Prevalence of Serious Emotional Disturbance Among U.S. Children: A Meta-Analysis

Nathaniel J. Williams, Ph.D., Lysandra Scott, M.S.W., Gregory A. Aarons, Ph.D.

Objective: Prevalence estimates of child psychiatric disorders with severe impairment vary widely, and there is a critical need for precise estimates to inform clinical practice and policy in the United States. This study presents a systematic review and meta-analysis of population-based U.S. studies estimating the prevalence of youths with serious emotional disturbance (SED), as defined by the Substance Abuse and Mental Health Services Administration.

Methods: Studies were identified through searches of the MEDLINE and PsycINFO databases and nine prior reviews. Two raters evaluated 423 full-text articles, and studies were included if they assessed psychopathology and functional impairment among community samples of youths (age ≤18) in the United States via structured interviews or standardized, nationally normed rating scales and if they reported point to 12-month prevalence estimates. Prevalence estimates of SED with domain-specific and global impairment were extracted, along with study characteristics and case definitions.

Random-effects meta-analysis was used to calculate pooled prevalence estimates; metaregression analyses tested predictors of heterogeneity.

Results: Twelve studies met inclusion criteria. The pooled prevalence of SED with domain-specific impairment was 10.06% (95% confidence interval [CI]=8.60%−11.51%, N=32,015); prevalence of SED with global impairment was 6.36% (CI=5.78%−6.93%, N=38,939). Prevalence estimates did not differ by study or sample characteristic, including representativeness of the sample (national versus regional), assessment method (taxonomic versus quantitative), or time frame (12 versus <12 months).

Conclusions: These estimates of SED are sufficiently precise to meaningfully guide clinical decision making, mental health policy, and consideration of child psychiatry workforce needs in the United States.

Psychiatric Services 2018; 69:32−40; doi: 10.1176/appi.ps.201700145

Accurate estimates of the prevalence of psychiatric disorders among children and adolescents are essential for effective service planning, allocation of resources, and development of public policy (1,2). Of special concern to clinicians and policymakers are prevalence rates of youths who experience severely impairing psychiatric disorders that cause substantial disruption in daily functioning (3). Clinically, there is evidence that youths who experience substantial impairment due to a psychiatric disorder have a different course and prognosis than their less impaired peers, are at greater risk for negative long-term outcomes, and require specialized interventions and more intensive levels of care (4,5). Despite this, many of these youths do not receive necessary mental health services (3).

Increasing knowledge of the prevalence of these conditions is a first step toward improved identification and treatment. From a policy standpoint, prevalence estimates of psychiatric disorders characterized by severe impairment are necessary to determine levels of need for services and benefits, accurately assess service gaps, and evaluate the magnitude of unmet need (6).

In the United States, numerous state and federal agencies target mental health services to the population of youths who experience psychiatric disorders that cause substantial functional impairment—a condition referred to in federal regulations as serious emotional disturbance (SED) (PL 102–321). As defined by the Substance Abuse and Mental Health Services Administration (SAMHSA), criteria for SED include persons under the age of 18 who experience a psychiatric disorder that causes substantial impairment in one or more functional domains during the previous 12 months (7,8). States are required to submit SED prevalence estimates in their applications for mental health block grant funds, and federal agencies such as the Centers for Medicare and Medicaid Services often use SED criteria to determine eligibility for services (9). Some federal agencies, such as the Social Security Administration, employ criteria similar to SED, but with more stringent requirements for severity of impairment, to determine eligibility for disability benefits (10). Clinicians are often directed to apply SED criteria when assessing youths as one component of establishing eligibility for mental

health services or determining an appropriate level of care (3).

Despite the importance of SED to mental health practice and policy in the United States, precise estimates of the prevalence of SED are lacking. Prior research estimated that 4% to 17% of youths in the United States meet criteria for SED; however, the breadth of these estimates significantly undermines their usefulness for clinical practice or policy (3,8,11). Furthermore, these reviews did not incorporate several recent nationally representative surveys of youth psychopathology sponsored by the National Institute of Mental Health and the Agency for Healthcare Research and Quality (1,12–14). During the past 20 years, several epidemiological studies have been conducted that provide important data points for estimating the true population prevalence of SED in the United States (9,15). However, each study relied on a unique sample and methods and, as a result, produced a unique prevalence estimate. An optimal population prevalence estimate can be derived by pooling these studies by using meta-analytic methods to model sampling variation and other forms of study heterogeneity (16). Nevertheless, none of the narrative reviews summarizing this literature has quantitatively synthesized the results (11,17,18).

The goals of this study were to determine pooled prevalence estimates of SED, based on a systematic review and meta-analysis of population-representative studies conducted in the United States, and to explore predictors of heterogeneity among these estimates.

METHODS

Data Sources, Study Selection, and Inclusion Criteria

The search process identified epidemiological studies of psychiatric disorders among community samples of children and adolescents in the United States. We followed PRISMA and MOOSE recommendations for the transparent reporting of systematic reviews and meta-analyses (19,20). With the assistance of a reference librarian, we conducted electronic searches in the MEDLINE and PsycINFO databases, which provide optimal coverage for psychosocial problems (21), accessing articles from January 1, 1980, the publication year of *DSM-III*, which included explicit diagnostic criteria, through January 1, 2017. Search terms focused on prevalence ("epidemiology" OR "prevalence"), psychiatric disorder ("psychiatric disorder" OR "mental disorder" OR "psychopathology" OR "serious emotional disturbance" OR "severe emotional disturbance" OR "emotional disturbance" OR "severe emotional disorder"), and child and adolescent populations ("child*" or "adoles*"). In addition, studies were extracted from nine previous reviews of childhood psychiatric epidemiology (2,3,6,8,11,17,18,22,23). References from these reviews were extracted and screened, as were the references from a recent National Academy of Sciences report on SED (15). Because of the focus on prevalence of SED in the United States, searches were limited to peer-reviewed articles published in English.

