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Does the Prevalence of CD and ODD Vary across Cultures?

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Abstract

The worldwide prevalence of conduct disorder (CD) and oppositional defiant disorder (ODD) is presented in order to examine the first of four criteria used in other studies to determine the validity of psychiatric disorders across cultures. The authors searched Medline and PsycINFO from 1987 to 2008. Studies were included if they were representative of specific communities or countries and reported point prevalence of CD or ODD according to DSM-III-R or DSM-IV criteria for children 18 years or younger. Only methodological and not geographic factors were associated with variability of the prevalence estimates. The results are discussed in terms of their significance for the classification of disorders and the need for further research to establish the validity of these two disorders across cultures.

Keywords

Conduct disorder; oppositional defiant disorder; prevalence across cultures

Introduction

There is evidence that cultural background influences the expression, interpretation and value given to psychiatric symptoms [18]. An important goal of both the Diagnostic Statistical Manual, Fourth Edition (DSM-IV) American Psychiatric Association [APA] [3] and the International Statistical Classification of Diseases and Related Health Problems, 10th edition (ICD-10) (WHO [83]) is to provide descriptions of valid diagnostic constructs that can be applied across age, gender, ethnicities and cultures or contexts [63]. Consistent with this goal, the DSM-IV included a section on Specific Culture, Age and Gender Features for each diagnostic category which is intended to guide the clinician on variations of the disorder that may be attributable to the individual's culture, sex or developmental stage. However, how well this goal has been achieved by this approach is a matter of controversy. In this paper, we are especially interested in the extent to which diagnostic criteria for conduct disorder (CD) and oppositional defiant disorder (ODD) are valid across cultures.

According to DSM-IV, all diagnoses should be applied only if the symptoms are the result of an underlying dysfunction within the individual and not a reaction to the immediate social context or a problematic environment. This inclusion represents a genuine attempt of DSM-IV to include contextual factors into the definition of disorders. Nevertheless, and as stated elsewhere [17], the DSM-IV has not formally incorporated social or cultural factors as

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exclusionary criteria of disorders, nor are explicit definitions of underlying dysfunctions provided for each disorder. As a result, it is difficult and sometimes impossible to distinguish between behaviors caused by negative environments that do not involve internal dysfunction and those that originate from negative environments but do involve internal dysfunction [80]. Some have questioned whether this distinction is appropriate and even possible (see [54]). However, it is clear that most clinicians and research using epidemiologic surveys are not able to distinguish between symptoms that cause an internal dysfunction from those that are merely reflections of a negative environment [11]. Moreover, research has demonstrated that negative environments can be influenced by a child's genetic make-up and that genes can influence a child's susceptibility to environmental stressors in the development of CD [50, 69] making it extremely difficult to disentangle environmental and genetic influences.

Children from ethnic minorities and /or living in developing poor countries have a greater risk of exposure to deprived or negative environments than non-minority or children living in developed countries. Ethnic minorities in the US, as well as children in poor countries have higher exposure to poor prenatal care and poor infant nutrition, more exposure to toxic and infection agents, live in disadvantaged and crime ridden neighborhoods and are often exposed to other stressful circumstances associated with physical abuse and poverty. All of these are risk factors that have been associated with CD and ODD (See [15, 55] for reviews). On the other hand, there is evidence that protective factors related to positive family environment may lower the prevalence of disruptive disorders even in developing or poor countries. For example, results of a longitudinal study of CD and ODD which compared the risk and protective factors of these disorders among Puerto Rican children living in San Juan, Puerto Rico and the Bronx showed that close family attachments and strict family monitoring and supervision [12] typical of the Puerto Rican culture were associated with lower prevalence of CD and ODD. Both risk and protective factors associated with CD and ODD are often highly correlated, and studies have not consistently disentangled whether the low or high prevalence rates of CD and ODD in poor or minority samples are due to differences in poverty or neighborhood characteristics or other risk factors, rather than to cultural differences that may be associated with protective factors [37].

