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Epidemiology of mental disorders in children and adolescents

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This article provides a review of the magnitude of mental disorders in children and adolescents from recent community surveys across the world. Although there is substantial variation in the results depending upon the methodological characteristics of the studies, the findings converge in demonstrating that approximately one fourth of youth experience a mental disorder during the past year, and about one third across their lifetimes. Anxiety disorders are the most frequent conditions in children, followed by behavior disorders, mood disorders, and substance use disorders. Fewer than half of youth with current mental disorders receive mental health specialty treatment. However, those with the most severe disorders tend to receive mental health services. Current issues that are now being identified in the field of child psychiatric epidemiology include: refinement of classification and assessment, inclusion of young children in epidemiologic surveys, integration of child and adult psychiatric epidemiology, and evaluation of both mental and physical disorders in children.

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According to the World Health Organization (WHO),¹ mental health disorders are one of the leading causes of disability worldwide. Three of the ten leading causes of disability in people between the ages of 15 and 44 are mental disorders, and the other causes are often associated with mental disorders. Both retrospective and prospective research has shown that most adulthood mental disorders begin in childhood and adolescence.² This highlights the importance of gaining understanding of the magnitude, risk factors, and progression of mental disorders in youth.

The aims of this review are: (i) to provide a background on the definition and goals of epidemiology and its contributions to our understanding of childhood mental disorders; (ii) to summarize the prevalence estimates of specific mental disorders in children; (iii) to describe the correlates and risk factors, and service patterns for childhood mental disorders in community surveys; and (iv) to describe key issues and future directions in research on the epidemiology of mental disorders in children.

Background: epidemiology

Definition and goals

Epidemiology is defined as the study of the distribution and determinants of diseases in human populations. Epidemiologic studies are concerned with the extent

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Selected abbreviations and acronyms

ADHD	<i>attention deficit-hyperactivity disorder</i>
CD	<i>conduct disorder</i>
GAD	<i>generalized anxiety disorder</i>
MDD	<i>major depressive disorder</i>
ODD	<i>oppositional-defiant disorder</i>

and types of illnesses in groups of people and with the factors that influence their distribution. Epidemiologists investigate the interactions that may occur among the host, agent, and environment (the classic epidemiologic triangle) to produce a disease state. The important goal of epidemiologic studies is to identify the *etiology* of a disease in order to prevent or intervene in the progression of the disorder. To achieve this goal, epidemiologic studies generally proceed from studies that specify the prevalence and distribution of a disease within a population by person, place, and time (that is, *descriptive* epidemiology) to more focused studies of the determinants of disease in specific groups (that is, *analytic* epidemiology).

Descriptive epidemiologic studies are important in specifying the rates and distribution of disorders in the general population. The two major estimates of rates in epidemiology are prevalence and incidence. Both are based on the goal of identifying the proportion of cases of a particular index disease in a defined population. Prevalence rates are the number of existing cases in a defined population during a specified time period; incidence rates are the number of new cases of a disorder in a defined population during a specified time period of observation.³ Incidence rates are derived from prospective cohort studies, but they can also be estimated from retrospective cohort studies. Most prevalence estimates in psychiatry include lifetime (the number of cases at any time in the lifetime of respondents, irrespective of whether the disorder is current), 12-month (the number of cases in the population during the past year), and point prevalence (the number of cases at the time of the survey). The most common estimates of prevalence in children are either point or 1-year, because of the lack of reliability of lifetime estimates. Prevalence and incidence rates are generally adjusted for gender and age of the base population.

Epidemiologic studies are also designed to identify risk factors that influence the base rates of diseases in the general population. Differential distribution by gender, age, ethnicity, geographic site, or by exposure to partic-

ular risk factors provides clues that may be tested systematically with case-control designs. These studies compare the association between a particular risk factor or disease correlate and the presence or absence of a given disease, after controlling for relevant confounding variables. Case-control studies generally proceed from retrospective designs defined by the presence or absence of a disease in the cases and controls, in order to identify potential associations between a particular risk factor or set of risk factors, and prospective cohort studies where the cases and controls are defined by the presence or absence of a putative risk factor, and followed prospectively to examine differential incidence of the disease.

Community study data can also be applied to identify biases that may exist in treated populations and to construct case registries from which persons may serve as probands for analytic epidemiologic studies. Such attention to sampling issues is a major contribution of the epidemiologic approach, as individuals identified in clinical settings often constitute the tip of the iceberg of the disease, and may not be representative of the general population of similarly affected individuals with respect to demographic, social, or clinical characteristics.

Application of epidemiology to psychiatry

The application of the tools of epidemiology to psychiatry have led to both methodological developments including the introduction of structured and semistructured diagnostic interviews and statistical methods for estimating prevalence and correlates of mental disorders, and substantive findings regarding the high prevalence of mental disorders in the general population, patterns of comorbidity within and between classes of disorders, sociodemographic and environmental correlates and risk factors for mental disorders, and service patterns in general population samples.⁴

Several recent discussions of adult psychiatric epidemiology conclude that the field has now reached its maturity, and that the future generation of psychiatric epidemiology should be used to gain understanding of how multiple risk factors interact over time in producing multiple outcomes.^{5,6} It now seems likely that many, or most, mental problems involve a complex mixture of multiple genetic and environmental influences, interacting in a nonlinear and nonadditive fashion.

