

Prevalence of Mental Disorders in Children Living in Alberta, Canada, as Determined From Physician Billing Data

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Background: The prevalence of mental disorders is often assessed using survey techniques. Although providing good estimates of prevalence, these techniques are time-consuming and expensive.

Objective: To estimate the prevalence of mental disorders among children aged 0 to 17 years living in Alberta, Canada, using health care administrative data.

Design: This was a cross-sectional study. *International Classification of Diseases, Ninth Revision, Clinical Modification* chapter 5 diagnostic codes from physician billing data were used. Codes were grouped into 10 categories. Prevalence rates for each category were calculated, stratified by age, sex, and premium subsidy status (a proxy for socioeconomic status). The age pattern, times of greatest risk, and the effect of sex on type and prevalence of mental disorder were estimated.

Setting: All fee-for-service health care venues in Alberta between April 1, 1995, and March 31, 1996, providing services to children registered with the Alberta

Health Care Insurance Commission on March 31, 1996.

Results: Prevalence of mental disorders varied by disorder category, age, sex, and premium subsidy status. For boys, maximum prevalence of 9.5% occurred at age 10 years; for girls, maximum prevalence of 12.0% occurred at age 17 years. Mental disorders were most common in young boys and adolescent girls and among children receiving welfare. Distinct patterns of disorder were evident and comorbidity was common.

Conclusions: Administrative data can be used to estimate the prevalence of mental disorders in a pediatric population. The estimates made are lower than those obtained by using surveys of similar populations, perhaps indicating the difference between treated and untreated prevalence. Strengths of this study are that the estimates reflect the entire population, are more easily and obtained at less cost, and are useful for the planning of mental health services.

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IN A SUMMARY of 52 studies exploring the prevalence of psychopathologic disorders among children and adolescents, Roberts et al¹ noted that estimates of prevalence varied widely. They attributed these differences to problems in sampling, case ascertainment, case definition, and data analysis. Samples were often small, usually only a narrow range of ages was studied, suitable sampling procedures were uncommon, and case detection lacked sensitivity and specificity because of inconsistent types and use of diagnostic tools.

This study presents another estimate of the prevalence of mental disorders in children. It uses the diagnosis provided by physicians when submitting billing data for reimbursement. Herein, these data are used to describe the prevalence of mental disorders in children aged 0 to 17 years living in Alberta, Canada,

from April 1, 1995, through March 31, 1996.

Although physician diagnostic data have been used before,²⁻⁵ usually as adjuncts to other estimates of mental disorder, data from such a large and diverse population are rare, particularly when an accurate denominator is available reflecting the total population at risk. This study uses cross-sectional data to develop estimates of the times of greatest risk and the differing effect of sex on prevalence. Data also were available to estimate the socioeconomic status of the children in this study. Many studies suggest that mental disorders are more prevalent among children living in poor socioeconomic circumstances,^{4,6-10} and one purpose of this study was to determine whether our data showed similar findings. The research purpose was to address the following questions: (1) What are the patterns of men-

MATERIALS AND METHODS

Alberta is Canada's westernmost prairie province, and has a population of about 2.8 million people. The majority of residents are of European descent, but there are a considerable number of aboriginal Canadians and individuals of Asian descent. About 75% of children and adolescents live in an urban setting, and the remainder live in rural areas, mainly small towns, farms, and ranches. Extreme poverty is relatively rare. Health care in Alberta is universal, with all medically necessary procedures and investigations being provided through health insurance administered by the Alberta Health Care Insurance Plan. The data consisted of all the fee-for-service records submitted by physicians to this agency between April 1, 1995, and March 31, 1996, for all children registered with Alberta Health and Wellness on March 31, 1996. The data were provided to one of us (D.W.S.) by Alberta Health and Wellness for the purpose of describing patterns of morbidity of Alberta children as determined from administrative data. The present article is the first public published report arising from this study.

With the exception of children moving to Alberta during the study year (about 1.68%; data provided by L.W.S.) and children born during the year and subsequently registered with Alberta Health and Wellness, all children in the data set had been registered for at least the preceding 12 months. Children moving out of the province during the study year were not included. The date of March 31, 1996, as the time when the population was to be counted was determined by Alberta Health and Wellness, as were the ages 0 to 17 years.

The data reflect every patient service for which a physician was reimbursed by fee-for-service and, except for a few small subspecialty programs, such as intensive care units, all patient services are provided this way. For this report, all physician contacts for mental health services would be reflected in the fee-for-service data. Nonphysician contacts, such as psychologists or mental health counselors, would not be considered and we cannot estimate their use. Most parents would likely take their children initially to a physician for assessment and the physician could refer the family for counseling if it was believed necessary. Children could have received medical services out of the province and if they were registered with Alberta Health and Wellness, these services would have been recorded and are part of the data set.