Prevalence rates can also be affected by cultural factors related to the degree to which CD and ODD symptoms are considered dysfunctional and or are differentially tolerated in various cultures and across age groups. For example, suppression of aggression, anger and strong emotions or overt behaviors is part of the Chinese culture as well as the Thai culture. This cultural suppression may lead parents to have a lower threshold (or tolerance) for externalizing behaviors and to curb this behavior more often than in other cultures where these behaviors are more accepted. In fact, studies of case vignettes comparing Thai and American parents showed very different thresholds for internalizing versus externalizing behaviors with Thai parents more concerned about internalizing, over-controlled behavior than American parents [81]. Given these cross cultural differences in parental perceptions and expectations of children's behaviors, it is not surprising that comparisons of children's syndromes across 16 different regions of the world as ascertained by the Child Behavior Checklist (CBCL) showed higher prevalence rates of internalizing syndromes and lower rates of externalizing syndromes in the Asian countries as compared to several Western countries [27]. In fact, a longitudinal 25 year follow up of a community sample of children from the United Kingdom (from 1970's to the late 1990s), showed that conduct problems significantly increased over this time period for children of both sexes and all socio-economic classes [22]. The long term outcomes for adolescents with conduct problems were similar across time providing evidence that the observed trends were not due to changing report effects. More recently, a five year follow up of this same cohort was performed [23].

The results showed that conduct problems as reported by parent, youth, and teachers either remained stable or slightly declined. Nevertheless, the extent to which these findings generalize to specific externalizing disorders such as CD and ODD need to be determined.

With this preamble in mind, in this paper, we review the literature on prevalence rates of DSM-III-R and DSM-IV CD and ODD across cultures, age, and ethnicities as evidenced by epidemiologic studies carried out in probability community or school samples. We excluded from our review findings treatment samples since they can be biased due to selection effects [20]. Bias can arise because clinical studies tend to focus on persons with more chronic and severe manifestations of the disorder. If selection bias is ignored, the estimates of prevalence, patterns of correlates, co-morbidity and impairment can be affected by statistical bias known as Berkson's bias [5, 9].

Our aim is to present the first of four criteria previously described for determining the validity of psychiatric disorders across cultures [10, 67]. The lack of established biological and genetic markers that are specific and replicated across samples [45], imprecise measurement, and lack of a gold standard for validating most psychiatric conditions makes these criteria relevant for reaching an approximation of the validity of psychiatric disorders. The first of these criteria states that the syndrome or disorder should be described similarly across cultures. This can be accomplished by either anecdotal reports of mental health professionals or the collective clinical wisdom of these professionals in a given setting or by the systematic gathering and analyses of epidemiologic data [10]. Remaining criteria are related to differentiation or delimitation from other disorders, the commonality in clinical outcomes and differential treatment response, diagnostic consistency over time, differentiation of risk factors, genetic aggregation in families, and differentiation of disorders by laboratory studies (e.g., functional imaging) and will not be addressed in this paper [45, 67].

In this paper we examine the first cross cultural validity criterion using literature reviews to determine the extent to which the prevalence rates of CD and ODD vary across cultures as ascertained in population or school based samples. We exclude from our review the few studies which used solely the ICD-10 classification of psychiatric disorders in order to reduce variability across studies that could be due to case definition. Also, the main purpose of the paper is to inform the future DSM-V psychiatric classification. We also examine the prevalence rates of CD and ODD across cultures or ethnicities and use meta -regression analyzes to determine the methodological and cross cultural factors associated with the heterogeneity of the prevalence estimates. Prior research has found that prevalence estimates of most children psychiatric disorders as assessed in population-based studies vary dramatically depending on the measure or diagnostic criteria [24, 55]. For example, concerns about the high rates of false positives in many population-based studies using DSM-III and DSM-III-R led to the addition of a clinical significance criterion for most specific disorders of DSM-IV that required a greater emphasis on clinical distress or impairment for case definition. As a result of the introduction of this criterion, most population- based epidemiologic studies that used the DSM-IV criteria observed much lower rates of psychiatric disorder than previously obtained in prior DSM-III-R studies (ranging from 17 to 20%) [12, 19, 34, 35, 41]. Prevalence rates of child psychiatric disorders also vary depending on the type of informant ascertained (i.e. parent, child or teacher) [42], the age of the child [11, 14], how data provided by different informants (i.e. parent, teacher or child) are combined [48] and whether or not impairment is used in the definition of a case [19, 71].