Prevalence and correlates of mental disorders in youth

Many of the future developments in child psychiatric epidemiology predicted 25 years ago by Earls⁷ have clearly been fulfilled during the past few decades. A recent comprehensive review of the field of child psychiatric epidemiology⁸ noted that the number of observations in community surveys of children and adolescents has risen from 10 000 in studies published between 1980 and 1993 to nearly 40 000 from 21 studies published between 1993 and 2002.⁹ The results of these studies indicate that about one out of every three to four youths is estimated to meet lifetime criteria for a Diagnostic and Statistical Manual of Mental Disorders (DSM) mental disorder.⁸ However, only a small proportion of these youth actually have sufficiently severe distress or impairment to warrant intervention.¹⁰ About one out of every ten youths is estimated to meet the Substance Abuse and Mental Health Services Administration (SAMHSA) criteria for a Serious Emotional Disturbance (SED),^{9,10} defined as a mental health problem that has a drastic impact on a child's ability to function socially, academically, and emotionally.¹¹ This section will provide an update of the epidemiology of child psychiatric disorders through a summary of the evidence from prior reviews and presentation of the findings from new studies that have not been included in previous summaries. We limit our review to studies that apply the DSM-IV criteria, and include direct structured interviews of children and reports regarding child symptoms and functioning from a parent or primary caretaker. The methods of community studies of children and ado-

lescents that meet these criteria are presented in *Table I*. The results of several new studies in the US have become available during the past 5 years. US studies include two community surveys in North Carolina, the most recent follow-up on the Great Smoky Mountains Study¹² and a study of rural white and African-American youth,¹³ a large multiethnic study of adolescents in Houston, Texas,¹⁴ and a population-based study of children in Puerto Rico.¹⁵ The results of two very large studies of children and adolescents ages 5 to 15 in Great Britain have also provided data on the prevalence, correlates, and service patterns of British youth (<http://www.statistics.gov.uk/>).

Table I also shows the diagnostic interviews that we used to assess the DSM-IV criteria in each of the surveys. More information about these interviews is provided in a comprehensive review of diagnostic interviews for children by Calinoiu and McClellan.¹⁶ In the following section, we summarize the prevalence rates from prior studies, and those from new surveys that have not been included in prior reviews.

Mood disorders in youth

Depressive disorders

Numerous studies have estimated the prevalence of Major Depressive Disorder (MDD) in community samples. Reviews of previous studies show a median prevalence estimate of 4.0% with a range from 0.2% to 17% for major depression.⁸ The current prevalence rates from newer studies of MDD shown in *Table II* reveals a range from 0.6% in Great Britain to 3.0% in Puerto Rico.

Location	Study	N	Age	No of waves	Diagnostic criteria	Diagnostic interview
Great Britain	<u>Child and Adolescent Mental Health Survey</u> Meltzer et al (2000); Ford et al (2003); Maughan (2004); Green et al (2005)	10 438	5-15	2	DSM-IV	DAWBA
United States	<u>Puerto Rico Community Study</u> Canino et al (2004)	1886	4-17	1	DSM-IV	DISC
	<u>North Carolina</u> <i>Rural Youth Survey</i> Angold et al (2002)	920	9-17	1	DSM-IV	CAPA
	<i>Great Smoky Mountains Study</i> Costello et al (2003)	1015	9-16	3	DSM-IV	CAPA
	<u>Teen Health 2000</u> Roberts et al (2007)	4175	11-17	1	DSM-IV	DISC

Table I. Recent community surveys of mental disorders in children and adolescents. Source: <http://www.statistics.gov.uk>. DAWBA, Development and Well Being Assessment; DISC, Diagnostic Interview Schedule for Children; CAPA, Child and Adolescent Psychiatric Assessment

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Rates of MDD in follow-up studies of community samples of children in early adulthood are strikingly high, with lifetime estimates of 23.2%^{17,18} to 33.5% in New Zealand¹⁹ and 43.3% in Oregon.²⁰

Prevalence estimates of dysthymia among adolescents and young adults are typically lower than those of major depression.²¹⁻²³ In contrast, prevalence estimates of sub-threshold depressive disorders and syndromes, including minor depression and depression not otherwise specified (NOS), are generally higher than those of major depression across all age groups.^{12-13,24-25}

Among preadolescents, researchers report either no gender differences in rates of depression or even higher rates in preadolescent boys.²⁶ During adolescence, however, rates of depression are greater among females than among males,^{23,27-33} with differences persisting into middle adulthood.³⁴

Longitudinal studies of community samples of children and adolescents suggest an average age of onset between 11 and 14 years³⁵ for MDD and depressive disorder (DD). Evidence from prospective epidemiologic studies reveals a large change in the prevalence of major depressive episodes after age 11.³⁶ Prospective data from the Oregon Adolescent Depression Project showed that the rates of new onsets of depression increase from 1% to 2% at age 13 and from 3% to 7% at age 15.²⁰ The incidence of depression continues to increase throughout early adulthood.³⁷ There do not appear to be gender differences in the average age of onset of MDE in the National Comorbidity Survey.^{20,38}