Data were available regarding the service date, the specialty of the service provider, and the *International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM)*¹¹ diagnostic code. The fee-for-service form provided for up to 3 diagnoses to be recorded; however, the majority of submissions contained only 1 diagnosis, thus we used only the primary diagnosis provided. Each diagnosis could be reported at up to 4 digits (eg, 300.1), and any diagnostic code in the *ICD-9-CM* lexicon could be used. Only diagnostic data were provided; no data regarding prescription

drugs or therapy used were available. Diagnoses could not be validated by reviewing charts or by interviewing patients. Only records where the *ICD-9-CM* code reflected "Chapter 5: Mental Disorder" were used. Each *ICD-9-CM* code was grouped into 1 of 10 categories of disorder, reflecting a blend of common patterns of presentation and major categories of psychopathology. These categories and their associated *ICD-9-CM* codes are shown in the **Table**, which also shows the number of patient contacts and individual patients affected for each *ICD-9-CM* code. The categories were created by one of us (A.H.T.), a child psychologist.

Demographic data were obtained for all children aged 0 to 17 years inclusive from a registration file listing individuals registered with Alberta Health and Wellness as of March 31, 1996. The child's "study age" was the integer age on March 31, 1996. Although Canada has universal health care, in Alberta it is administered as an insurance program and individuals pay premiums. Those with a family income of under about \$14 000 (Canadian) per year have their premium subsidized in full or in part by the government. Individuals receiving welfare have their premium paid by Alberta Family and Social Services. Treaty status aboriginal Canadians have their premium paid by the Government of Canada. This results in 4 levels of premium subsidy for analysis: no subsidy, part/full subsidy, treaty status, and welfare. These 4 levels were used as a proxy for socioeconomic status.

Rates for a 1-year prevalence of psychopathology and for each category of disorder were created using the total number of registered children for any given age, sex, and premium subsidy status as the denominator. The numerator was the number of appropriately stratified children affected with a specific disorder; thus, a child with 5 visits for depression and 3 visits for reactive disturbances would be counted once each for depression and reactive disturbance. Data analysis was primarily descriptive. Logistic regression using Stata statistical software¹² was used to assess the effect of premium subsidy status on the prevalence of specific categories of mental disorder (the dependent variables). Independent variables were sex (female as the referent), age (10 years as the referent), and premium subsidy status. Ten years was chosen as the age reference because it reflects a transition time between childhood and adolescence. The reference group for premium subsidy status was no subsidy because this was the largest group and the most affluent. Psychiatric comorbidity was investigated briefly by determining those children having more than 1 psychiatric disorder during the same year and summarizing the data regarding frequency of comorbidity and the disorders most commonly linked.

This research was approved by the University of Alberta Faculty of Medicine Ethics Review Committee. Confidentiality of subjects was maintained by using anonymized personal identifiers. Only one of us (L.W.S.), an employee of Alberta Health and Wellness and under a bond of confidentiality, had access to the code that encrypted the identifiers.

tal disorder seen in Alberta children? (2) How do these patterns vary with the child's age and sex? and (3) Do patterns vary between children of differing economic means? To our knowledge, no other Canadian study ex-

ists that uses health care administrative data and no study has captured virtually the entire population of children and adolescents in a large defined geographical and administrative area.

Categories of Mental Disorders

Short Name	ICD-9-CM* Code	Description	No. of Contacts	No. of Patients
Depression	311	Depressive disorder not otherwise specified	17 850	5607
Hyperactivity	314-314.9	Attention-deficit disorder	38 368	15 479
Reactive disturbances	308-308.9	Acute reaction to stress	2034	1643
	309-309.9	Adjustment reaction	5192	1860
Anxiety/neurotic disorders	300-300.9	Neurotic disorders	17 167	10 149
	313-313.9	Disturbance of emotions specific to childhood and adolescence	19 972	5228
Psychoses: organic and nonorganic	290-290.9	Senile and presenile organic psychotic conditions	53	29
	293-293.9	Transient organic psychotic conditions	88	28
	294-294.9	Other organic psychotic conditions	55	14
	295-295.9	Schizophrenic disorders	1438	259
	296-296.9	Affective psychoses	3750	945
	297-297.9	Paranoid states	44	16
	298-298.9	Other nonorganic psychoses	311	139
	299-299.9	Psychoses with origin specific to childhood	1172	467
Developmental delay	315-315.9	Specific delays in development	7954	4829
	317	Mild mental retardation	563	187
	318-318.2	Other specified mental retardation	395	205
	319	Unspecified mental retardation	144	91
Alcohol and drug problems	291-291.9	Alcoholic psychoses	25	11
	292-292.9	Drug psychoses	173	42
	303	Alcohol dependence	686	328
	304-304.9	Drug dependence	595	139
	305-305.9	Drug abuse	1396	448
Conduct disorder	301-301.9	Personality disorders	772	547
	302-302.9	Sexual deviations and disorders	194	141
	312-312.9	Disturbance of conduct not elsewhere classified (NEC)	17 605	5607
Special symptoms NEC	307-307.9	Special symptoms or syndromes NEC	4492	2211
	307.1	Anorexia nervosa	413	81
	307.2	Tics	766	219
	307.4	Sleep disorder	254	176
	307.5	Other and unspecified disorders of eating	126	59
	307.6	Enuresis	1026	814
	307.7	Encopresis	285	181
Mind-body problems	306-306.9	Physiological malfunction arising from mental factors	419	304
	316	Psychic factors associated with diseases classified elsewhere	130	110