After the initial screening of abstracts and titles, two authors (NW and LS) independently reviewed the full text of articles considered for inclusion and resolved disagreements through discussion with the third author. Studies were selected for inclusion if they collected original, prospective data on the point to 12-month prevalence of psychiatric disorders among persons ages 18 and younger; included a probabilistic community sample in the United States; derived *DSM* or *ICD* diagnoses on the basis of structured assessment procedures or assessed youth psychopathology via a standardized, nationally normed quantitative measure; assessed three or more disorders or symptom clusters representing both externalizing and internalizing psychopathology; and included measures of functional impairment. Studies with insufficient data to estimate standard errors were excluded, as were studies that relied on clinical records to make diagnoses, reported lifetime prevalence, were conducted with samples outside the United States, or incorporated response rates less than 50% in the final sampling stage (mean response rate of 75%, range 56%−96%). For longitudinal studies, the most recent wave of data was used whenever possible in order to obtain the most up-to-date estimates.

Data Extraction and Coding

Studies that met the selection criteria were coded for sample characteristics, methodological approaches, and case definitions. Coded variables were selected a priori on the basis of their importance for assessing the reliability and validity of prevalence estimates and their association with variation in prevalence estimates in prior studies. Consistent with prior reviews and conceptual research on SED, prevalence estimates of SED were extracted from the studies at two levels of functional impairment—domain-specific impairment and global impairment (8,11). Domain-specific impairment indicates substantial disruption in role functioning secondary to a psychiatric disorder in at least one functional domain of family, peers, educational settings, or the community (11). This definition meets the minimum criteria set by SAMHSA to identify a youth with SED (24). Global impairment is more severe and indicates substantial impairment of role functioning in multiple domains, operationalized here as two or more domains (11). Because of differences in the prevalence estimates of these two populations as well as likely differences in service needs, estimates of SED prevalence were extracted for both levels of impairment whenever possible. In addition, information was extracted on the measure and criteria (for example, cut score) used to operationalize each level of impairment in each study.

Consistent with prior research, SED estimates that relied on the Children's Global Assessment Scale (CGAS) to assess functional impairment were classified as domain-specific if they used a cut score of ≤60, which indicates "disturbance would be apparent to those who encounter the child in a dysfunctional setting or time but not to those who see the child in other settings" (4,13). Estimates were classified as

TABLE 1. Studies of SED prevalence that were included in the meta-analysis[a]

Study title or identifier	Authors	Time frame	Representativeness (geographic region)	Age range	Evaluated sample size (N)	Sampling frame	Diagnostic system	Diagnostic measure and algorithm	Domain-specific impairment: Measure and criteria	Domain-specific impairment: Prevalence (%)	Global impairment: Measure and criteria	Global impairment: Prevalence (%)
Medical Expenditure Panel Survey (MEPS)	Olfson et al., 2015 (1)	Present	National	6–17	18,865	Households	Quantitative (CIS)	CIS cut score; parent only	CIS score ≥16	10.7	CIS score ≥20	6.2
National Health Interview Survey (NHIS)	Bourdon et al., 2005 (14)	6 months	National	4–17	9,878	Households	Quantitative (SDQ)	SDQ symptom items; cut score varies by diagnosis; parent only			SDQ impairment items; cut score varies by diagnosis (≥2 or ≥3)	7.1
National Comorbidity Survey Replication–Adolescent Supplement (NCS-A)	Kessler et al., 2012 (13); Kessler et al., 2012 (35); and Kessler et al., 2009 (34)	12 months	National	13–17	6,483	Dual frame (households and schools)	Taxonomic (DSM-IV)	CIDI; "or rule" (i.e., either parent or youth report)			Regression-based CGAS score approximation ≤50	8.0
Houston	Roberts et al., 2007 (33)	12 months	Regional	11–17	4,175	Households	Taxonomic (DSM-IV)	DISC-IV; youth only	DISC-specific impairment in ≥1 areas	11.1		
National Health and Nutrition Examination Survey (NHANES)	Merikangas et al., 2010 (12)	12 months	National	8–15	3,042	Households	Taxonomic (DSM-IV)	DISC-IV; varies by diagnosis	Study-specific questions; impairment in ≥1 areas	11.3		
Oregon	Lewinsohn et al., 1993 (36)	Present	Regional	14–18	1,710	Schools	Taxonomic (DSM-IV)	K-SADS; youth only	K-SADS–specific impairment in ≥1 areas	7.8		
Methods for the Epidemiology of Child and Adolescent Mental Disorders (MECA)	Shaffer et al., 1996 (37); Lahey et al., 1996 (38)	6 months	Regional (Connecticut, Georgia, New York, and Puerto Rico)	9–17	1,285	Households	Taxonomic (DSM-IV)	DISC-2.3; "or rule"	CGAS score ≤60	11.5	CGAS score ≤50	5.4
Great Smoky Mountains Study (GSMS)	Costello et al., 1998 (11); Costello et al., 1996 (39); Costello et al., 1996 (40); Costello et al., 2003 (5); and Angold et al., 1999 (41)	3 months	Regional (North Carolina)	9–16	1,015	Households	Taxonomic (DSM-IV)	CAPA; "or rule"	CAPA-specific impairment in ≥1 areas	7.4	CAPA-specific impairment in ≥2 areas	6.8
New York State	Costello et al., 1998 (11); Cohen et al., 1993 (42); and Velez et al., 1989 (43)	Present	Regional (Upstate New York)	9–18	764	Households	Taxonomic (DSM-IV)	DISC-1; "or rule"	Study-specific scales; bottom 10% on any 1 scale	6.4	Study-specific scales; bottom 10% on mean of all scales	5.8