Although studies of adults suggest that depression is associated with lower social class,³⁹ findings from samples of children and adolescents are less consistent. Whereas some studies report a lack of association between depres-

sive and anxiety disorders and social class,¹² others report a significant association, at least for the most impoverished groups.⁴⁰⁻⁴²

Because of differing measures, samples, and reporting techniques, difficulties arise in attempting to compare patterns of depression across studies of racial and ethnic groups. The small sample size of ethnic minority youth in most community studies of children and adolescents diminishes the statistical power to test differences in prevalence of disorders between specific ethnic subgroups. Recent studies have found that African-Americans have lower rates of depression than either whites¹³ or Latinos.⁴³⁻⁴⁴ Recent studies have also shown that there are increased depressive symptoms among Hispanic youth, particularly among Mexican-Americans, compared with their white and-African American counterparts.^{14,45-47}

Bipolar disorder

Only a few of the community surveys have included assessment of mania or hypomania, in part because of the widely held belief that these conditions are too rare in children. The current or 12-month prevalence rates of mania, hypomania, and bipolar disorder in population-based studies of youth range from 0% to 0.9% in children age 14 to 18.^{8,35} Lifetime prevalence rates for bipolar disorder among youth range from 0% to 2.1%, and the lifetime prevalence rate for hypomania ranges between 0% and 0.4%. The results of most community surveys find nearly equal rates of bipolar disorder in males and females.

The prospective study of Lewinsohn et al⁴⁸ found that the incidence of bipolar disorder peaks at age 14 in both males and females and decreases gradually thereafter.

Location	Study	N	Age	Prevalence period	Major depressive disorder	Dysthymia	Any depression
Great Britain	Meltzer et al (2000)	10 438	13-18	Point			2.5%
	Green et al (2004)	7977	5-16	Point	0.6%	---	0.9%
United States	<u>North Carolina</u>						
	Angold et al (2002)	920	9-17	3 mo	1.0%	---	2.9%
	Costello et al (2003)	1015	9-16	3 mo	2.2%	---	2.2%
	<u>Puerto Rico</u>						
	Canino et al (2004)	1886	4-17	12 mo	3.0%	3.4%	3.4%
	<u>Texas</u>						
	Roberts et al (2007)	4175	11-17	12 mo	1.7%	0.3%	2.1%

Table II. Prevalence rates of depression in recent community surveys. Source: <http://www.statistics.gov.uk>. Prevalence definitions: Point = current; 3 mo =3 months; 12 mo =12 months

There are also a growing number of studies that evaluate the incidence of first-onset mania in clinical samples of youth. Incidence rates from these studies range from 1.7 to 2.2 per 100 000 per year.⁴⁹

Both major depression and bipolar disorder are associated with multiple other disorders including attention-deficit/hyperactivity disorder (ADHD),^{48,50-52} anxiety disorders and/or oppositional defiant disorder (ODD),⁵² and conduct disorder.⁴⁸ Results of prospective studies of youth suggest that anxiety disorders may be an early manifestation of bipolar disorder. An 8-year follow-up study of a population sample of youth from New York state revealed that childhood anxiety disorders and depression, and to a lesser extent disruptive behavior disorders, were significantly associated with bipolar disorder in early adulthood.^{53,54} Future studies should attempt to distinguish whether anxiety disorders represent manifestations of the same etiologic factors or independently elevate the risk for development of mood disorders.

Anxiety disorders in youth

During the past decade, the results of international epidemiologic surveys have revealed that anxiety disorders are the most prevalent class of mental disorders in adults.³⁸ Similar to community studies of adults, anxiety disorders are also quite prevalent in the general population of children and adolescents. The median prevalence rate of all anxiety disorders in a recent review was 8% with an extremely wide range of estimates (eg, 2% to 24%).⁹ *Table III* presents the rates of anxiety disorders in recent community surveys of youth. Current or 12-month

rates of anxiety disorders range from 2.2% in North Carolina youth⁵⁵ to 9.5% in Puerto Rico.¹⁵ Generalized Anxiety Disorder (GAD) and Social Anxiety Disorder (SAD) are the two most prevalence disorders in youth. In contrast, panic disorder and obsessive-compulsive disorder (OCD) are both quite rare in children under 12. Similar to the gender ratio for adults, girls tend to have more of all subtypes of anxiety disorders, irrespective of the age composition of the sample. However, it has also been reported that, despite the greater rates of anxiety in girls across all ages, there is no significant difference between boys and girls in the average age at onset of anxiety.²⁶ Although there is substantial variation across studies, the results of prospective community-based research reveal differential peak periods of onset of specific subtypes of anxiety: separation anxiety and specific phobias in middle childhood; overanxious disorder (OAD) in late childhood; social phobia in middle adolescence; panic disorder in late adolescence; GAD in young adulthood; and OCD in early adulthood.¹⁸ Data from prospective studies reveal a sharp increase in girls beginning as early as age 5, with a continuously increasing slope throughout adolescence. Although rates of anxiety among males also increase throughout childhood and adolescence, the rise is far more gradual than that of females, and they begin to level off in late adolescence. Thus, by age 6, females have significantly greater rates of anxiety than males. Despite the far more rapid increase in anxiety disorders with age in girls than in boys, there are no gender differences in the mean age at onset of anxiety disorders or in their duration. There are consistent few differences in the distribution of anxiety disorders by ethnicity and social class.⁵⁶