To our knowledge this is the first study to present data on the world-wide prevalence of CD and ODD as a first step in evaluating the validity of these disorders in different cultures.

Several other studies have reviewed the literature and presented rates of overall psychopathology in children across cultures [11, 14, 24, 66] but have not presented data on specific psychiatric disorders such as CD and ODD. Nevertheless, a recent study presented data on the prevalence rates of ADHD across cultures and showed that variability across studies regarding diagnostic criteria, source of information (whether parent, child or teacher), and requirement of impairment for diagnosis, accounted mostly for differences in prevalence rates [64]. No geographical difference between North America and Europe was observed. Given these previous results, we expect significant variability mainly related to methodological factors, in the prevalence of CD and ODD across cultures and ethnicity. However, we also expect significant heterogeneity in prevalence rates due to geographic or cultural variability, given the importance of contextual and environmental factors associated with ODD and CD.

Method

Method of Review

We performed a systematic review of the literature by a computer search of databases and review of references of all articles retrieved, in particular the references of previous extensive reviews of the topic at hand [15–16, 51, 55, 64]. We searched Medline and PsychInfo from 1987 to October of 2008 for articles written in English, Spanish or Portuguese (the languages of the authors) using the following words; CD, ODD, child and adolescent, prevalence rates, epidemiologic studies, mental disorders and symptoms of CD, ODD. Our search in Medline produced 5,352 abstracts, and in PsychINFO resulted in 2,815 abstracts for a total of 8,209 abstracts. All abstracts were reviewed by the first author and the abstract was selected for review if it met the following criteria: 1) the study presented prevalence rates based on a probability school or community household sample of children 18 years of age or less including population based twin data and birth registers; 2) the prevalence rates were based on DSM-III-R or DSM-IV criteria. If only preschool children were enrolled, the study was excluded. We reviewed 1,237 abstracts of the 8,209 abstracts identified. For all abstracts that met these or similar criteria, the full articles were read (115). Of these 115 articles 39 met our full criteria. However, for 14 of these 39 studies we were not able to locate the authors and the publication of prevalence rates did not include either standard errors or confidence intervals necessary for the meta-regression analysis. The information that appears in Table 1 was extracted for the 25 articles that met our full criteria including the availability of confidence intervals. If longitudinal data were presented, only results from the first wave were analyzed. If more than one prevalence rate was presented, the total rate was analyzed.

Data Analysis

In meta-regression, a random-effect meta-analysis is extended to evaluate the association between methodological characteristics of studies and heterogeneity in prevalence estimates [76]. First, a model with no covariates was estimated, which is equivalent to a random effects meta-analysis, and a pooled estimate is computed with a correspondent estimate of heterogeneity. Second, a model including all covariates was estimated and analyzed with a backward procedure. The covariates with the higher p value were progressively deleted until all remaining had a correspondent p value of 0.1 or less. The effect of the following study level covariates over the heterogeneity of results was estimated by: i) continent; ii) age group: below or above 12 years old; iii) diagnostic criteria: DSM-III-R or DSM-IV; iv) source of information for the diagnosis: in order of priority for selection: best-estimate, and rule, or rule, parent, teacher, child (because only one study derived the diagnosis based on ‘and rule’, but also on ‘or-rule’, we selected the rate associated with the latter); v) requirement or not of impairment for the diagnosis: yes or no. Although sex of the child is

an important covariate that is well known to be associated with the prevalence rates of CD and ODD [55, 59–61], it was not included in the analyses due to the small number of eligible studies that presented rates of these disorders by sex and also presented confidence intervals (See Table 2).