TABLE 1, *continued*

Study title or identifier	Authors	Time frame	Representativeness (geographic region)	Age range	Evaluated sample size (N)	Sampling frame	Diagnostic system	Diagnostic measure and algorithm	Domain-specific impairment		Global impairment	
									Measure and criteria	Prevalence (%)	Measure and criteria	Prevalence (%)
Chicago	Lavigne et al., 1996 (32); Lavigne et al., 1993 (44)	Present	Regional	2–5	510	Households	Taxonomic (*DSM-III-R*)	*DSM-III-R* diagnosis based on 2 Ph.D.-level raters and battery of tests for preschool children; best estimate	CGAS score ≤60	9.1		
Boston	Costello et al., 1998 (11) and Reinherz et al., 1993 (45)	Present	Regional	17–18	386	Schools	Taxonomic (*DSM-III-R*)	*DIS-III-R*; youth only	Study-specific scales; bottom 10% on any 1 scale	14.6	Study-specific scales; bottom 10% on mean of all scales	5.4
Pittsburgh	Costello et al., 1999 (4); Costello et al., 1998 (11); and Costello, 1989 (46)	12 months	Regional	12–18	263	Households	Taxonomic (*DSM-III-R*)	DISC–2.1; "or rule"	CGAS score ≤60 or CBCL social competence score in lowest 10%	13.1	CBCL social competence score in lowest 10%	5.8

[a] CAPA, Child and Adolescent Psychiatric Assessment; CBCL, Child Behavior Checklist; CGAS, Children's Global Assessment Scale; CIDI, Composite International Diagnostic Interview; CIS, Columbia Impairment Scale; DIS, Diagnostic Interview Schedule; DISC, Diagnostic Interview Schedule for Children; DSM, Diagnostic and Statistical Manual of Mental Disorders; K-SADS, Schedule for Affective Disorders and Schizophrenia for School-Aged Children; SDQ, Strengths and Difficulties Questionnaire; SED, serious emotional disturbance

global if they used a CGAS cut score of ≤50, which indicates the youth experiences "interference in functioning in most social areas" due to the psychiatric disorder.

In addition to measuring functional impairment, studies were required to include diagnostic procedures for establishing the presence of psychopathology or psychiatric disorder. The literature on youth psychopathology is characterized by two approaches to assessment, one representing a taxonomic approach that relies on structured interviews to derive *DSM* or *ICD* diagnoses and the other representing a quantitative approach that relies on elevated symptom scores on standardized rating scales (9). Both approaches have demonstrated adequate sensitivity and specificity for population-based epidemiological studies, and there is considerable interest in examining the equivalence of these approaches; consequently, we included both types of studies in the meta-analysis.

For studies that used a taxonomic approach, we included SED estimates that relied on any decision rule to generate diagnoses (i.e., parent report only, youth report only, or parent or youth report ["or rule"]). For studies that used a quantitative approach, we required that the standardized measure have strong evidence of reliability and validity plus national norms for scoring and clinical cutoff criteria. Validity studies of the two standardized scales included in our meta-analysis (the Strengths and Difficulties Questionnaire and the Columbia Impairment Scale) confirm that they have adequate sensitivity and specificity for detecting psychiatric disorders among youths, and consequently the possibility of over- or underestimating prevalence based on the cut scores used was low (14,25–28).
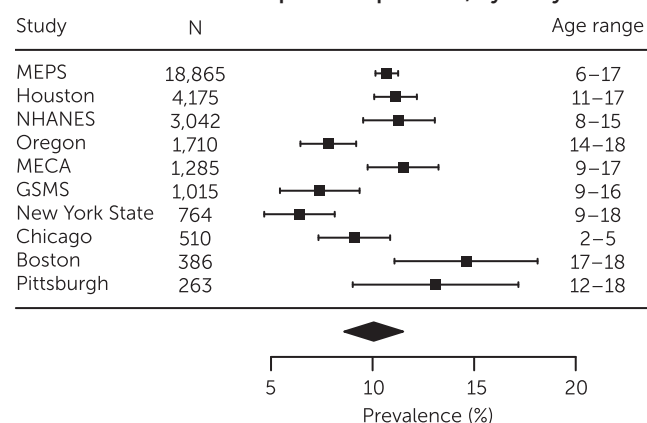
Data Synthesis

Because of differences across studies in their samples, procedures, measures, and case definitions, the assumption of homogeneity that underlies fixed-effects meta-analytic models was untenable. Consequently, we relied on a random-effects meta-analytic model to estimate the population prevalence of SED at two levels of impairment—domain-specific impairment and global impairment. Each study contributed only one prevalence estimate per analysis. After estimating the prevalence of SED at each level of functional impairment, we subsequently fitted mixed-effects regression models (metaregression) to identify moderators that might explain variation in the prevalence estimates (16,29,30). All models were fitted by using the metafor package in R (31).