Location	Study	N	Age	Prevalence period	Panic	OCD	SAD	GAD	Agora-phobia	Social phobia	Specific phobia	Any anxiety	
Great Britain	Meltzer et al (2000)	10 438	5-15	Point									
	Green et al (2004)	7977	5-16	Point	0.2	0.2	0.4	0.8	0.1	0.3	0.8	3.3	
United States	<u>North Carolina</u>												
	Costello et al (2002)	2709	9-12	3 mo	0.1	0.1	2.1	1.4	0.2	0.3	0.1	2.9	
	Angold et al (2002)	3895	13-16	3 mo	0.3	0.2	0.4	2.3	0.3	0.7	0.3	2.2	
		970	9-17	3 mo	1.2	0.2	3.0	1.3	0.5	1.4	0.4	5.7	
	<u>Puerto Rico</u>												
Canino et al (2004)	1897	4-17	12 mo	0.7	---		2.4	---	2.8	---	9.5		
<u>Texas</u>													
Roberts et al (2007)	4175	11-17	12 mo	0.7	---	---	0.4	4.5	1.6	---	6.9		

Table III. Prevalence rates of anxiety disorders in recent community surveys. Source: <http://www.statistics.gov.uk>. Prevalence definitions: Point = current; 3 mo = 3 months; 12 mo = 12 months. OCD, obsessive-compulsive disorder; SAD, social anxiety disorder; GAD, generalized anxiety disorder

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Comorbidity between anxiety disorders and other mental disorders is already apparent in childhood and adolescence. Anxiety disorders are associated with all of the other major classes of disorders, including mood disorders, disruptive behaviors, eating disorders, and substance use disorders. The co-occurrence of anxiety disorders and mood disorders is so common that there is emerging evidence that anxiety disorders may be part of the developmental sequence in which anxiety is expressed early in life followed by depression in adulthood.²⁶

Behavior disorders

ADHD

Although the point prevalence rates of ADHD have varied from 1.7% to 17.8%, the median prevalence of ADHD in a recent review was 3%.^{8,57,58} Prevalence rates from recent studies of ADHD using DSM-IV criteria are shown in *Table IV*. In more recent studies, the point prevalence of ADHD in 5- to 15-year-olds was 2.23%,⁵⁹ and the 12-month prevalence ranged between 2% and 8.7% for ages 4 to 17 years.^{14,15,60} Inclusion of recent studies increases the median prevalence rate of ADHD from 3% to 4%.⁹

The increased prevalence of ADHD in boys been well established.^{27,61-62} Rates of ADHD in recent surveys consistently show a male preponderance of ADHD as follows: 11.8% in boys and 5.4% in girls,⁶⁰ 3.62% in boys and 0.85% in girls,⁵⁹ 2.0% for boys and 0.5% for girls,¹⁵ and 1.5% for boys and 0.3% for girls.¹²

There is conflicting evidence linking ADHD with socioeconomic status. While one study found a twofold increase in ADHD for the poorest children when compared with

the wealthiest children,⁶⁰ two other studies found no association between family income or education and rates of ADHD.^{14,15} Some recent studies have shown lower rates of ADHD among Mexican-Americans residing in the US,⁶⁰ and among Asian children in the UK.⁵⁹

Conduct and oppositional disorder

The median 12-month prevalence rate of disruptive behavior disorders (ie, conduct disorder [CD] or oppositional defiant disorder [ODD]) is 6% with a range from 5% to 14%.⁸ The prevalence rates of CD and ODD based on DSM-IV criteria in recent studies can be found in *Table V*. Estimates of current or point prevalence in the UK are 2.3% for ODD and 1.5% for CD,⁵⁹ whereas somewhat higher rates were found in recent U.S. studies with ranges of 2.8% to 5.5% for ODD and 2.0% to 3.32% for CD.¹⁴⁻¹⁵ Similar to ADHD, CD is also more prevalent in boys than girls, with many studies showing a difference of 3 to 4 times higher for boys. The prevalence difference between boys and girls for ODD is less clear. Some studies find higher rates in boys, but others find very similar rates between boys and girls.⁶³

No consistent differences have been found in recent studies of the association between disruptive behavior disorders and socioeconomic status.^{14-15,63} However, Asian children in the UK had lower rates of ODD than non-Asian youth.⁵⁹ Age of onset of disruptive behavior disorders appears to be an important predictor of outcome, with earlier onset associated with more aggressive behaviors,⁶⁴ and boys who have a diagnosis of ADHD being more likely to have an early onset of CD.⁶³

