Instruments

**Construct 1: Risk for Mental Health Service Use**

Diagnoses and Symptoms. The Child and Adolescent Psychiatric Assessment (CAPA) [18,19] is an interview that elicits information about symptoms that contribute to a wide range of diagnoses. The CAPA combines the characteristics of an "interviewer-based" and a "respondent-based" interview. [18] Like respondent-based interviews, the CAPA uses a highly structured protocol, with required questions and probes. However, as in an interviewer-based interview, the onus throughout is on the interviewer to ensure that subjects (1) understand the question being asked, (2) provide clear information on behavior or feelings relevant to the symptom, and (3) have the symptom at a prespecified level of severity as defined in an extensive glossary. Diagnoses are generated by computer algorithms. Separate algorithms are available for child and parent reports and "combined reports," where a symptom is regarded as being present if either the parent or the child reports it.

The DSM-III-R [20] was the taxonomy used for wave 1; subsequent waves will be analyzed by means of both DSM-III-R [20] and DSM-IV. [21] A test-retest reliability study of a clinical sample aged 10 to 17 years [19] found kappa=0.52 for oppositional disorder, kappa=0.61 for conduct disorder, kappa=0.95 for substance abuse, kappa=0.52 for separation anxiety, kappa=0.77 for overanxious disorder, kappa=0.65 for dysthymia, and kappa=0.85 for major depression.

Level of Functioning. The functional impairment or incapacities section of the CAPA, which follows the section on symptoms, relates the symptoms to the child's ability to function at a developmentally appropriate level in relationships with family, peers, and teachers, in activities at school, at home, and in the community. A test-retest study of the incapacities section with 77 children showed an intraclass correlation of 0.76. [19]

Four other measures of functioning were collected. Interviewers completed the Children's Global Assessment Scale, [22] for which the interviewer gives the child a single score ranging from 0 to 100, and the Child and Adolescent Functional Assessment Scale, [23] which rates the child on role performance at school, ability to think clearly, behavior toward self and others, mood and emotional state, and caregiver's resources, needs, and level of social support. Both of these scales show reasonable reliability in clinic populations. [22,23] Parent and child completed the Social Interactions Survey, [24] which assesses the child's ability to relate well to peers, parents, teachers, and other adults. The Social Interactions Survey consists of 12 vignettes describing a social situation (eg, rejection by peers). The subject marks on a 0- to 100-point scale the extent to which the vignette describes the child in question. One-week retest reliability on a sample of 32 children aged 9 to 12 years yielded intraclass correlation coefficients of 0.86 for peer relationships and 0.85 for adult relationships. In the second and third waves of the study, 3 teachers for each child completed the
and third waves of the study, 3 teachers for each child completed the Teacher Report Form, a version for teachers of the Child Behavior Checklist that includes information on the child's academic and social functioning at school.

**Construct 2: Service Use, Access, and Barriers to Care**

The Child and Adolescent Services Assessment (CASA) is an interview about use of specialty mental health providers, pediatricians, other medical care providers, school counselors, probation officers, Department of Social Services staff, self-help groups, spiritual advisors, family, and friends. The CASA has 3 parts. First, a screen assesses the use of a list of providers. For each provider actually seen by the index child, probes are used to determine the onset, frequency, and duration of contacts, services provided, cost, who paid, and the recipient's level of perceived benefit. The CASA then asks about barriers to using services for mental health care: time, distance, lack of transportation, cost, lack of a common language, and fear that the child will be taken away or that parental rights will be lost. Reliability studies on the CASA show that it has high retest reliability (kappa>0.80) for the more intensive services, such as inpatient hospitalization, good reliability (kappa>0.60) for less intensive professional mental health services, such as outpatient treatment and school services, and moderate to low reliability for nonprofessional services, such as consulting ministers and friends. A comparison of CASA parent reports of mental health service use with the records of local mental health agencies for 160 high-intensity service users showed complete agreement for inpatient services, 91% agreement for outpatient services, and 79% agreement overall.

**Construct 3: Family Resources**

Information is collected on family income, parental occupation and educational status, and health and mental health insurance.