RESULTS

Study Pool

The search process yielded 12 studies that estimated the prevalence of SED in the United States (1,4,5,11–14,32–46). [A PRISMA flow diagram of study identification, screening, and selection is available as an online supplement to this article.]

FIGURE 1. Estimated prevalence of serious emotional disturbance with domain-specific impairment, by study[a]

Study	N		Age range
MEPS	18,865		6–17
Houston	4,175		11–17
NHANES	3,042		8–15
Oregon	1,710		14–18
MECA	1,285		9–17
GSMS	1,015		9–16
New York State	764		9–18
Chicago	510		2–5
Boston	386		17–18
Pittsburgh	263		12–18

[a] MEPS, Medical Expenditure Panel Survey (1); Houston (33); NHANES, National Health and Nutrition Examination Survey (12); Oregon (36); MECA, Methods for the Epidemiology of Child and Adolescent Mental Disorders (37,38); GSMS, Great Smoky Mountains Study (5,11,39–41); New York State (11,42,43); Chicago (32,44); Boston (11,45); and Pittsburgh (4,11,46)

The studies included 10 estimates of SED with domain-specific impairment and eight estimates of SED with global impairment. Six studies provided estimates of SED at both levels of impairment. Most studies, which spanned 1989 to 2015, assessed eight- to 17-year-olds. Four studies incorporated U.S. national samples, and eight included regional samples. Only two studies derived SED prevalence estimates on the basis of quantitative measures. Table 1 presents the study characteristics and estimates of SED at each level of impairment for each study.

Prevalence of SED With Domain-Specific Impairment
The pooled prevalence of SED with domain-specific impairment was 10.06% (95% confidence interval [CI]=8.60%–11.51%). This estimate is based on 10 studies incorporating 32,015 youths. Figure 1 presents the forest plot of each study's prevalence estimate and CI. Consistent with our random-effects analytic approach, there was significant variance between studies in their prevalence estimates (Q=56.96, df=9, p<.001), suggesting the importance of examining potential moderators.

Table 2 presents the moderator analyses examining variation in the prevalence rates of domain-specific SED by study characteristics. Results of the metaregression analyses indicated that domain-specific SED prevalence did not differ by assessment method (taxonomic versus quantitative), diagnostic time frame (12 months versus less than 12 months), representativeness of the study sample (regional versus national), year of data collection, age range of youths, measure of impairment, sample size analyzed, sampling frame (for example, households versus schools), type of informant, or diagnostic interview, although all of these analyses were considered exploratory because of the small number of studies.

We also calculated separate meta-analytic point estimates and CIs for domain-specific SED prevalence rates for targeted subsets of studies, for example, studies with national samples or studies with a 12-month time frame [see online supplement]. These data provide additional information for evaluating the relationship between study characteristics and domain-specific SED prevalence rates. Results of these analyses are consistent with the metaregression moderator tests but offer increased precision for readers interested in specific prevalence estimates based on particular types of studies.

Prevalence of SED With Global Impairment
The pooled prevalence of SED with global impairment was 6.36% (CI=5.78%–6.93%), based on eight studies incorporating 38,939 youths. Figure 2 shows the forest plot of studies estimating the prevalence of SED with global impairment. There was no significant variance in the prevalence estimates of these studies, suggesting they were homogeneous.

Table 3 presents the moderator analyses of the prevalence of SED with global impairment. Results indicated that prevalence rates of SED with global impairment did not differ by study or sample characteristic. [Separate meta-analytic point estimates and CIs for the prevalence of SED with global impairment in selected subsets of studies are available in the online supplement.]

DISCUSSION

This systematic review and meta-analysis of population-representative studies conducted in the United States suggests that 10.06% of youths experience SED with substantial impairment in one or more functional domains and that 6.36% of youths experience SED with substantial impairment in two or more domains. The large numbers of youth and families affected by SED, the significant long-term consequences of these conditions, and the considerable costs and complexity of treating these disorders underscore the need for comprehensive and effective prevention and treatment services.

Results from this study have important implications for mental health services. First, whereas clinicians in primary care might expect a relatively small proportion of pediatric patients to present with substantial impairment related to a psychiatric disorder, these results suggest that one in 10 youths will likely require treatment or referral to appropriate mental health services. Collaborative care models may be promising in regard to engaging these patients (47,48). Second, the significant challenges in daily functioning experienced by these youths highlight the importance of research to develop and implement community-based services that provide care in the least restrictive setting. Wraparound service models, which feature a growing evidence base, are a promising alternative to restrictive out-of-home placements
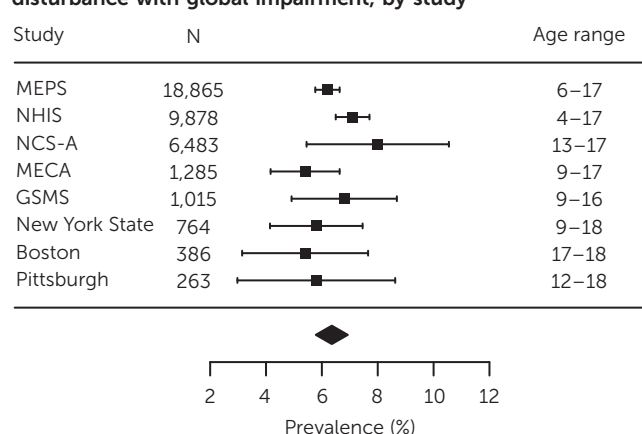
TABLE 2. Metaregression analyses of moderators of prevalence of SED with domain-specific impairment[a]