Community studies of youth have shown a high degree of co-occurrence of CD and ADHD.⁶³ Likewise, there is

Location	Study	N	Age	ADHD
Great Britain	Meltzer et al (2000)	10 438	5-15	2.2%
	Green et al (2004)	7977	5-16	1.5%
United States	<u>National Health and Nutrition Examination Survey</u>			
	Froehlich et al (2007)	3082	8-15	8.7%
	<u>North Carolina</u>			
	Angold et al (2002)	920	9-17	1.3%
	Costello et al (2003)	1015	9-16	0.9%
	<u>Puerto Rico</u>			
	Canino et al (2004)	1886	4-17	8.0%
	<u>Texas</u>			
	Roberts et al (2007)	4175	11-17	2.1%

Table IV. Prevalence rates of ADHD in recent community surveys. Source: <http://www.statistics.gov.uk>. ADHD, attention deficit-hyperactivity disorder

also a strong association between the disruptive behavior disorders with mood and anxiety disorders. Studies in child psychiatric epidemiology have begun to focus far more on identifying explanations for specific patterns of comorbidity than simply documenting that comorbidity is pervasive.⁶³

Substance use disorders

Trends of drug and alcohol use in high-school youth in the US are carefully monitored by studies such as Monitoring the Future (MTF).⁶⁵ The 2007 MTF survey that encompassed nearly 50 000 8th-, 10th-, and 12th-grade students in over 400 secondary schools nationwide continues to show a decline in illicit drug use across the US. However, this survey does not collect information on substance use disorders. The median estimate of alcohol or drug abuse or dependence in community surveys of adolescents is 5% with a range from 1% to 24%.⁸ The results of the recent studies described in *Table I* yield similar estimates: 4.7%,¹³ 5.3%,¹⁴ 2.4%,¹² and 1.7%.¹⁵ The lower rates in the latter two studies are likely to be attributed to the lower age range of these samples. For example, in the Great Smoky Mountains Survey, there was a dramatic increase in the rates of substance use disorders with age, with a 3-month prevalence rate of 0.3% at age 13, 1.4% at age 14, 5.3% at age 15, and 7.6% at age 16. Gender differences in prevalence rates of substance use disorders are inconsistent. Whereas several studies show equal prevalence rates in males and females,¹³ others show that males have greater rates than females.¹⁴ Substance use disorders have been generally shown to be more common in white youths, and equally distributed by parental social class.⁶⁶

Risk factors for mental disorders in youth

Aside from providing extensive information on regional differences in mental disorders in the US, the majority of prior population studies of mental disorders in youth have also included longitudinal follow-up that provide information on the predictors and consequences of mental disorders.^{17,19,21,35,67,68} Prospective follow-up of youth from many of the above studies have shown that child and adolescent mental disorders are related to a wide array of adverse outcomes.^{69,70}

Risk factors for the development of mental disorders in children have been divided into child characteristics and those of his/her parents/family. *Child characteristics* include gender, age, ethnicity, physical health, cognitive and psychological function, pre- and perinatal exposures to illness, physical stress, alcohol, drugs, nutrition, infections and other environmental agents, and lifetime history of environmental exposures to toxins, stress, infections, social environment and stressful life events; *family and parent characteristics* including parental education, age, social class, employment, psychiatric and medical history, and family function, structure,^{7,10,19,71} and *neighborhood and broader contextual influences* on the health of children and their families.⁶⁹ One of the most consistent and potent risk factors for the development of mental disorders in children is a parental history of mental disorders. There is also some evidence for specificity of familial aggregation of the broad classes of mental disorders.²⁶

One of the most informative studies on childhood risk factors that are associated with the subsequent development of psychopathology is the Christchurch Health and

Location	Study	N	Age	Prevalence period	Conduct	Oppositional defiant	Any disruptive
Great Britain	<u>British Child and Adolescent Mental Health Survey</u>						
	Meltzer et al (2000)	10 438	5-15	Point	1.5%	2.3%	--
	Green et al (2004)	7977	5-16	Point	2.7%	3.0%	5.8%
United States	<u>North Carolina</u>						
	Costello et al (2003)	1015	9-16	3 mo	2.7%	2.7%	7.3%
	Angold et al (2002)	920	9-17	3 mo	5.4%	1.8%	
	<u>Puerto Rico</u>						
	Canino et al (2004)	1886	4-17	12 mo	2.6%	6.0%	---
	<u>Texas</u>						
	Roberts et al (2007)	4175	11-17	12 mo	3.3%	2.8%	6.5%

Table V. Prevalence rates of conduct and oppositional defiant disorder. Source: <http://www.statistics.gov.uk>. Prevalence definitions: 3 mo =3 months, 12 mo =12 months

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Development Study that followed a birth cohort of 1265 children to age 21.¹⁹ Extensive testing of causal links between several risk factors and specific mental disorders that have been examined include: lead exposure and cognitive outcomes; parental separation and divorce and child psychopathology; child abuse and mental health in adolescence; the accumulative effects of adverse family factors; sexual orientation and mental health; and a range of other factors such as cannabis use/abuse and other illicit drugs, adoption, interparental violence and migration.¹⁹