Results

Twenty-five studies were included in the meta-regression for CD and ODD (see Table 1). The pooled prevalence of CD was estimated as 3.2% (SE .53), which was associated with significant heterogeneity of estimates ($p < 0.001$). In the multivariate meta-regression model, requirement of impairment for diagnosis (coef=−4.42; SE=1.45; p=.006) and diagnostic criteria (coef=−2.36; SE=1.13; p=.049) were the only covariates that remained significantly associated with heterogeneity of results for CD following the successive deletion of non-significant variables. The continent where the study was conducted was not associated with the heterogeneity of CD estimates (p=.389). The pooled prevalence of ODD was estimated as 3.3% (SE .45), which was associated with significant heterogeneity of estimates ($p < 0.001$). In the multivariate meta-regression model, age (coef=−3.42; SE=1.16; p=.013) was the only covariate that remained significantly associated with heterogeneity of results for ODD following the successive deletion of non-significant variables. The continent where the study was conducted was not associated with the heterogeneity of estimates (p=.657) of this disorder.

To further investigate the effect of the continent where the studies were conducted on the heterogeneity of estimates, we compared studies conducted in North America (n=9) versus Europe (n=10). There was no significant variability on estimates of CD (p=.355) and ODD (p=.575) from studies conducted in North America and Europe.

Discussion

Contrary to what we expected, geographic location of the studies, which is a broad index of different cultures and contexts, was not associated with significant variability in prevalence estimates of CD or ODD. The variability in prevalence was mostly related to methodological differences across studies. Both the requirement of impairment for diagnosis and variability in diagnostic criteria were significantly associated with the heterogeneity of prevalence estimates for CD. For ODD, only age was significantly associated with heterogeneity. For CD, requirement of impairment for diagnosis was associated with a lower prevalence estimate in comparison to no requirement, as well as DSM-IV in comparison to DSM-III-R. For ODD, children more than 12 years had lower rates than children with less than 12 years.

For CD, the differences in prevalence rates due to the requirement of impairment seem to suggest that there may be a number of individuals who show enough symptoms of the disorder to meet the diagnostic threshold but for whom these symptoms do not cause significant impairment. Thus, studies requiring impairment report lower prevalence rates. In addition, a significant difference between DSM-III-R and DSM-IV was precisely in the addition of a criterion B in CD that required that the disturbance in behavior cause clinically significant impairment in social, academic or occupational functioning. Such criterion was not part of DSM-III-R. Also, differences in prevalence rates based on variability in the diagnostic criteria are likely due to several changes in the criteria for CD that increased the prevalence in studies using the DSM-IV criteria [3], as opposed to the DSM-III-R [2]. Specifically, the DSM-III-R required the three symptoms of CD to be present within the past six months, whereas the DSM-IV increased the window to the past year. Further, the DSM-IV criteria added two symptoms (i.e., often bullies, threatens, or intimidates others; often

stays out at night despite parental prohibitions, beginning before the age 13 years) to the diagnostic criteria. The difference in the prevalence rate of ODD due to age is consistent with past reviews suggesting that the rate of ODD decreases in adolescence [55]. Thus, the prevalence of ODD and CD seem to be similar across multiple cultures when ascertained using the DSM-III-R or DSM-IV classification, providing initial support for the cross-cultural validity of these diagnostic nosologies [67].

However, these general conclusions need to be tempered by several important considerations. First, 21 of the 25 countries compared were mostly western countries from Europe and the Americas, with only four non-western countries meeting our criteria (three from Asia, and one from the Middle East). We were not able to contact the authors 14 of the 39 eligible studies to obtain standard errors or confidence intervals. It is still possible, that if a larger number of non-western cultures could have been included in our analyses that differences between Western and non-Western countries would have emerged. A larger sample would have increased the internal and external validity of our findings. Second, the cross-cultural equivalence has not been tested directly through multi-group confirmatory factor analysis or other analytic techniques [40]. This is an important area for further research. Third, it is still possible that some cultures may have alternative ways of expressing psychopathology not captured by the DSM classification. By using the DSM symptoms in these studies, investigators may have imposed an appearance of cross cultural homogeneity that would not have appeared if cultural variations in symptoms had been allowed. Fourth, and perhaps most importantly, there is a need to evaluate the validity of ODD and CD symptoms across different cultures using several important external and clinical criteria, such as response to pharmacological or evidence based psychosocial treatment, developmental course, genetic aggregation in families, environmental risk factors (e.g., ineffective parenting) and biological/neuropsychological correlates.