Moderator	B (%)	SE	95% CI	p
Diagnostic approach				.775
Taxonomic (reference)	10.00	.85	8.33 to 11.66	
Quantitative	.71	2.46	−4.12 to 5.53	
Diagnostic time frame				.158
<12 months (reference)	9.42	.82	7.81 to 11.03	
12 months	2.19	1.55	−.85 to 5.23	
Representativeness of sample				.523
Regional (reference)	9.80	.87	8.10 to 11.51	
National	1.18	1.84	−2.43 to 4.78	
Year of data collection[b]				.237
1993 (mean year)	10.10	.71	8.72 to 11.49	
Each additional year	.10	.09	−.07 to .28	
Measure of impairment				.789
CGAS (reference)	11.01	1.67	7.74 to 14.28	
Standardized normed scale	−.31	3.08	−6.35 to 5.73	
Study-specific scales	−.59	2.34	−5.18 to 4.00	
Questions from diagnostic interview	−2.17	2.28	−6.63 to 2.29	
Analyzed sample size[b]				.720
3,202 (mean N)	10.10	.79	8.55 to 11.65	
Each additional youth	.00	.00	−.00 to .00	
Sampling frame				.774
Households (reference)	9.97	.88	8.24 to 11.70	
Schools	.59	2.05	−3.44 to 4.62	
Informant				.855
Caregiver or youth (reference)	9.72	1.22	7.32 to 12.12	
Caregiver only	.22	2.19	−4.07 to 4.51	
Youth only	1.09	1.98	−2.79 to 4.98	
Diagnostic interview				.589
DISC (reference)	11.06	1.11	8.89 to 13.24	
K-SADS	−3.25	2.77	−8.68 to 2.19	
Quantitative measure	−.36	2.70	−5.65 to 4.92	
DSM-III-R	−1.96	2.83	−7.51 to 3.58	
CAPA	−3.66	2.86	−9.28 to 1.94	
Age range (years)				.701
<6 included (reference)	9.94	1.81	6.41 to 13.48	
8–18	−.36	2.15	−4.58 to 3.85	
≥12	1.35	2.47	−3.48 to 6.18	

[a] The analysis included 10 studies (N=32,015) of the prevalence of serious emotional disturbance (SED). Moderators were tested by using the Q test (16). CGAS, Children's Global Assessment Scale; CAPA, Child and Adolescent Psychiatric Assessment; DISC, Diagnostic Interview Schedule for Children; DSM, Diagnostic and Statistical Manual of Mental Disorders; K-SADS, Schedule for Affective Disorders and Schizophrenia for School-Aged Children
[b] Continuous moderator variables were centered around their grand mean. The intercept represents the estimated prevalence at the mean value of the moderator (e.g., mean year of data collection), and the slope represents the estimated change in SED prevalence for each additional 1-point increase in the moderator.

FIGURE 2. Estimated prevalence of serious emotional disturbance with global impairment, by study[a]

[a] MEPS, Medical Expenditure Panel Survey (1); NHIS, National Health Interview Survey (14); NCS-A, National Comorbidity Survey Replication Adolescent Supplement (13,33–35); MECA, Methods for the Epidemiology of Child and Adolescent Mental Disorders (37,38); GSMS, Great Smoky Mountains Study (5,11,39–41); New York State (11,42,43); Boston (11,45); and Pittsburgh (4,11,46)

increased risk of treatment failure and dropout (13); consequently, it is important for clinicians to recognize the heterogeneity of diagnoses associated with SED and provide evidence-based care built around valid assessment and diagnosis (50). Examples of evidence-based approaches for youths with SED include multisystemic therapy, functional family therapy, a range of cognitive-behavioral therapies for specific diagnoses, and community-based wraparound services (51,52).

Another area of concern given these estimates is the shortage of child psychiatrists to provide care in community settings (53). Approximately 8,700 child psychiatrists deliver services in the United States, implying an untenable 620:1 ratio of youths with SED per child psychiatrist (54). This situation is exacerbated by the low number of child psychiatry residents and fellows in the United States, who numbered just 869 in 2015, and by an uneven distribution of child psychiatrists across the United States such that more rural and impoverished areas have particularly acute shortages (55–57). Currently, only about 50% of youths with SED receive any mental health treatment within a one-year period (12). Increasing workforce capacity is critical to improving access to mental health services for youths with SED.

Findings from this study also have implications for policy. First, these estimates provide a basis for states to determine rates of SED and thereby establish proxy classes or service targets. Second, the small differences between prevalence estimates based on standardized rating scales versus structured diagnostic interviews suggest that relatively cost-effective standardized measures may be useful for estimating SED prevalence in targeted population areas. Third, the large discrepancy between prevalence of SED with domain-specific impairment and SED with global impairment confirms the

and have been increasingly embraced by states (49). Third, the category of SED belies the complexity of mental health problems faced by these youths due to a specific diagnosis or set of comorbid diagnoses. Youths with SED are more likely to experience comorbid psychiatric disorders and are at

TABLE 3. Metaregression analyses of moderators of prevalence of SED with global impairment[a]