**Construct 4: Family Functioning, Psychiatric Symptoms, and Family Burden**

The CAPA includes a section on the quality of family relationships (parent-child and parent-parent relationships, parenting style, etc). Retest reliability is good (eg, intraclass correlation of 0.76 for the family relationships scale). A brief section also reviews the psychiatric problems of the index child's parents or primary caretakers. Questions cover history of treatment for psychiatric or substance abuse problems, and criminal convictions. Kappa statistics for individual items are all 0.60 or better.

The caregiver completes the Child and Adolescent Burden Assessment, a section in CAPA, for children with any identified psychiatric problems. This instrument covers such issues as the economic burden of having a child with mental health problems, the impact on family finances and relationships, restrictions on activities, including ability to work, parental psychological distress, and stigma.

**Construct 5: Child's Physical Health and Development**

Each child is weighed and measured, and blood samples are assayed for luteinizing hormone, follicle-stimulating hormone, testosterone, dehydroepiandrosterone, and androstenedione in boys and girls, and estradiol in girls, by means of fluorometric immunoassay methods developed by Worthman and Stallings. Children also complete a self-report measure of Tanner staging, which provides a good
approximation to physical examination for pubertal development, and answer a series of questions on self-perception of developmental status relative to other children and satisfaction with developmental status. In the second and third waves of data collection, parents complete the Childhood (Medical) Conditions section of the National Health Interview Survey Supplement Booklet, which collects basic information about the child's physical health history.

Construct 6: Adversity and Traumatic Events

The CAPA includes an extensive review of long-term adversity, such as poverty and living in an unsafe neighborhood, and life events that could contribute to posttraumatic stress disorder and other disorders.

Construct 7: Community Resources

The network of services available in the area has been studied by members of the group (E.J.C., A.A., and B.J.B.) as part of another study in the same community, and a detailed analysis of the service system for children and adolescents is available.

INTERVIEWERS AND INTERVIEWER TRAINING

Interviewers are residents of the area in which the study is taking place. Some, but not all, of the interviewers for the American Indian sample are American Indians. All interviewers have at least bachelor's-level degrees and receive 1 month of training. After training, quality control is maintained through postinterview reviews of each schedule, weekly staff meetings to review audiotapes of randomly selected field interviews, and regular refresher sessions with one of us (A.A.).

PROCEDURES FOR THE FIRST WAVE

Children were screened and interviewed as close as possible to the birthday on which they became 9, 11, or 13 years old. Families recruited for the interview stage of the study were visited at home by 2 interviewers. After the informed consent and physical procedures, parent and child were interviewed in separate rooms. Each parent and child was paid $10 after the interview was completed.

(Figure 1) shows the completion rates for various stages of sample recruitment for the main study. Of the 4500 names selected, 433 were eliminated, either because the family had moved out of the study area or because errors in the database misclassified the child's age. It proved impossible to complete 56 of the 1071 interviews scheduled for the main sample within the window of 6 months from the child's birthday, because of severe weather in the mountains. These families remain in the study and form part of the wave 2 data collection but are treated as having missing data for wave 1. The racial composition of the main sample at wave 1 was as follows: African American, 79; Hispanic, 6; Asian American, 3; mixed race, 11; and white, 916. There were also 323 American Indians in the companion study.

```
<table>
<thead>
<tr>
<th>Eligible</th>
<th>Screening Sample</th>
<th>Ineligible</th>
</tr>
</thead>
<tbody>
<tr>
<td>4067</td>
<td>4600</td>
<td>433</td>
</tr>
</tbody>
</table>
```

The availability of screening data made it possible to check on potential differences between the interviewed sample and (1) the families who were selected for the main study but refused to participate and (2) families who agreed to participate but could not be interviewed at wave 1. Comparisons were made, by chi squared or t tests, on age, sex, income, rural or urban residence, mean within-group screen score, percentage scoring in the high-risk range, percentage of children below grade for age, and the percentage who had sought help because of the child’s emotional or behavioral problems. There were no statistically significant differences on any individual variable or combination of variables, with P<.1 used as the criterion. We conclude that the results of the study are unlikely to be seriously biased by nonresponse.