The results of a recent 3-year follow-up of the large UK study of child health found that different risk factors predicted the onset and the persistence of mental and behavior disorders in youth.⁷² Aside from the well-established demographic characteristics of youth, onset of emotional disorders was predicted by physical illness, changes in the number of parents in the home, the number of children at home and poor maternal mental health. Predictors of conduct disorder onset included low income, rented accommodations, low maternal education, living in a reconstituted family, special educational needs of the child and changes in maternal mental health over time. Accumulation of stressful life events predicted the onset of either type of disorder across the 3-year follow-up period. Persistence of mental disorders in general was predicted by poor maternal mental health, low socioeconomic status, and rented accommodations. The UK study also investigated strengths of the child that tend to protect against mental disorder.⁷² Although the report did not describe the inter-relationships of these risk factors, it is apparent that the social context of the child, particularly a lack of stability of the home environment, has substantial influence on both the onset and persistence of mental disorders.

Services

Despite the magnitude and serious consequences of mental disorders in youth, only about half of those with mental disorders in the US receive mental health services.^{13,15,28,73,74} However, a recent review of service rates among those with mental disorders identified in community surveys concluded that those with the most severe disorders do indeed receive service.⁷⁵ Similar patterns have been reported in the UK.⁷⁵ School services are the most common point of entry for children seeking help, although those who enter through the education sector

are unlikely to transition to specialty mental health services.⁷⁶ The actual diagnostic process and services provided differ dramatically according to the context of entry to service.⁷⁷ A recent comprehensive review of characteristics of youth with service needs in community surveys highlighted the large gap between assessment of mental disorders among those in clinical and community surveys.⁷⁵ Factors associated with service utilization include ethnicity, impairment, comorbidity, suicide attempts, parental recognition, and family burden.^{13,15,19,23,78}

Impact

One of the major advances in epidemiology during the past decade has been the increasing focus on the impact and burden of mental disorders. The importance of role disability has become increasingly recognized as a major source of indirect costs of illness because of its high economic impact on ill workers, their employers, and society.⁷⁹⁻⁸³

The introduction of the concept of disability-adjusted life years (DALYS), which estimates the disease-specific reduction in life expectancy attributable to disability and increased mortality, has highlighted the dramatic public health impact of mental disorders.⁸⁴ By the year 2020, it is estimated that psychiatric and neurologic disorders will account for 15% of the total burden of all diseases. Although the global burden of mental disorders has not been examined in a nationally representative sample of youth in the US, studies in other countries such as the UK have examined both the impact or consequences of mental disorders on the child and the burden on others.⁸⁵ However, because impairment is an important criterion for the diagnosis of disorders in children, the prevalence estimates of childhood disorders generally reflect the impact of these conditions as well.^{40,86}

In contrast to adult mental disorders, the economic impact of childhood mental disorders has not been widely studied. Costs associated with childhood mental disorders include medical expenses, special education needs, burden to the criminal justice system, and social services. Many studies that report the cost of child mental disorders focus only on direct medical costs and do not consider the indirect costs to society. One study estimated that a child with ADHD has annual medical costs of \$4306 compared with \$1944 for children without ADHD. Conduct disorder has been found to be even more costly at \$14 000 compared with \$2300 for children without CD.^{87,88}

Key issues in child psychiatric epidemiology

Classification of childhood mental disorders

The results of recent epidemiological studies have illustrated the need for further development of the psychiatric diagnostic system.^{79, 81, 89-91} There is growing dissatisfaction with the current categorical diagnostic system, which is not believed to provide a valid representation of emotional and behavior problems in youth. First, there is a growing research demonstrating that some diagnostic entities are better characterized as a spectrum.⁹²⁻⁹⁴ Recent studies have begun to expand the diagnostic criteria for mental disorders to collect information on the spectra of expression of particular conditions. For example, expansion of the diagnostic concept of bipolar disorder in the National Comorbidity Survey-Replication (NCS-R) demonstrated the clinical significance of the spectrum concept of bipolarity that had long been described in clinical settings.^{91, 92, 95} Second, epidemiologic studies of children show that there is pervasive comorbidity between purportedly distinct diagnostic entities. As described in the above review, few children manifest only a single disorder. Numerous efforts are underway to integrate dimensional and categorical assessments of children.^{96, 97}

Inclusion of children under age 6 in population surveys

With the exception of pervasive developmental disorders, there has been considerable controversy about the validity of diagnosis of mental disorders in very young children (ages 2 to 5 years). There is accumulating evidence, however, that mental disorders generally identified in school-age children are quite prevalent in preschool children. In a summary of the community surveys of young children, Egger and colleagues⁹⁸ reported the following range of rates of childhood disorders: ADHD from 2% to 5.7%; ODD from 4% to 16.8%; CD from 0% to 4.6%; depression from 0% to 2.1%; and anxiety disorders from 0.3% up to 9.4%. In addition to the prevalence of these disorders in young children, rates of impairment are very high (ie, about 84.6% of those with emotional disorders and 100% of those with behavioral disorders). There is also a high degree of comorbidity in young children with mental disorders; of those with one disorder, approximately 25% have a second disorder. The proportion of

children with comorbidity increases about 1.6 times for each additional year from age 2 (18.2%) to 5 (49.7%).⁹⁸