Another important limitation in the existing research is the lack of research directly comparing important subgroups of children with CD and ODD. For example, a number of studies across various countries have supported the distinction between childhood- and adolescent-onset forms of CD [58, 59]. Recent evidence suggests that children who show significant levels of callous and unemotional (CU) traits (i.e., lacking empathy and guilt; constricted emotions) are also an important subgroup in that they tend to show a more severe form of CD that seems to be more persistent and associated with violence and offenses ([36, 38] for reviews). However, the vast majority of these studies on the importance of CU traits have been conducted in the US or Canada [36] with only a few studies carried out in Europe [28, 30, 31, 78] and Israel [73]. Clearly more cross-cultural research is needed on the importance of CU traits for designating an important subgroup of youth with CD.

Finally, revisions of diagnostic criteria should consider the differing contexts within and outside the US that may influence the age of onset of these disorders, the expression of CU traits, and the meaning that symptoms might have across culture, ethnicity, and developmental stage. Recognizing the importance of dimensional approaches [44, 47] is also necessary. Criteria that include specific thresholds for what is considered pathological or impairing are more likely to differ across culture, but the recognition of common symptoms across cultures is more easily achieved.

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Table 1

Prevalence of CD and ODD across Countries

First author, year	Site	Age Range	Diagnostic Criteria	Source of information	Final evaluation procedure	Requirement of impairment	Sample size**	Response rate (%)	CD Prevalence % (95% CI)	CD Prevalence % (95% CI) w impairment	ODD Prevalence % (95% CI)	ODD Prevalence % (95% CI) w impairment
Alyahri, 2008 [1]	Yemen, Arab	7–10	DSM-IV	P or T	DAWBA	No	1306	92.6	1.8 (0.5–3.0)	_	4.0 (2.0–6.0)	_
Andrés, 1999 [4]	Valencia, Spain	10	DSM-III-R	C or P	K-SADS	Yes	387	387/394	_	1.8 (.7 – 2.9)	_	3.6 (1.8 – 5.4)
Angold, 2002 [6]	North Carolina, USA	9 to17	DSM-IV	C or P	CAPA	No	3613/920	70.7	5.6 (3.7–8.2) W 5.3 (3.5–8.1)AA 5.4 (4.1–7.3)Total	_	2.7 (1.4–5.1) W 1.1 (0.5–2.3) AA 1.8 (1.1–3.0) Total	_
Beals,1997 [8]	Northern Plains, USA	14 to 16	DSM-III-R	C	DISC 2	No	109	109/111	3.8(.21 – 7.38) AI	_	2.9(−.25 – 6.05) AI	_
Bird, 2006 [12]	Bronx, New York San Juan, PR	5 to 13	DS IV	P	DISC 4	No	2491	89	0.8(SE 0.3) Bronx 0.7 (SE 0.3) PR	_	4.8 (SE0.7) Bronx 5.2 (SE 0.6) PR	_
Breton, 1999 [13]	Quebec, Canada	6 to 14	DSM-III-R	C, P, T	DISC 2	Yes	2400	83.5	_	2.0 (1.5–2.7) C 0.4 (0.2–0.8) P 0.7 (0.3–1.4) T	_	3.4 (2.7–4.3) C 2.8 (2.2–3.6) P 2.0 (1.3–3.0) T