*ICD-9-CM indicates *International Classification of Diseases, Ninth Revision, Clinical Modification*.

RESULTS

There were 749 924 (49% female) children registered with Alberta Health and Wellness. This number is estimated by Alberta Health and Wellness to be more than 99.5% of the total population¹³; thus, the "sample" is effectively the entire population at risk. Most (77%) children came from families receiving no premium subsidy. Families of 12.6% of the children received a partial or full premium subsidy; these families could be construed as the "working poor." The remaining children were divided into those whose families were receiving welfare (4.6%) or who were treaty status aboriginal Canadians (5.6%).

There were 143 226 health care services attributed to mental disorders among 40 592 children. General practitioners provided services to 59% of children, pediatricians to 35%, and psychiatrists to 22%. Other specialists, such as emergency department physicians or internal medicine physicians, saw about 4% of children. Nearly 18% of children were seen for their problem by more than 1 type of practitioner. Psychiatrists provided 55.5% of all services to children older than 9 years and saw indi-

vidual children an average of 7.4 times, compared with an average of less than 2.1 times for pediatricians and family practitioners. Psychiatrists saw children with all categories of disorder; the most common categories were depression, with 39% of children being seen by a psychiatrist, followed by anxiety/neurotic disorders (24%), psychoses (64%), and personality problems (34%).

Figure 1 shows that the prevalence of psychopathologic disorders varies by age and sex. In boys, the maximum prevalence of disorder (9.5%) is at about age 10 years, whereas for girls the maximum prevalence (12.0%) is at age 17 years.

Figure 2 shows that although differences appear to exist between each premium subsidy group, the welfare group is quite distinct from the rest. At almost any age, a child receiving welfare is nearly twice as likely to have a mental disorder than is a child in any other group. For treaty status children, the prevalence of disorder rises rapidly during adolescence to more than twice that at age 9 years.

Figure 3 shows the age and sex patterns of 9 categories from the Table. The category "Special Symptoms NEC [not elsewhere classified]" is not included as

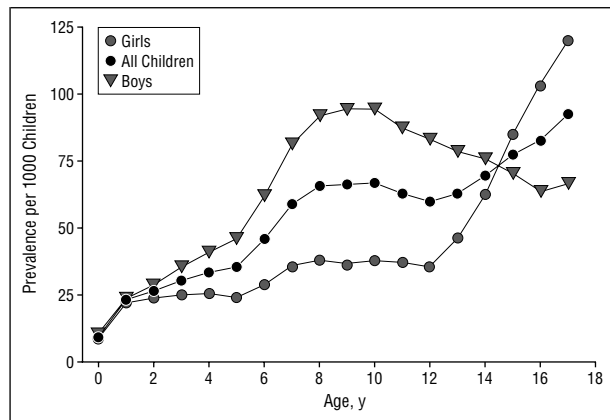


Figure 1. Prevalence of mental disorders in children living in Alberta, Canada, as recorded on physician fee-for-service submissions, April 1, 1995, through March 31, 1996.

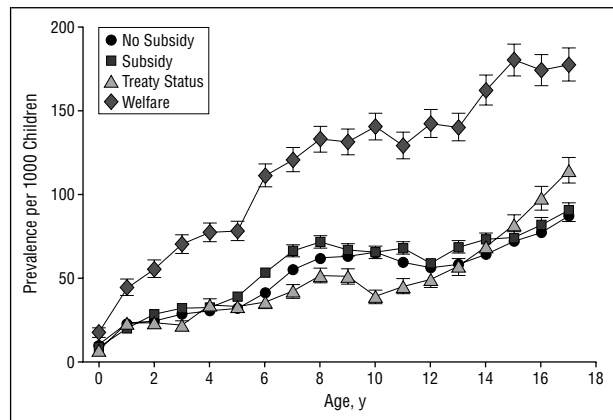


Figure 2. Prevalence of mental disorders in children living in Alberta, Canada, stratified by premium subsidy group, April 1, 1995, through March 31, 1996. Error bars reflect 1 SE.