Moderator	B (%)	SE	95% CI	p
Diagnostic approach				.303
Taxonomic (reference)	6.02	.44	5.15 to 6.88	
Quantitative	.60	.58	−.54 to 1.74	
Diagnostic time frame				.511
<12 months (reference)	6.29	.32	5.67 to 6.91	
12 months	.71	1.08	−1.41 to 2.83	
Representativeness of sample				.112
Regional (reference)	5.79	.46	4.90 to 6.68	
National	.91	.57	−.21 to 2.03	
Year of data collection[b]				.354
1995 (mean year)	6.22	.35	5.54 to 6.91	
Each additional year	.03	.04	−.04 to .10	
Measure of impairment				.717
CGAS (reference)	6.07	.71	4.70 to 7.47	
Standardized normed scale	.49	.82	−1.12 to 2.11	
Study-specific scales	−.03	.96	−1.92 to 1.85	
Analyzed sample size[b]				.543
4,867 (mean N)	6.23	.38	5.48 to 6.97	
Each additional youth	.00	.00	−.00 to .00	
Sampling frame				.372
Households (reference)	6.33	.32	5.71 to 6.95	
Schools	−.93	1.29	−3.46 to 1.61	
Households and schools	1.67	1.43	−1.13 to 4.47	
Informant				.534
Caregiver or youth (reference)	6.11	.48	5.17 to 7.05	
Caregiver only	.50	.63	−.72 to 1.73	
Youth only	−.71	1.35	−3.35 to 1.92	
Diagnostic interview				.197
DISC (reference)	5.56	.50	4.57 to 6.54	
CIDI	2.44	1.46	−.41 to 5.29	
Quantitative measure	1.05	.61	−.15 to 2.25	
CAPA	1.24	1.16	−1.04 to 3.51	
Age range (years)				.530
<6 included (reference)	6.62	.39	5.84 to 7.39	
8–18	−.75	.67	−2.06 to .55	
≥12	−.26	.89	−2.00 to 1.48	

[a] The analysis included eight studies (N=38,939) of the prevalence of serious emotional disturbance (SED). Moderators were tested by using the Q test. CAPA, Child and Adolescent Psychiatric Assessment; CGAS, Children's Global Assessment Scale; CIDI, Composite International Diagnostic Interview; DISC, Diagnostic Interview Schedule for Children

[b] Continuous moderator variables were centered around their grand mean. The intercept represents the estimated prevalence at the mean value of the moderator (e.g., mean year of data collection), and the slope represents the estimated change in SED prevalence for each additional 1-point increase in the moderator.

importance of impairment criteria in defining this target population. Fourth, these findings suggest that recent concerns regarding the overuse of benefits programs such as Supplemental Security Income (SSI) for youths with major mental disorders may be unwarranted (58). Combining the estimated prevalence of SED with global impairment from this study with data on SSI enrollment suggests that a maximum of 19% (N=654,370) of the 3.4 million American youths with SED with global impairment received SSI benefits in 2013 (10,59).

Limitations of this study included three issues common to systematic reviews and meta-analyses. First, the primary studies included in the analysis may have had flaws that influenced the results. For example, differential nonresponse of youths and caregivers of youths with SED may have attenuated the prevalence estimates of primary studies. If this occurred systematically across studies, the meta-analytic estimates would be downwardly biased.

Second, it is possible that some epidemiological studies of youth psychiatric disorders were not identified during the search process. Studies could have been missed during the search or because they were published outside of our inclusion dates. This threat was diminished, however, by several factors. First, the combination of MEDLINE and PsycINFO databases provides optimal coverage for systematic reviews of psychosocial disabilities (21). By combining searches of these databases with reference harvesting from nine prior reviews, it is unlikely that major prevalence studies were missed. Second, epidemiological studies of disease prevalence do not involve allegiance effects and are therefore less likely to result in unpublished studies (the "file drawer" problem) (16). Third, the pattern of results in both forest plots—which include high and low prevalence estimates distributed around a pooled mean—increases confidence that a range of estimates have been reported in the literature and were systematically identified by the search process.

Third, the heterogeneity in study methods and samples raised the "lumping and splitting" question that is common to meta-analysis—that is, were the included studies all measuring the same construct (16)? Several factors support the inclusion criteria used. First, the federal definition of SED supports the broad inclusion of studies with respect to diagnoses, age range (up to 18), and time frame for diagnosis (up to 12 months). Second, the moderator analyses, although relatively underpowered, offered little evidence to suggest that prevalence rates differed by sample or methodological characteristic. Third, findings from this meta-analysis are consistent with other studies that show that, with the exception of poverty, few youth characteristics are systematically related to rates of SED (2,9). Fourth, the application of uniform criteria developed a priori to classify SED estimates increases confidence that the studies were measuring the same construct.

CONCLUSIONS

This meta-analysis of 12 population-representative studies of youths varying in age from two to 18 found that 10% of youths met federal criteria for SED in at least one area of functioning, suggesting that one in 10 pediatric patients is likely to require treatment or referral to appropriate mental health services. The estimates of SED presented here provide clinicians and policy makers with necessary evidence to guide clinical decision making and mental health policy in the United States.

AUTHOR AND ARTICLE INFORMATION

Dr. Williams and Ms. Scott are with the School of Social Work, Boise State University, Boise, Idaho. Dr. Aarons is with the Department of Psychiatry, University of California, San Diego. Send correspondence to Dr. Williams (e-mail: natewilliams@boisestate.edu).