Canino, 2004 [19]	Puerto Rico	4 to 17	DSM-IV	C or P t	DISC 4	Yes	1886	90.1	2.0 (1.4–3.0)	1.3 (0.73–2.2)	5.5 (4.3–7.0)	3.4 (2.58–4.7)
Costello, 2003 [26]	Western North Carolina, USA	9 to 16	DSM-IV	C or P	CAPA	No	6674	95	2.7 (2.1–3.5)	_	2.7 (2.2–3.3)	_
Eapen, 1998 [29]	Al Ain District, UAE Middle East	6 to 15	DSM-IV	P	best estimate K-SADS	No	3278/199		1.5 (1.0–2.6)	_	1.0 (0.9–2.5)	_
Fergusson, 1993 [33]	Christchurch, New Zealand, Australia	15	DSM-III-R	C, P	DISC 1	No	965/986	78	3.2 (±1.1) C 3.3 (±1.1) P	_	5.1 (±1.4) C 1.8 (±0.8) P	_
Fleitlich-Bilik, 2004 [34]	Taubaté, Brazil	7 to 14	DSM-IV	C, P	best estimate DAWBA	No	1251	83	2.2 (1.2–3.2)	_	3.2 (1.6–4.9)	_
Ford, 2003 [35]	Great Britain	5 to 15	DSM-IV	C, P	best estimate DAWBA	No	10438	83	1.47 (SE 0.13)	_	2.31 (SE 0.14)	_
Gau, 2005 [39]	Taiwan, China	13 to 15	DSM-IV	C 7-8-9 T	best estimate K-SADS_E	No	1070/1051	98.2	2.5 (1.6–3.5) 7th grade 2.9 (1.9–3.9) 8th grade 2.9 (1.9–3.9) 9th grade	_	1.9 (1.1–2.7) 7th grade 2.8 (0.6–5.0) 8th grade 1.3 (0.6–1.9) 9th grade	_
Heiervang, 2007 [43]	Bergen, Norway	7 to 9	DSM-IV	P	DAWBA	No	9155/1011	49.7	0.47 (0.19–0.74)	_	2.45 (1.76–3.14)	_
Kim-Cohen, 2005* [46]	England & Wales	5	DSM-IV	P or T	CBCL-DISC-TRF	Yes	2232	93	8.5 (7.31 – 9.63)	3.4 (2.65 – 4.15)	_	_
Leung, 2008 [52]	Hong Kong, China	7 to 8 grades	DSM-IV	C or P	DISC 4	Yes	541	78	2.6 (1.3–3.9)	1.7 (0.6–2.8)	8.7 (6.3–11.1)	6.8 (4.7–8.9)
Lewinsohn, 1993 [53]	Oregon, USA	14 to 18	DSM-III-R	C	Best Estimate K-SADS	Yes	1508	61%	_	0.13 (SE 0.09) Time 1 0.13 (SE 0.09) Time 2	_	0.94 (SE 0.23) Time 1 0.33 (SE 0.15) Time 2
Lynch, 2006 [56]	Dublin, Ireland	12 to 15	DSM-IV	P	best estimate K-SADS_PL	No	723/195	51.2/62	1.2 (0.0–3.0)	_	1.2 (0.3–2.0)	_
McArdle, 2004 [57]	Newcastle-upon- Tyne, UK	7 to 8	DSM-III-R	P	CAPA	Yes	1044/277	99.3/100	_	1.7 (07–2.7)	_	5.0 (3.4–6.6)
Romano, 2001 [68]	Quebec, Canada	14 to 17	DSM-III-R	C, P, T	DISC 2	Yes	1201	60	6.2 (4.8–7.6) C 0.8 (0.3–1.3) P 6.6 (5.2–8.0) C or P	4.0 (2.9–5.1) C 0.7 (0.2–1.2) P 4.6 (3.4–5.8) C or P	0.6 (0.2–1.0) C 2.9 (1.9–3.9) P 3.3 (2.3–4.3) C or P	0.6 (0.2–1.0) C 2.8 (1.9–3.7) P 3.2 (2.2–4.2) C or P
Shaffer, 1996 [71]	USA and PR	9 to 17	DSM-III-R	C or P	DISC 2	Yes	1285	84.4	5.8 (SE 0.66) C or P	5.1 (SE 1.2) C or P	7.1(SE 0.71) C or P	6.6 (SE 1.4) C or P
Simonoff, 1997 [72]	Virginia, USA	8 to 16	DSM-III-R	C or P	CAPA	Yes	2762	75	66 per 1000 (56–78)	43 per 1000 (35–53)	39 per 1000 (32–47)	34 per 1000 (27–42)
Steinhausen, 1998** [74]	Zürich, Switzerland	6 to 17	DSM-III-R	P	DISC 2	No	1964/379	73.4/56	_	_	2.09 (SE 0.90)	_
Verhulst, 1997* [77]	The Netherlands	13 to 18	DSM-III-R	C, P	DISC 2	Yes	2227/272	82.2/87	0.6 (SE 0.3) C & P 6.0 (SE 1.6) C or P	0.6 (SE 0.3) C & P 2.6 (SE 0.7) C or P	1.3 (SE 0.5) C or P	1.3 (SE 0.5) C or P
West, 2003 [82]	West of Scotland	15	DSM-IV	C	Voice DISC	Yes	1734	79	8.7 (7.4–10.1)	5.8 (4.7–7.0)	4.0 (3.2–5.1)	3.6 (2.8–4.6)