it is composed of disorders not easily classified and without common features. Boys and girls have patterns that differ in kind or degree and with age. Depression, reactive disturbances, anxiety/neurotic disorders, and psychoses are all more common in younger boys than in girls, gradually increase with increasing age, and become substantially more common in girls during adolescence. In contrast, attention-deficit disorder is substantially more common in boys than girls (odds ratio, 3.8; 95% confidence interval [CI], 3.6-4.0) but the general age-related pattern of prevalence is similar for both sexes. A third pattern is seen with conduct disorder, where prevalence is consistently higher in boys. Other distinct patterns are seen with developmental delay and with alcohol and drug problems.

The prevalence of disorder was examined with respect to subsidy status. For the most part, the pattern seen in Figure 2 was maintained for each disorder (results not shown). Except for the categories mind-body problems and special symptoms NEC, where differences were not significant, the age- and sex-adjusted odds of disorder were at least 2 times as likely in the welfare group relative to the no subsidy group. For children with alcohol and drug problems, treaty status children were 5.2 (95% CI, 4.4-6.2) and children receiving welfare 4.2 (95% CI, 3.5-5.1) times as likely as the no subsidy group to have the disorder.

About 20.8% of children with at least 1 psychiatric disorder were diagnosed as having more than 1 mental disorder during the year; 16.0% were diagnosed as having 2 disorders, 3.7% as having 3 disorders, and the remaining 1.1% were diagnosed as having more than 3 disorders. For 7014 children with more than 4 visits due to mental disorder, comorbidity was diagnosed in 59%. Comorbidity was more common among older children. Boys were 1.3 (95% CI, 1.2-1.4) times more likely than were girls to have comorbidity, and children receiving welfare were the most likely group to exhibit comorbidity (odds ratio, 1.6; 95% CI, 1.5-1.7). The 5 most common pairings were attention-deficit disorder+ (anxiety/neurotic disorder or conduct disorder or developmental delay) and anxiety/neurotic+ (depression or conduct disorder).

COMMENT

This study used physician diagnostic codes to describe the patterns of mental disorder prevalence among virtually all children in a Canadian province. The data provide good supportive evidence of the presence of significant mental disorders in children where little other evidence exists at a population level. Although the only contextual data provided are age, sex, and subsidy status, good insight can still be gained into the epidemiology of mental disorder. These results suggest that health care administrative data can be a useful aid to planning mental health policy and programs.

These data report the prevalence of medically reported childhood mental disorders. They do not reflect disorders in the community that are seen by other health practitioners, nor do they reflect untreated disorders that might be detected in individuals using screening surveys of the general population. Nevertheless, the data have significant strengths. They span all of childhood and the whole population of a defined area is included, thus sampling properties and sampling error are not at issue. Also, all physician-generated diagnoses of mental disorder are captured. Since the demographic makeup of Alberta is similar to many provinces in Canada, and probably many states in the United States, the results are reasonably generalizable to similar populations.

The results suggest that the prevalence of mental disorder varies with age and sex, and that either figure for prevalence is inappropriate—both age and sex must be considered. They also demonstrate that there are specific patterns for different mental disorders and that these disorders have specific age and sex relationships. For example, boys are more likely than girls to be affected with depression in preadolescence and its prevalence in girls rises significantly in their early teens, at about the presumed time of menarche. This observation agrees with the findings of Patton et al,¹⁴ who demonstrated that menarche marks a transition in the risk of depression and anxiety in girls and with those of Angold et al,^{15,16} who noted that after the transition to mid-puberty, girls were more likely than boys to be depressed. The pattern seen in attention-deficit disorder, where boys are nearly 4 times