FOLLOW-UP TELEPHONE CONTACTS AND INTERVIEWS

After the wave 1 interviews, families are contacted by telephone every 3 months. They report on any service use during the intervening period, as well as any change of address, school, or family structure. Thereafter, the parent and child are reinterviewed annually by means of a protocol almost identical to that used in wave 1.

RESULTS

PREVALENCE OF PSYCHIATRIC DISORDERS

(Table 2) shows the 3-month weighted prevalence estimates and SEs in wave 1, for DSM-III-R diagnoses and combinations of diagnoses, for boys, girls, and both. Diagnoses in parentheses are rare disorders that yielded fewer than 5 cases in the interviewed sample.
<table>
<thead>
<tr>
<th>Diagnosis</th>
<th>Female</th>
<th>Male</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Separation anxiety</td>
<td>4.30±1.20</td>
<td>2.70±0.91</td>
<td>3.49±0.75</td>
</tr>
<tr>
<td>Overanxious disorder</td>
<td>1.60±0.89</td>
<td>0.88±0.24</td>
<td>1.38±0.46</td>
</tr>
<tr>
<td>Generalized anxiety disorder</td>
<td>2.43±1.68</td>
<td>0.96±0.57</td>
<td>1.67±0.81</td>
</tr>
<tr>
<td>Simple phobia</td>
<td>0.42±0.17</td>
<td>0.13±0.09</td>
<td>0.27±0.10</td>
</tr>
<tr>
<td>(Agoraphobia)</td>
<td>0</td>
<td>0.13±0.09</td>
<td>0.07±0.05</td>
</tr>
<tr>
<td>(Panic disorder)</td>
<td>0</td>
<td>0.07±0.07</td>
<td>0.03±0.03</td>
</tr>
<tr>
<td>(Avoidant disorder)</td>
<td>0.07±0.07</td>
<td>0</td>
<td>0.03±0.03</td>
</tr>
<tr>
<td>Social anxiety</td>
<td>0.83±0.63</td>
<td>0.33±0.15</td>
<td>0.58±0.32</td>
</tr>
<tr>
<td>(Elective mutism)</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Obsessive-compulsive disorder</td>
<td>0.14±0.10</td>
<td>0.20±0.12</td>
<td>0.17±0.06</td>
</tr>
<tr>
<td>(Posttraumatic stress disorder)</td>
<td>0.05±1.60</td>
<td>0</td>
<td>0.02±0.96</td>
</tr>
<tr>
<td>(Anorexia nervosa)</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>(Bulimia)</td>
<td>0.07±0.07</td>
<td>0.14±0.10</td>
<td>0.10±0.06</td>
</tr>
<tr>
<td>(Major depression)</td>
<td>0.07±0.07</td>
<td>0</td>
<td>0.03±0.03</td>
</tr>
<tr>
<td>(Dysthymia)</td>
<td>0.07±0.07</td>
<td>0.20±0.12</td>
<td>0.13±0.07</td>
</tr>
<tr>
<td>Depression not otherwise specified</td>
<td>1.22±0.86</td>
<td>1.88±0.66</td>
<td>1.46±0.46</td>
</tr>
<tr>
<td>(Hypomania)</td>
<td>0.07±0.07</td>
<td>0.13±0.09</td>
<td>0.10±0.06</td>
</tr>
<tr>
<td>(Manic episode)</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Conduct disorder</td>
<td>1.13±0.26</td>
<td>5.43±1.23</td>
<td>3.32±0.85</td>
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<tr>
<td>Oppositional defiant disorder</td>
<td>2.33±0.70</td>
<td>3.16±0.47</td>
<td>2.75±0.41</td>
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<tr>
<td>ADHD†</td>
<td>0.95±0.26</td>
<td>2.90±0.73</td>
<td>1.94±0.39</td>
</tr>
<tr>
<td>(Substance abuse/dependence)</td>
<td>0.13±0.09</td>
<td>0.07±0.07</td>
<td>0.10±0.06</td>
</tr>
<tr>
<td>Motor tic</td>
<td>2.71±1.12</td>
<td>4.32±1.48</td>
<td>3.53±0.94</td>
</tr>
<tr>
<td>(Vocal tic)</td>
<td>0.20±0.11</td>
<td>1.25±0.64</td>
<td>0.75±0.33</td>
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<tr>
<td>(Tourette disorder)</td>
<td>0.07±0.07</td>
<td>0.13±0.09</td>
<td>0.10±0.06</td>
</tr>
<tr>
<td>Trichotillomania</td>
<td>0</td>
<td>0.34±0.15</td>
<td>0.17±0.08</td>
</tr>
<tr>
<td>Enuresis</td>
<td>2.46±0.85</td>
<td>7.86±1.74</td>
<td>5.11±0.98</td>
</tr>
<tr>
<td>Encopresis</td>
<td>0.07±0.07</td>
<td>1.36±0.59</td>
<td>0.72±0.30</td>
</tr>
<tr>
<td>(Schizophrenia)</td>
<td>0.13±0.09</td>
<td>0.07±0.07</td>
<td>0.10±0.06</td>
</tr>
<tr>
<td>Any anxiety disorder‡</td>
<td>6.95±1.60</td>
<td>4.46±1.09</td>
<td>5.69±0.96</td>
</tr>
<tr>
<td>Any depressive disorder</td>
<td>1.36±0.65</td>
<td>1.66±0.66</td>
<td>1.52±0.46</td>
</tr>
<tr>
<td>Any emotional disorder</td>
<td>6.85±1.71</td>
<td>5.67±1.26</td>
<td>6.64±1.05</td>
</tr>
<tr>
<td>Any behavioral disorder</td>
<td>3.50±0.76</td>
<td>9.53±1.44</td>
<td>6.56±0.81</td>
</tr>
<tr>
<td>Any tic disorder</td>
<td>2.90±1.13</td>
<td>5.47±1.49</td>
<td>4.20±0.94</td>
</tr>
<tr>
<td>Any other disorder¶</td>
<td>5.67±1.41</td>
<td>14.36±2.28</td>
<td>10.48±1.37</td>
</tr>
<tr>
<td>Any emotional or behavioral disorder</td>
<td>10.79±1.83</td>
<td>13.04±1.77</td>
<td>11.93±1.26</td>
</tr>
<tr>
<td>Comorbid emotional and behavioral diagnoses</td>
<td>0.75±0.35</td>
<td>2.16±0.75</td>
<td>1.47±0.45</td>
</tr>
<tr>
<td>Any core disorder¶</td>
<td>10.86±1.83</td>
<td>13.31±1.78</td>
<td>12.10±1.26</td>
</tr>
<tr>
<td>Any disorder</td>
<td>15.64±2.23</td>
<td>24.86±2.62</td>
<td>20.25±1.72</td>
</tr>
</tbody>
</table>