Integration of child and adult studies

Epidemiologic studies of adults and children have generally proceeded independently, in part because of differences in diagnostic methods and measures, and the requisite inclusion of informant reports regarding child disorders. One manifestation of this independence is the controversy between what constitutes bipolar disorder in adults and children. There has been substantial debate about whether the rapid mood changes and behavioral dysregulation that characterizes children in clinical samples is truly a manifestation of bipolar disorder that has been fairly well-operationalized in adults.⁹⁹ There is sparse information on the symptoms of bipolar disorder from community surveys that can address the possible sampling bias in these clinical samples of youth (with the exception of prospective studies such as that of Lewinsohn et al).¹⁰⁰

The prospective design of many of the community surveys of children and adolescents that began in the 1970s and 1980s has generated substantial information on the continuity of childhood disorders into early adulthood. The cumulative lifetime prevalence of mental disorders derived from these long-term follow-up studies^{17, 19-21, 101} tend to be even greater than the retrospective estimates of lifetime prevalence reported in adult psychiatric epidemiology.^{2, 102}

Comorbidity of mental and physical disorders

Although there is a substantial body of literature on patterns of comorbidity of mental and physical disorders in adults,^{86, 103, 104} the association between physical illness and mental disorders has only recently received attention in child psychiatric epidemiology.^{105, 106} Several prospective studies have shown that children with physical illness are more likely to develop depression,¹⁰⁶ and other studies have shown that children with emotional disorders have an increased risk of developing physical disorders.⁷² Several ongoing studies are investigating the biologic links between mental and physical disorders such as asthma and anxiety disorders,¹⁰⁷ and diabetes and mood disorders.¹⁰⁸ Other studies examine the impact of comorbid physical and mental disorders on youth and their families.¹⁰⁹

State of the art

Summary and future research

Summary

This article provides a review of the magnitude of mental disorders in children and adolescents from community surveys across the world. Although there is substantial variation in the findings based on methodologic characteristics of the studies, the findings converge in demonstrating that approximately one fourth of youth experience a mental disorder during the past year, and about one third across their lifetimes. Anxiety disorders are the most frequent condition in children, followed by behavior disorders, then mood disorders and substance use disorders. Variation in the rates across the world can be attributed to both methodologic factors and also to true cultural differences in the magnitude of childhood disorders. Girls have greater rates of mood and anxiety disorders, and boys have greater rates of behavior disorders, whereas there is an equal gender ratio for substance use disorders. ADHD and anxiety states begin in childhood, whereas the onset of conduct disorder occurs at early adolescence, and mood disorders tend to begin in late adolescence.

Although these general patterns of rates and ages of onset have been consistently reported in previous studies, the newer studies have provided more information on the specific subtypes of disorders based on DSM-IV criteria. The more recent studies have also included much larger samples of ethnic subgroups in the population^{12-15,110} that will increase the power to identify different risk profiles that may explain ethnic differences in rates of mental and behavior disorders in youth. Recent epidemiologic surveys have also collected more extensive data on patterns of comorbidity within and between classes of mental disorders. Moreover, there has been increasing attention to comorbidity of mental and physical disorders including asthma, obesity, and headache.^{72,106}

Finally, one of the encouraging findings from the newer studies is that more children with mental disorders are receiving services through either the schools, pediatricians or a mental health specialist than those identified in earlier surveys.^{75,111-113} However, ethnic minority youth are still unlikely to receive mental health services.⁹

The need for US national data

Although these studies begin to address the urgent need for systematic information tracking of the prevalence and

distribution of mental disorders as well as patterns of service utilization as called for in the US Surgeon General's Report on Mental Health,¹¹ national data are still unavailable. The absence of empirical data on the magnitude, course, and treatment patterns of mental disorders in a nationally representative sample of US youth has impeded efforts essential for establishing mental health policy for this population.^{9,96,97,114-116}

Based on the recommendations of several reviews and advisory panels such as the landmark Surgeon General's Report on Mental Health¹¹ and a subgroup of the National Institute of Mental Health (NIMH) National Advisory Mental Health Council,¹¹⁷ NIMH established several research initiatives to address the lack of national statistics on mental health in children. First, a brief dimensional scale of recent (past 6 months) symptoms of mental disorders, the Strength and Difficulties Questionnaire (SDQ),¹¹⁸ was added to the National Health Interview Survey (NHIS) in 2001. The NHIS assesses close to 50 000 families containing a total of approximately 10 000 youth (ages 4 to 17) each year.^{119,120} Second, selected modules from the NIMH Diagnostic Interview Schedule for Children (DISC) Version 4¹²¹ were administered to a sample of 8449 youth (ages 8 to 19) in the 1999-2004 National Health and Nutrition Examination Surveys.^{60,122} Third, the NIMH took advantage of the opportunity to collect nationally representative data on adolescent mental health by extending the lower age range of the National Comorbidity Survey Replication (NCS-R),¹²³ a nationally representative survey of adult mental disorders that was fielded from 2001 to 2003. The decision was made to limit the sample to youth ages 13 to 17 because pilot studies showed that the interview schedule used in the NCS-R, the WHO Composite International Diagnostic Interview (CIDI) Version 3.0,¹²³ had limited validity among youth younger than age 13. This NCS-R Adolescent Supplement (NCS-A) was consequently carried out in a nationally representative sample of 10 148 youth in the age range of 13 to 17.