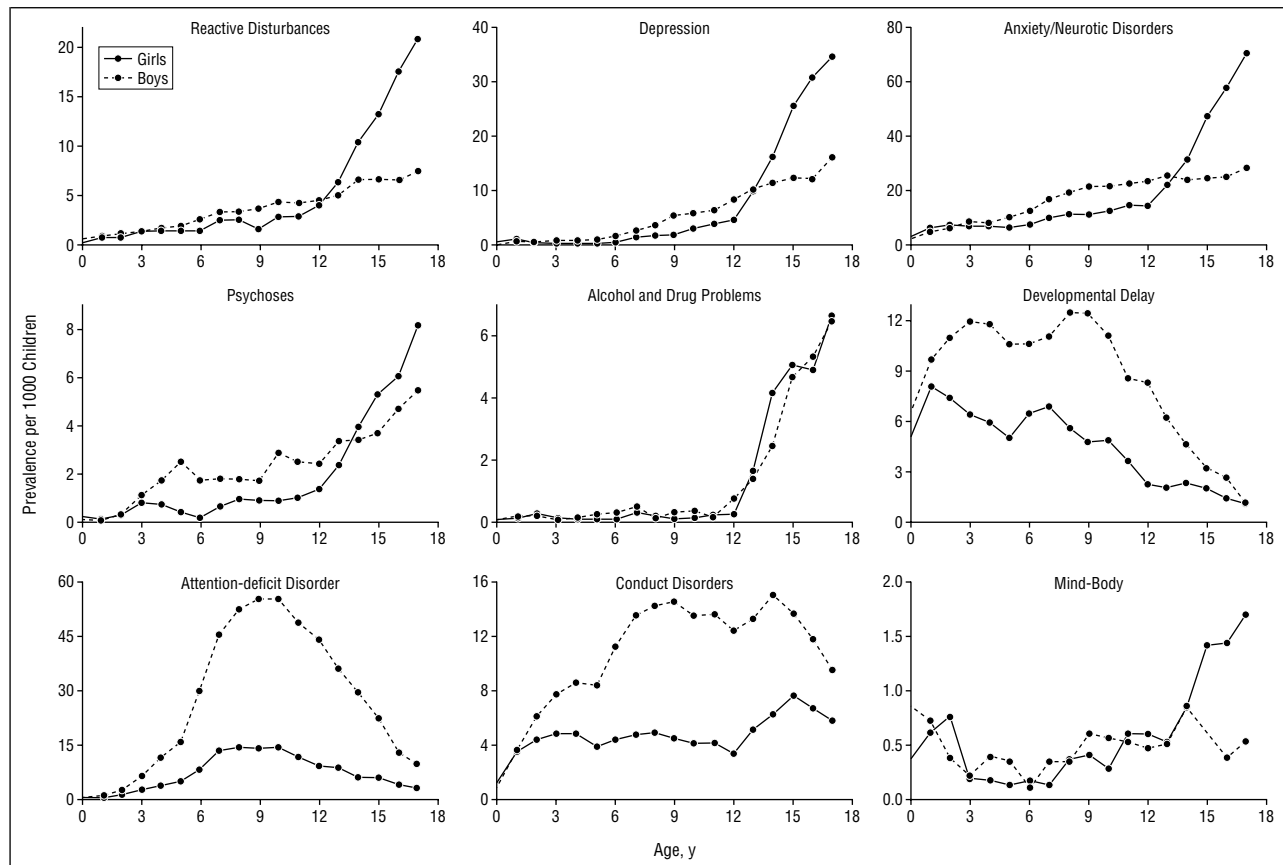


Figure 3. Selected examples of patterns of mental disorders in children living in Alberta, Canada, stratified by type of disorder and sex, April 1, 1995, through March 31, 1996. The vertical scale varies for each graph, thus rates are not directly comparable.

more likely to be affected than girls and where the problem is most common in the early school years, is consistent with Szatmari et al,¹⁷ who found that prevalence of attention-deficit/hyperactivity disorder was 9.0% in boys and 3.3% in girls.

Figure 3 suggests a key role for adolescence to affect the prevalence of disorder. The prevalence of depression, reactive disturbances, anxiety/neurotic disturbances, alcohol and drug problems, and psychoses increases with the onset of adolescence, whereas the prevalence of attention-deficit disorder declines. These findings are consistent with those of Newman et al,¹⁸ who surveyed a birth cohort of young adults at ages 11, 13, 15, 18, and 21 years, and found that mental disorders increased longitudinally from late childhood through middle to late adolescence and young adulthood. The observed decline in developmental delay, which is a relatively static problem, may reflect the fact that developmental delay per se may not be the reason why an adolescent is visiting a physician. The patterns of disorder observed in this study are similar to those reported by Cohen et al¹⁹ for young persons aged 10 to 20 years. They found age and sex differences between disorders and also found that major depression showed a pattern suggestive of a role for the onset of puberty, but their results suggested that the prevalence of depression in girls declines in later adolescence whereas our findings suggest a rise. In all instances, the prevalence of disorder is greater in the study of Cohen et al. Possibly the problem of dissimilar pat-

terns and increased prevalence lies in part in the definition used for a specific disorder and the method used to make the diagnosis.