REFERENCES

1. Olfson M, Druss BG, Marcus SC: Trends in mental health care among children and adolescents. New England Journal of Medicine 372:2029–2038, 2015

2. Polanczyk GV, Salum GA, Sugaya LS, et al: Annual research review: a meta-analysis of the worldwide prevalence of mental disorders in children and adolescents. Journal of Child Psychology and Psychiatry, and Allied Disciplines 56:345–365, 2015

3. Costello EJ, Egger H, Angold A: 10-year research update review: the epidemiology of child and adolescent psychiatric disorders: I. methods and public health burden. Journal of the American Academy of Child and Adolescent Psychiatry 44:972–986, 2005

4. Costello EJ, Angold A, Keeler GP: Adolescent outcomes of childhood disorders: the consequences of severity and impairment. Journal of the American Academy of Child and Adolescent Psychiatry 38:121–128, 1999

5. Costello EJ, Mustillo S, Erkanli A, et al: Prevalence and development of psychiatric disorders in childhood and adolescence. Archives of General Psychiatry 60:837–844, 2003

6. Merikangas KR, Nakamura EF, Kessler RC: Epidemiology of mental disorders in children and adolescents. Dialogues in Clinical Neuroscience 11:7–20, 2009

7. ADAMHA Reorganization Act, PL No 102-321, § 106 Stat 323 (1992)

8. Friedman RM, Katz-Leavy JW, Mandersheid RW, et al: Prevalence of serious emotional disturbance in children and adolescents; in Mental Health, United States, 1996. Edited by Manderscheid RW, Sonnenschein MA. Rockville, MD, US Department of Health and Human Services, 1996

9. Merikangas KR, He J: Epidemiology of mental disorders in children and adolescents: background and US studies; in From Research to Practice in Child and Adolescent Mental Health. Edited by Raynaud JG, Hodes M, Gau SS. Lanham, MD, Rowman & Littlefield, 2014

10. Perrin JM, Houtrow A, Kelleher K, et al: Supplemental Security Income benefits for mental disorders. Pediatrics, 2016 (doi 10.1542/peds.2016-0354)

11. Costello EJ, Messer SC, Bird HR, et al: The prevalence of serious emotional disturbance: a re-analysis of community studies. Journal of Child and Family Studies 7:411–432, 1998

12. Merikangas KR, He JP, Brody D, et al: Prevalence and treatment of mental disorders among US children in the 2001–2004 NHANES. Pediatrics 125:75–81, 2010

13. Kessler RC, Avenevoli S, Costello J, et al: Severity of 12-month DSM-IV disorders in the National Comorbidity Survey Replication Adolescent Supplement. Archives of General Psychiatry 69:381–389, 2012

14. Bourdon KH, Goodman R, Rae DS, et al: The Strengths and Difficulties Questionnaire: US normative data and psychometric properties. Journal of the American Academy of Child and Adolescent Psychiatry 44:557–564, 2005

15. Measuring Serious Emotional Disturbance in Children: Workshop Summary. Washington, DC, National Academies Press, 2016

16. Lipsey M, Wilson D: Practical Meta-Analysis. Thousand Oaks, CA, Sage, 2001

17. Roberts RE, Attkisson CC, Rosenblatt A: Prevalence of psychopathology among children and adolescents. American Journal of Psychiatry 155:715–725, 1998

18. Brauner CB, Stephens CB: Estimating the prevalence of early childhood serious emotional/behavioral disorders: challenges and recommendations. Public Health Reports 121:303–310, 2006

19. Moher D, Liberati A, Tetzlaff J, et al: Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. Annals of Internal Medicine 151:264–269, W64, 2009

20. Stroup DF, Berlin JA, Morton SC, et al: Meta-analysis of observational studies in epidemiology: a proposal for reporting. JAMA 283:2008–2012, 2000

21. Hartling L, Featherstone R, Nuspl M, et al: The contribution of databases to the results of systematic reviews: a cross-sectional study. BMC Medical Research Methodology 16:127, 2016

22. Perou R, Bitsko RH, Blumberg SJ, et al: Mental health surveillance among children—United States, 2005–2011. Morbidity and Mortality Weekly Report 62:1–35, 2013

23. McDonnell MA, Glod C: Prevalence of psychopathology in preschool-age children. Journal of Child and Adolescent Psychiatric Nursing 16:141–152, 2003

24. Children with serious emotional disturbance; estimation methodology—SAMHSA. final notice. Federal Register 63:38661–38665, 1998

25. Goodman R: Psychometric properties of the Strengths and Difficulties Questionnaire. Journal of the American Academy of Child and Adolescent Psychiatry 40:1337–1345, 2001

26. Bird HRA, Schwab-Stone M, Goodman S, et al: Global measures of impairment for epidemiologic and clinical use with children and adolescents. International Journal of Methods in Psychiatric Research 6:295–307, 1996

27. Harris ESC, Canning RD, Kelleher KJ: A comparison of measures of adjustment, symptoms, and impairment among children with chronic medical conditions. Journal of the American Academy of Child and Adolescent Psychiatry 35:1025–1032, 1996

28. He JP, Burstein M, Schmitz A, et al: The Strengths and Difficulties Questionnaire (SDQ): the factor structure and scale validation in US adolescents. Journal of Abnormal Child Psychology 41:583–595, 2013

29. van Houwelingen HC, Arends LR, Stijnen T: Advanced methods in meta-analysis: multivariate approach and meta-regression. Statistics in Medicine 21:589–624, 2002

30. Tipton E: Small sample adjustments for robust variance estimation with meta-regression. Psychological Methods 20:375–393, 2015

31. Viechtbauer W: Conducting meta-analyses in R with the metafor package. Journal of Statistical Software 36:1–48, 2010

32. Lavigne JV, Gibbons RD, Christoffel KK, et al: Prevalence rates and correlates of psychiatric disorders among preschool children. Journal of the American Academy of Child and Adolescent Psychiatry 35:204–214, 1996