The NCS-A was designed to: estimate the lifetime-to-date and current prevalence, age-of-onset distributions, course, and comorbidity of DSM-IV disorders in the child and adolescent years of life among adolescents in the US; identify risk and protective factors for the onset and persistence of these disorders; describe patterns and correlates of service use for these disorders; and lay the groundwork for subsequent follow-up studies that can be used to identify early expressions of adult mental disorders. Forthcoming results of these two national surveys of ado-

lescent mental health in the US, the National Comorbidity Survey-Adolescent Extension (<http://www.hcp.med.harvard.edu/ncs/>) and the National Health and Nutrition Examination Survey (NHANES) (<http://www.cdc.gov/nchs/nhanes.htm>) should begin to address the gap in knowledge regarding the epidemiology of adolescent mood disorders in the US.

Global progress

There is an increasing effort to identify gaps in our knowledge of the state of child mental health at the global level as well. The Atlas Project, run by the WHO,^{87,117} recently collected information on cultural factors associated with the burden and impairment of mental disorders in children and adolescents in 66 countries. Although there were dif-

ferences in policies and programs across low and high income countries, they found that there was a general lack of specific policies, data-gathering capacity, and continuum of care for children.⁸⁷ There have also been collaborative efforts to increase awareness of child mental disorders across the world. For example, through the auspices of the World Psychiatric Association, the WHO, and the International Association of Child and Adolescent Psychiatry and Allied Professionals, a Child Mental Health Task Force was formed to educate and develop programs to disseminate awareness of child mental health in nine different countries around the world.¹²⁴ While there is still a large amount of change and progress that needs to be made in the area of child and adolescent mental health, studies and programs such as these are moving the global community in the right direction. □

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State of the art

Epidemiología de los trastornos mentales en niños y adolescentes

Este artículo entrega una extensa revisión acerca de la magnitud de los trastornos mentales en niños y adolescentes a partir de investigaciones en la comunidad realizadas en diversas partes del mundo. Aunque existen diferencias considerables en los resultados de acuerdo con las características metodológicas de los estudios, los hallazgos demuestran que aproximadamente la cuarta parte de los jóvenes sufre algún trastorno mental en el último año y cerca de la mitad lo presenta a lo largo de la vida. Los trastornos de ansiedad son las condiciones más frecuentes en los niños, seguidos por los trastornos de conducta, los trastornos del ánimo y los trastornos por el uso de sustancias. Las variaciones en la frecuencia de la magnitud de los trastornos de la niñez a través del mundo se pueden atribuir a factores metodológicos y también a válidas diferencias culturales. Menos de la mitad de los jóvenes con trastornos mentales actuales reciben tratamientos especializados de salud mental. Sin embargo, son aquellos con los trastornos más graves los que tienden a recibir los servicios de salud mental. Los últimos temas que en la actualidad están siendo identificados en el campo de la epidemiología psiquiátrica incluyen: precisión en la clasificación y evaluación, inclusión de niños de menor edad en las investigaciones epidemiológicas, integración de la epidemiología psiquiátrica de niños y adultos, y la evaluación tanto de los trastornos físicos como mentales en los niños.

Épidémiologie des troubles mentaux chez l'enfant et l'adolescent

Cet article propose une revue détaillée de l'ampleur des troubles mentaux chez l'enfant et l'adolescent à partir d'études réalisées en communauté à travers le monde. En dépit de variations substantielles des résultats dépendant de la méthodologie employée dans les études, les données obtenues montrent qu'environ un quart des jeunes ont souffert d'un trouble mental au cours de l'année précédente et environ la moitié au cours de leur vie. Les troubles anxieux sont les affections les plus fréquentes chez l'enfant, suivis des troubles du comportement, des troubles de l'humeur et des addictions. Les variations observées à travers le monde seraient dues à des facteurs méthodologiques et à de réelles différences culturelles concernant l'ampleur des troubles chez l'enfant. Moins de la moitié des jeunes souffrant actuellement de troubles mentaux font l'objet d'un traitement psychiatrique spécifique. Cependant, les jeunes les plus sévèrement atteints semblent bénéficier d'une aide des services de santé mentale. Au sein de l'épidémiologie psychiatrique infantile, plusieurs objectifs actuels ont été identifiés : perfectionnement de la classification et de l'évaluation, inclusion de jeunes enfants dans les études épidémiologiques, intégration de l'épidémiologie psychiatrique infantile et adulte, et évaluation des troubles à la fois physiques et mentaux chez l'enfant.

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