An important finding of this study was the relationship of socioeconomic status to the prevalence of disorder. Rates of prevalence among families receiving welfare were generally twice that of the rest of the population. This finding is consistent with the findings of Costello et al²⁰ and Lipman et al.²¹ Costello et al found that poverty was the strongest demographic correlate of diagnosis, in both urban and rural children. Lipman et al, using data from the Ontario Child Health Study, found similar results and reported that the odds of psychiatric disorder among children with a family income of less than \$10,000 was more than twice that of children with higher family incomes. They noted the independent contribution of family dysfunction in influencing the development of childhood psychiatric disorder and, in a later report,⁷ argued that eliminating poverty per se would not necessarily reduce psychiatric morbidity in children. Other factors such as low maternal education and family conflict may be more influential. Shaw et al²² suggested that multiple family stressors adversely affect a child's psychosocial development. The present study appears to agree with the idea that increased risk is associated with more than just economics. Many families of children in the part/full subsidy group and much of the treaty status group would have had incomes only slightly better than families receiving welfare and yet children from these

groups appear consistently to be much less likely than those receiving welfare to have mental disorders. Clearly, something unique about the welfare group sets these children apart, but it is unclear just what this “something” is. Likely factors relate to family structure and stability, parenting skills, employment status, and parental lifestyles.

The question arises as to how comparable are these results with others. The estimates obtained seem to be in fair agreement with those of other physicians working in clinics but are less than those derived using surveys. This is consistent with the findings of Costello et al,³ who noted that pediatricians have low sensitivity but high specificity to the diagnosis of mental disorder. The results are also consistent with the observation that, in adults, treated prevalence rates are lower than survey estimated prevalence rates.^{2,23}

The closest comparisons would be with those of other physicians working in clinics. In this regard, several studies have suggested that pediatricians diagnose psychopathologic conditions in about 4% to 7% of their patients, compared with survey estimates of at least twice that.^{2,24} Costello² reviewed 12 studies in which physician diagnosis was used to estimate prevalence of psychopathologic disorders. Among 5 studies reviewed by Costello and where the denominator included everyone enrolled in a health care plan, the prevalence of disorder ranged from 3.4% to 10.1%. Clinic physician-derived figures are often lower than survey estimates and may reflect the possibility that impairment could be an important factor when a physician opts for a diagnosis of mental disorder, or when a parent chooses to bring their child to the physician for assessment.²⁵ The lower figure could also be due to physician reluctance to attend to behavior complaints because of inexperience, physician feelings of inadequacy, the recognized difficulty in management of behavior disorder, or time constraints.²⁶

The rates of disorder in this study are similar to estimates of 4% to 8% for serious emotional disturbance reported in the Great Smoky Mountains Study of Youth⁶ but are less than the same authors' estimate of 20.3% for any *DSM-III-R* Axis I disorder.²⁰ The results are consistent with those of Rutter et al,²⁷ who estimated a prevalence of disorder of about 6.8% in 10-year-old children on the Isle of Wight, but are less than his estimates of mental disorder in 10-year-old inner-city London children²⁸ but neither sample really reflects a general population. Verhulst et al,²⁹ using multiple informants, estimated the prevalence of mental disorder in 13- to 18-year-old adolescents to be between 4% to more than 20%. In a companion study of children aged 8 to 11 years, the prevalence of moderate or severe disorder was 26%.³⁰ Steinhausen et al³¹ used multiple informants and estimated the prevalence of disorder in Swiss children aged 6 to 17 years to be about 22.5%. Oford and coworkers³² surveyed a combination of Canadian parents, teachers, and children and found a 6-month prevalence of 18.1% for 4 child psychiatric disorders among children 4 to 16 years old.

More specific studies that used surveys to determine prevalence may well be more accurate; however, they have the problems of small, nonrepresentative, sample sizes. They often cover a narrow age range and age-related dif-

ferences cannot be assessed.¹ Some studies³² cover large age ranges but have too few children at any age to make age specific estimates. As well, the criteria used for case ascertainment are inconsistent. Some studies focus on sensitivity and thus may overestimate prevalence; others focus on specificity and may underestimate prevalence. In some instances, multiple informants are used to assess the prevalence of morbidity.²⁹ With respect to comparability with the present study, there are problems with case definition and the question arises “whether community or epidemiologic ‘cases’ are cases in the same sense as the cases of children brought to clinical settings.”¹

A further question arises as to the accuracy of the diagnoses provided. Given the variation in psychiatric expertise among physicians, misdiagnosis clearly exists. We tried to minimize this problem by using categories of disorder reflecting common symptom patterns and then estimated the prevalence of these categories. The categories are based on the experience of one of the authors and discussions with colleagues; others may use a different grouping. Similar approaches have been used in studies of pediatric morbidity,³³ but we could not find clear evidence of the use of similar classification schemes for describing psychiatric morbidity. Validity can also be inferred somewhat from the comparison of patterns of disorder with other studies. In this instance, the patterns of depression and attention-deficit disorder are similar to the findings of others.