33. Roberts RE, Roberts CR, Xing Y: Rates of DSM-IV psychiatric disorders among adolescents in a large metropolitan area. Journal of Psychiatric Research 41:959–967, 2007

34. Kessler RC, Avenevoli S, Costello EJ, et al: National Comorbidity Survey Replication Adolescent Supplement (NCS-A): II. overview and design. Journal of the American Academy of Child and Adolescent Psychiatry 48:380–385, 2009

35. Kessler RC, Avenevoli S, Costello EJ, et al: Prevalence, persistence, and sociodemographic correlates of DSM-IV disorders in the National Comorbidity Survey Replication Adolescent Supplement. Archives of General Psychiatry 69:372–380, 2012

36. Lewinsohn PM, Hops H, Roberts RE, et al: Adolescent psychopathology: I. prevalence and incidence of depression and other DSM-III-R disorders in high school students. Journal of Abnormal Child Psychology 102:133–144, 1993

37. Shaffer D, Fisher P, Dulcan MK, et al: The NIMH Diagnostic Interview Schedule for Children Version 2.3 (DISC-2.3): description, acceptability, prevalence rates, and performance in the MECA study. Journal of the American Academy of Child and Adolescent Psychiatry 35:865–877, 1996

38. Lahey BB, Flagg EW, Bird HR, et al: The NIMH Methods for the Epidemiology of Child and Adolescent Mental Disorders (MECA) study: background and methodology. Journal of the American Academy of Child and Adolescent Psychiatry 35:855–864, 1996

39. Costello EJ, Angold A, Burns BJ, et al: The Great Smoky Mountains Study of Youth: functional impairment and serious emotional disturbance. Archives of General Psychiatry 53:1137–1143, 1996

40. 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. Archives of General Psychiatry 53:1129–1136, 1996

41. Angold A, Costello EJ, Farmer EM, et al: Impaired but undiagnosed. Journal of the American Academy of Child and Adolescent Psychiatry 38:129–137, 1999

42. Cohen P, Cohen J, Kasen S, et al: An epidemiological study of disorders in late childhood and adolescence—I. age- and gender-specific prevalence. Journal of Child Psychology and Psychiatry, and Allied Disciplines 34:851–867, 1993

43. Velez CN, Johnson J, Cohen P: A longitudinal analysis of selected risk factors for childhood psychopathology. Journal of the American Academy of Child and Adolescent Psychiatry 28:861–864, 1989

44. Lavigne JV, Binns HJ, Christoffel KK, et al: Behavioral and emotional problems among preschool children in pediatric primary care: prevalence and pediatricians' recognition. Pediatrics 91: 649–655, 1993

45. Reinherz HZ, Giaconia RM, Lefkowitz ES, et al: Prevalence of psychiatric disorders in a community population of older adolescents. Journal of the American Academy of Child and Adolescent Psychiatry 32:369–377, 1993

46. Costello EJ: Child psychiatric disorders and their correlates: a primary care pediatric sample. Journal of the American Academy of Child and Adolescent Psychiatry 28:851–855, 1989

47. Aupont O, Doerfler L, Connor DF, et al: A collaborative care model to improve access to pediatric mental health services. Administration and Policy in Mental Health and Mental Health Services Research 40:264–273, 2013

48. Moses K, Klebonis J, Simons D. Developing Health Homes for Children with Serious Emotional Disturbance: Considerations and Opportunities. Baltimore, Centers for Medicare and Medicaid Services, Health Home Information Resource Center, Feb 2014

49. Sather A, Bruns EJ: National trends in implementing wraparound: results of the State Wraparound Survey, 2013. Journal of Child and Family Studies 25:3160–3172, 2016

50. De Los Reyes A, Augenstein TM, Wang M, et al: The validity of the multi-informant approach to assessing child and adolescent mental health. Psychological Bulletin 141:858–900, 2015

51. Weisz JR, Kazdin AE: Evidence-Based Psychotherapies for Children and Adolescents. New York, Guilford, 2010

52. Burns BJ, Hoagwood K: Community Treatment for Youth: Evidence-Based Interventions for Severe Emotional and Behavioral Disorders. Bethesda, MD, Oxford University Press, 2002

53. Walker ER, Berry FW III, Citron T, et al: Psychiatric workforce needs and recommendations for the community mental health system: a state needs assessment. Psychiatric Services 66:115–117, 2015

54. Physician Masterfile: Physician Specialty by Type of Practice. Washington, DC, American Medical Association. http://www.mmslists.com/data/countspdf/AMA-SpecialtyByTOPS.pdf. Accessed March 10, 2017

55. ACGME Residents and Fellows by Sex and Specialty, 2015. Washington, DC, Association of American Medical Colleges. https://www.aamc.org/data/workforce/reports/458766/2-2-chart.html. Accessed May 4, 2017

56. Fritsch SL, Schlesinger A, Habeger AD, et al: Collaborative care and integration: changing roles and changing identity of the child and adolescent psychiatrist? Journal of the American Academy of Child and Adolescent Psychiatry 55:743–745, 2016

57. Thomas CR, Holzer CE III: The continuing shortage of child and adolescent psychiatrists. Journal of the American Academy of Child and Adolescent Psychiatry 45:1023–1031, 2006

58. Supplemental Security Income: Better Management Oversight Needed for Children's Benefits. Washington, DC, US Government Accountability Office, 2012

59. Hoagwood KE, Zima BT, Buka SL, et al: State-to-state variation in SSI enrollment for children with mental disabilities: an administrative and ethical challenge. Psychiatric Services 68:195–198, 2017