*Diagnoses in parentheses had fewer than 5 cases in the interviewed sample. CAPA indicates Child and Adolescent Psychiatric Assessment; ADHD, attention-deficit hyperactivity disorder.
†Based on parent report only.
‡Separation anxiety, overanxious disorder, generalized anxiety disorder, simple phobia, agoraphobia, panic disorder, avoidant disorder, social anxiety.
§Encopresis, enuresis, tic, Tourette disorder, obsessive-compulsive disorder, bulimia, trichotillomania.
||Any emotional or behavioral disorder, schizophrenia, obsessive-compulsive disorder, anorexia, bulimia, Tourette disorder, trichotillomania, posttraumatic stress disorder, elective mutism, encopresis.

Table 2. Three-Month Prevalence of CAPA/DSM-III-R Diagnoses*
The weighted 3-month population prevalence rate (+/-SE) was 20.3% +/- 1.7%. The CAPA makes several diagnoses not commonly included in other community [backslash-] studies, and some of these, notably tic disorders and enuresis, occurred at a fairly high rate. We calculated an overall prevalence rate for a set of "core" diagnoses made in several other studies (Table 2). Also, while strictly diagnosed DSM-III-R depressive disorders were rare, there was a substantial group of children (28 of the interviewed sample) who had the core symptoms of mood disorder and anhedonia but did not quite reach the criterion either for duration (for dysthymia) or for number of other symptoms (for major depression). It seemed appropriate to include this markedly symptomatic group, and they are designated in (Table 2) under "depression not otherwise specified" and included in the overall and core prevalence rates.