The estimate of the presence of psychiatric comorbidity of 20.8% is less than some reports³⁴ and similar to others.²⁵ Comorbidity is probably more common than this study implies since usually only one diagnosis was provided at a physician visit; thus, a child had to attend 2 visits to have any comorbidity detected. This may reflect the diagnostic practices of different practitioners, the consequences of referral to a psychiatrist, or the demonstration over time of more than 1 psychiatric problem in a child. The nature of the comorbid disorders is similar to those found by Verhulst et al²⁹ and Steinhausen et al,³¹ although not examined in the present study, it is also likely that various other illnesses of childhood are also associated with mental disorder.

In a review of 50 years of epidemiologic studies in child and adolescent psychiatry, Cederblad wrote

Most studies state that boys have more behavior deviances than girls before puberty. Girls have more problems during adolescence, especially depressions and psychosomatic symptoms. Girls have more internalizing symptoms, while boys display more acting-out behaviors.³⁵

The results of this study are consistent with this generalization and extend it by describing the patterns of mental disorder more completely. They demonstrate the important role of adolescence in determining the prevalence of mental disorder and also the role of socioeconomic status as a determinant of mental health in children. Estimating the prevalence of mental disorders is difficult. Accurate estimates may require a number of sophisticated approaches with different perspectives. The data presented herein reflect one such approach that can act as an adjunct to help mental health workers plan services and detect groups at high risk.

What This Study Adds

Mental disorder affects a significant proportion of the population of children in a society. The distribution of mental disorder varies by age, sex, and socioeconomic status. Measuring the prevalence of disorder is time-consuming, expensive, and rarely reflects an entire population, thus the data that are available are often spotty and describe only a segment of a population or a particular age group. The present study uses health care administrative data to provide an estimate of the prevalence of mental disorders among virtually all children and adolescents aged 0 to 17 years living in the province of Alberta, Canada. The estimate obtained likely underestimates the true prevalence, but the patterns of prevalence described for various mental disorders are likely fair representations of reality. The article also describes the strong relationship of socioeconomic status to the prevalence of mental disorder.