First author, year	Site	Age Range	Diagnostic Criteria	Source of information	Final evaluation procedure	Requirement of impairment	Sample size**	Response rate (%)	CD Prevalence % (95% CI)	CD Prevalence % (95% CI) w impairment	ODD Prevalence % (95% CI)	ODD Prevalence % (95% CI) w impairment
Zwirs, 2007 [84]	The Netherlands	6 to 10	DSM-IV	C, P, T	best estimate DISC SCICA	Yes	2041/376	73/67	3 (SE 1–6)	2.0 (SE 1–3)	11.0 (SE 7–15)	4.0 (SE 2–6)

CAPA = Children and Adolescent Psychiatric Assessment; DICA= Diagnostic Interview for Children and Adolescent; DISC = Diagnostic Interview Schedule for Children; CBCL=Child Behavior Checklist; TRF= Teacher Report Form; K-SADS= Kiddie Schedule for Affective Disorders and Schizophrenia for School Age Children; DAWBA= Development and Well-Being Assessment; ADIKA=Amsterdam Diagnostic Interview for Children and Adolescent; IWI =Isle of Wight Interview; CAS=Child Assessment Schedule; SCICA= Semi-structured Clinical Interview for Children and Adolescent

W=White AA=African American AI= American Indian

C=Child P=Parent T=Teacher

* Included in the meta-regression for CD only;