There were 307 children with a DSM-III-R diagnosis in the sample, whereas a prevalence rate of 20.3% would yield 206 cases from a random population sample of 1015. Thus, the screening process yielded a sample containing 49% more cases. We discuss the cost-efficiency of 2-stage sampling in detail in another article. [31]

COMORBIDITY

Comorbidity was not uncommon in the sample: 100 of the 307 children with a diagnosis had more than 1. Some children had more than 1 diagnosis within 1 category (eg, more than 1 anxiety disorder), while others had, for example, both an emotional and a behavioral disorder. (Figure 2) shows the numbers of children interviewed with various types of comorbidity, while the percentages are weighted to reflect the population rates. Overall, 1.5% of the population had both an emotional and a behavioral disorder. Comorbidity was more commonly associated with some diagnoses than others. Only 21% (weighted) of children with an "other" disorder (mainly tics and enuresis) had an emotional or behavioral disorder, whereas 53% of children with depression (including depression not otherwise specified) were comorbid, as were 38% of children with a behavioral disorder and 28% of those with an anxiety disorder.
Figure 2. Comorbidity among diagnostic areas, showing number of interviewed children with diagnoses and weighted 3-month prevalence rates (in parentheses). Associations between diagnostic categories, with odds ratio, 95% confidence intervals, and associated P values, are as follows: depressive/anxiety disorders, 4.9, 1.5 to 16.5, and .01; depressive/behavioral disorders, 6.6, 2.1 to 20.5, and .001; depressive/other disorders (chiefly enuresis and tic disorders; see Table 2), 0.8, 0.2 to 3.8, and .79; anxiety/behavioral disorders, 3.2, 1.5 to 6.7, and .002; anxiety/other disorders, 1.1, 0.8 to 3.5, and .146; and behavioral/other disorders, 2.6, 1.3 to 4.8, and .004.

DEMOGRAPHIC CORRELATES OF DIAGNOSIS

The relationship between diagnosis and sex, age, race, income, and urban or rural location was examined by logistic regression. Since rates of disorder were similar in 11- and 13-year-olds, and somewhat higher in 9-year-olds, a dichotomous variable (9 vs 11+13 years) was used in the logistic regressions. Income was dichotomized as being above or below the federal poverty line, and race as African American vs other. SUDAAN [8] was used to generate the odds ratios (ORs), confidence intervals (CIs), and probabilities. All ORs control for the other demographic correlates.

Sex

Boys were at higher risk for any psychiatric disorder (24.9% +/- 2.6% [SE] vs 15.5% +/- 2.2%; OR, 1.8; 95% CI, 1.3-2.5; P<.001). This was mainly the result of their higher rates of behavioral disorders (9.5% vs 3.5%; OR, 2.9; 95% CI, 1.6-5.1; P<.001) and enuresis (7.7% vs 2.5%; OR, 2.8; 95% CI, 1.4-5.6; P=.003). Comorbidity of emotional and behavioral disorders was almost 3 times as common in boys as in girls (2.2% vs 0.8%; OR, 2.7; 95% CI, 0.9-7.7; P=.06).

Age

Rates of separation anxiety, tics, and enuresis fell significantly between 9 and 11 years of age, but there were no other significant age differences.

Race

The only comparison examined here was between African American children, who made up 8.1% of the sample, and white children. African American children were more likely to have functional enuresis, but rates of all other disorders, and of comorbidity, were similar.

Income

The children from the poorest families were at increased risk of any disorder (33.4% +/- 3.9% vs 15.9% +/- 1.7%; OR, 3.2; 95% CI, 2.3-4.4; P<.001) and of every type of diagnosis except for tic disorders. The highest risk was for behavioral disorders (11.0% vs 4.4%; OR, 2.7; 95% CI, 1.6-4.4; P<.001). Poor children had comorbid emotional and behavioral conditions at 3 times the rate of other children (6.5% vs 2.0%; OR, 3.3; 95% CI, 1.7-6.6; P<.001).