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REFERENCES

1. Roberts RE, Attkisson CC, Rosenblatt A. Prevalence of psychopathology among children and adolescents. *Am J Psychiatry*. 1998;155:715-725.
2. Costello EJ. Primary care pediatrics and child psychopathology: a review of diagnostic, treatment, and referral practices. *Pediatrics*. 1986;78:1044-1051.
3. Costello EJ, Edelbrock C, Costello AJ, Dulcan MK, Burns BJ, Brent D. Psychopathology in pediatric primary care: the new hidden morbidity. *Pediatrics*. 1988;82(3, pt 2):415-424.
4. Goldberg ID, Roghmann KJ, McInerney TK, Burke JDJ. Mental health problems among children seen in pediatric practice: prevalence and management. *Pediatrics*. 1984;73:278-293.
5. Jacobson AM, Goldberg ID, Burns BJ, Hoepfer EW, Hankin JR, Hewitt K. Diagnosed mental disorder in children and use of health services in four organized health care settings. *Am J Psychiatry*. 1980;137:559-565.
6. Costello EJ, Angold A, Burns BJ, Erkanli A, Stangl DK, Tweed DL. The Great Smoky Mountains Study of Youth: functional impairment and serious emotional disturbance. *Arch Gen Psychiatry*. 1996;53:1137-1143.
7. Lipman EL, Offord DR, Boyle MH. What if we could eliminate child poverty? the theoretical effect on child psychosocial morbidity. *Soc Psychiatry Psychiatr Epidemiol*. 1996;31:303-307.
8. Offord DR. Child psychiatric disorders: prevalence and perspectives. *Psychiatr Clin North Am*. 1985;8:637-652.
9. Offord DR, Boyle MH, Racine Y. Ontario Child Health Study: correlates of disorder. *J Am Acad Child Adolesc Psychiatry*. 1989;28:856-860.
10. Velez CN, Johnson J, Cohen P. A longitudinal analysis of selected risk factors for childhood psychopathology. *J Am Acad Child Adolesc Psychiatry*. 1989;28:861-864.
11. ICD-9-CM: *International Classification of Diseases, Ninth Revision, Clinical Modification*. 3d ed. Vols 1-3. [Official authorized addendum effective October 1, 1990; Health Care and Financing Administration]. *J Am Med Assoc*. 1990;61(suppl 35).
12. StataCorp. *Stata Statistical Software: Release 7.0*. College Station, Tex: Stata Corporation; 2001.
13. Svenson LW, Woodhead SE, Platt GH. Estimating the prevalence of asthma in Alberta: a study using provincial health care records. *Chron Dis Can*. 1993;14:28-33.
14. Patton GC, Hibbert ME, Carlin J, et al. Menarche and the onset of depression and anxiety in Victoria, Australia. *J Epidemiol Community Health*. 1996;50:661-666.
15. Angold A, Costello EJ, Worthman CM. Puberty and depression: the roles of age, pubertal status and pubertal timing. *Psychol Med*. 1998;28:51-61.
16. Angold A, Costello EJ, Erkanli A, Worthman CM. Pubertal changes in hormone levels and depression in girls. *Psychol Med*. 1999;29:1043-1053.
17. Szatmari P, Offord DR, Boyle MH. Ontario Child Health Study: prevalence of attention deficit disorder with hyperactivity. *J Child Psychol Psychiatry*. 1989;30:219-230.
18. Newman DL, Moffitt TE, Silva PA, Caspi A, Magdol L, Stanton WR. Psychiatric disorder in a birth cohort of young adults: prevalence, comorbidity, clinical significance, and new case incidence from ages 11 to 21. *J Consult Clin Psychol*. 1996;64:552-562.
19. Cohen P, Cohen J, Kasen S, et al. An epidemiological study of disorders in late childhood and adolescence, I: age- and gender-specific prevalence. *J Child Psychol Psychiatry*. 1993;34:851-867.
20. Costello EJ, Angold A, Burns BJ, et al. The Great Smoky Mountains Study of Youth: goals, design, methods, and the prevalence of DSM-III-R disorders. *Arch Gen Psychiatry*. 1996;53:1129-1136.
21. Lipman EL, Offord DR, Boyle MH. Relation between economic disadvantage and psychosocial morbidity in children. *CMAJ*. 1994;151:431-437.
22. Shaw DS, Vondra JI, Hommerding KD, Keenan K, Dunn M. Chronic family adversity and early child behavior problems: a longitudinal study of low income families. *J Child Psychol Psychiatry*. 1994;35:1109-1122.
23. Wernicke TF, Linden M. Clinical recognition and drug treatment of depression in cases found by standardized assessment. *Pharmacopsychiatry*. 1994;27(suppl 1):54-57.
24. Dulcan MK, Costello EJ, Costello AJ, Edelbrock C, Brent D, Janiszewski S. The pediatrician as gatekeeper to mental health care for children: do parents' concerns open the gate? *J Am Acad Child Adolesc Psychiatry*. 1990;29:453-458.
25. Costello EJ, Costello AJ, Edelbrock C, et al. Psychiatric disorders in pediatric primary care: prevalence and risk factors. *Arch Gen Psychiatry*. 1988;45:1107-1116.
26. Starfield B, Borkowf S. Physicians' recognition of complaints made by parents about their children's health. *Pediatrics*. 1969;43:168-172.
27. Rutter M, Tizard J, Whitmore K. *Education, Health, and Behavior*. Harlow, England: Longman Group; 1970.
28. Rutter M, Cox A, Tupling C, Berger M, Yule W. Attainment and adjustment in two geographical areas, I: the prevalence of psychiatric disorder. *Br J Psychiatry*. 1975;126:493-509.
29. Verhulst FC, Van der Ende J, Ferdinand RF, Kasius MC. The prevalence of DSM-III-R diagnoses in a national sample of Dutch adolescents. *Arch Gen Psychiatry*. 1997;54:329-336.
30. Verhulst FC, Berden GF, Sanders-Woudstra JA. Mental health in Dutch children, II: the prevalence of psychiatric disorder and relationship between measures. *Acta Psychiatr Scand Suppl*. 1985;324:1-45.
31. Steinhausen HC, Winkler Metzke C, Meier M, Kannenberg R. Behavioral and emotional problems reported by parents for ages 6 to 17 in a Swiss epidemiological study. *Eur Child Adolesc Psychiatry*. 1997;6:136-141.
32. Offord DR, Boyle MH, Szatmari P, et al. Ontario Child Health Study, II: six-month prevalence of disorder and rates of service utilization. *Arch Gen Psychiatry*. 1987;44:832-836.
33. Freid VM, Makuc DM, Rooks RN. Ambulatory health care visits by children: principal diagnosis and place of visit. *Vital Health Stat 13*. 1998;137:1-23.
34. Anderson JC, Williams S, McGee R, Silva PA. DSM-III disorders in preadolescent children: prevalence in a large sample from the general population. *Arch Gen Psychiatry*. 1987;44:69-76.
35. Cederblad M. Fifty years of epidemiologic studies in child and adolescent psychiatry in Sweden. *Nordic J Psychiatry Suppl*. 1996;50:55-66.