** Included in the meta-regression for ODD only

Table 2

Prevalence Rates of ODD and CD by Gender across Countries

Study	Site	Age range	CD Prevalence % (95% CI)		ODD Prevalence % (95% CI)	
			Boys	Girls	Boys	Girls
Andrés, 1999 [4]	Valencia, Spain	10	3.2 (±2.5)	0.5 (±0.3)	4.9 (±3.1)	2.5 (±2.1)_
Angold, 2002 [6]	North Carolina, USA	9 to17	8.0 (5.6–11.2)	2.9 (1.7–5.0)	2.4 (1.3–4.6)	1.2 (0.6–2.8)
Ashenafi, 2001 [7]	Butajira, Ethiopia	5 to 15	4 (SE 0.7)	6 (SE 0.8)	6 (SE 1.2)	6 (SE 1.6)
Cohen, 1993 [21]	New York, USA	10 to 20	16.0 (SE 2.2) 10–13 yrs 15.8 (SE 2.3) 14–16 yrs 9.5 (SE 2.0) 17–20 yrs	3.8 (SE 1.2) 10–13 yrs 9.2 (SE 1.8) 14–16 yrs 7.1 (SE 1.7) 17–20 yrs	14.2 (SE 2.1) 10–13 yrs 15.4 (SE 2.3) 14–16 yrs 12.2 (SE 2.2) 17–20 yrs	10.4 (SE 1.9) 10–13 yrs 15.6 (SE 2.2) 14–16 yrs 12.5 (SE 2.2) 17–20 yrs
Costello, 1997 [25]	Appalachians, North Carolina, USA	9, 11 and 13	8.1 (SE 2.1) AI 7.8 (SE 1.4) W	4.6 (SE 1.7)AI 2.8 (SE 0.8)W	_	_
Costello, 2003 [26]	Western North Carolina, USA	9 to 16	4.2 (3.1–5.6)	1.2 (0.7–2.1)	3.1 (2.4–4.2)	2.1 (1.6–2.9)
Fergusson, 1993 [33]	Christchurch, New Zealand, Australia	15	8.6	7.5	_	_
Fergusson, 2001 [32]	Christchurch New Zealand	7,14 and 21	6.5 15 yrs 7.9 18 yrs	3.4 15 yrs 1.7 18 yrs		
Ford, 2003 [35]	Great Britain	5 to 15	2.13 (SE 0.22)	0.81 (SE 0.12)	3.24 (SE 0.25)	1.39 (SE 0.16)
Heiervang, 2007 [43]	Bergen, Norway	7 to 9	5.1	0.9	_	_
Kim-Cohen, 2005 [46]	England & Wales	5	9.9	3.5	_	_
Kroes, 2001 [49]	Limburg, The Netherlands	6 to 8	15.2 (SE 6.2)	9.3 (SE 1.8)	13.3 (SE 5.5)	9.4 (SE 1.6)
Leung, 2008 [52]	Hong Kong, China	7 to 8 grades	3.4 (1.2–5.6)	1.8 (0.2–3.4)	6.9 (3.8–10.0)	10.4 (6.8–14.0)
Lewinsohn, 1993 [53] (Rates with impairment)	Oregon, USA	14 to 18	0.85 (SE 0.32)	0.34 (SE 0.19)	1.47 (SE 0.42)	0.45 (SE 0.22)
Panyayong, 2002 [62]	Bangkok, Thailand	8 to 11 Grade 4	8.5	1.58	_	_
Puura, 1998 [65]	Finland	8 to 9	3.0 C 4.3 P	0.4 C 1.0 P	_	_
Romano, 2001 [68]	Quebec, Canada	14 to 17	9.1 (6.7–11.5) C 0.8 (0.1–1.5) P 9.3 (6.9–11.7) C+P	3.3 (1.8–4.8) C 0.9 (0.1–1.7) P 3.8 (2.2–5.4) C+P	0.6 (0.0–1.2) C 3.1 (1.7–4.5) P 3.6 (2.1–5.1) A+P	0.5 (−0.1–1.1) C 2.5 (1.2–3.8) P 2.8 (1.4–4.2) A+P
Sawyer, 2001 [70]	Australia	4 to 17	4.4	1.6	_	_
Simonoff, 1997 [72] (Rates with impairment)	Virginia, USA	8 to 16	5.9 Overall 4.5 8–10 yrs 4.7 11–13 yrs 9.0 14–16 yrs	2.9 Overall 2.1 8–10 yrs 2.3 11–13 yrs 4.8 14–16 yrs	3.9 Overall 1.9 8–10 yrs 4.1 11–13 yrs 5.8 14–16 yrs	3.0 Overall 2.3 8–10 yrs 3.5 11–13 yrs 3.3 14–16 yrs
Sugawara, 1999 [75]	Kawasaki, Japan	7 to 9	3.5	3.5	7.0	5.3

Study	Site	Age range	CD Prevalence % (95% CI)		ODD Prevalence % (95% CI)	
			Boys	Girls	Boys	Girls
West, 2003 [82]	West of Scotland	15	14.0	2.9	3.4	4.7
Wacharasindhu, 2002 [79]	Bangkok, Thailand	8 to 11	8.5	1.6	_	_
Zwirs, 2007 [84]	The Netherlands	6 to 10	7(2–11)	0 (0–1)	13 (7–18)	9 (4–14)

Note: Prevalence rates without CI or SE are not provided in some studies because they were not available.

W= white, AI= American Indian