Place of Residence

Any differences between urban and rural children became nonsignificant when poverty was included in the model.
LIMITATIONS

Limitations of the present study include the following: (1) Information is available for only 3 groups of children recruited at ages 9, 11, and 13 years. (2) This is a southern, rural, predominantly white sample, containing almost no Hispanic or Asian-American children. (3) Wave 1 of the GSMS collected information only from the index child and 1 parent. Other research has shown that parents often have different views of the same child, as do teachers and others in the child's immediate circle. In the second and subsequent waves, questionnaire information is being collected from 3 teachers for each child, as well as from treatment settings. (4) The CAPA provides prevalence estimates only for the 3 months preceding the interview. However, data on service use is collected every 3 months between interviews, so complete longitudinal data will be available. (5) By screening for behavioral but not emotional or other problems, we may have increased the SEs of the estimates of depression, anxiety, tics, enuresis, etc; however, the screen-low group was large enough (N=260) to prevent any significant distortion of the prevalence estimates.

PREVALENCE

The most important conclusion to be drawn from the data presented herein is that rates and correlates of childhood psychiatric disorder were similar in this remote, rural area of the United States to those found in studies in urban areas. Poverty does not have to be accompanied by urban pressures to be associated with psychiatric symptoms.

In a previous publication, we summarized rates of child psychiatric disorders reported by several recent epidemiologic studies, finding that they fell within a fairly narrow range (17.6%-22.0%). The overall prevalence rates of disorder and comorbidity found in the GSMS sample fell within the expected range.

From a public health point of view, the high rate of comorbidity illustrated in (Figure 2) is a cause for concern. The Dunedin, New Zealand, longitudinal study has documented a high rate of learning difficulties and other problems in adolescents who had some types of psychiatric comorbidity in childhood. Studies of adults have shown that those with multiple disorders in the course of a lifetime are at higher risk of having "severe" disorders (psychoses or disorders requiring hospitalization or causing severe role impairment) and of substance abuse. This study replicated others in finding that depression, in particular, is highly likely to be accompanied by other disorders.

CORRELATES OF PSYCHIATRIC DISORDER

In general, the patterns linking rates of psychiatric disorder to differences in sex, age, race, and place of residence support those previously reported. Thus, we found more behavioral disorders in boys than in girls, decreasing rates of separation anxiety, tics, and enuresis with age, and an increased risk in children from impoverished families. On the other hand, rates of disorder were high only in children living in the direst poverty; children from families with even a modestly higher income, up to twice the federal poverty level, had rates of psychiatric disorders no higher than those of children from the highest income groups. Once we controlled for poverty, however, we did not find the higher rates of disorder in urban
poverty, however, we did not find the higher rates of disorder in urban children that others have reported. [32-34,46] Nor were African-American children at higher risk for anything other than enuresis, controlling for poverty and urban residence.

Adults in the southern United States appear to report fewer mental health problems than those in other areas of the country. In the National Comorbidity Survey of adults, Kessler et al [41] found marked regional differences in lifetime prevalence rates, with lower rates of all but affective disorders in the southern United States, although the odds ratios comparing other regions with the south did not reach significance. The North Carolina site of the adult Epidemiologic Catchment Area Study had the lowest rates of affective disorders, substance use or abuse, and antisocial personality disorders, but ranked highest in rates of somatization, panic, generalized anxiety, and obsessive-compulsive disorders. As George et al [47] pointed out, caution must be used in drawing inferences about the south on the basis of a single, highly urbanized site. Sampling procedures used in the National Comorbidity Study, on the other hand, were designed to yield regional estimates and probably provide the best basis for regional comparisons. The Isle of Wight-Inner City comparison by Rutter and colleagues [46] found twice as much psychopathology in urban youth, but they ascribed the difference to the higher rates of poverty and life stresses in the urban sample. A cautious inference from this study is that the lower rate in the south has more to do with poverty than with latitude or urbanization.

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