Prevalence of DSM-IV disorders in Chinese adolescents and the effects of an impairment criterion
A pilot community study in Hong Kong

Abstract Purpose To provide preliminary prevalence estimates of common DSM-IV (Diagnostic and Statistical Manual of Mental Disorders—4th Edition) disorders in a sample of Hong Kong Chinese adolescents. Methods 541 Chinese adolescents were recruited from Grades 7, 8 and 9 of 28 mainstream high schools in Hong Kong (mean age = 13.8 years; SD = 1.2). The adolescents and their parents were separately administered the Youth and Parent versions of DISC-IV (Diagnostic Interview Schedule for Children-Version 4), respectively. Results Based upon both symptom and impairment criteria, as required by DSM-IV, the overall prevalence estimate of DSM-IV disorders in our sample of Chinese adolescents was 16.4%. Estimates for such individual disorders/diagnostic groupings as anxiety disorders, depressive disorders, attention deficit/hyperactivity disorder (ADHD), oppositional defiant disorder (ODD), conduct disorder (CD), and substance use disorders were 6.9, 1.3, 3.9, 6.8, 1.7, and 1.1%, respectively. These rates were largely compatible with those reported in previous studies with perhaps lower rates of generalized anxiety disorder (GAD), depressive disorders, CD, and substance use disorders, but a higher rate of ODD. The rate of ADHD was somewhat higher, but this might reflect the current DSM-IV diagnostic practice. The rate of anxiety disorders was not as high as predicted from some previous questionnaire surveys. The application of an impairment criterion had discernible impacts on prevalence estimates, greater on anxiety and substance use disorders, but smaller on depressive and disruptive behavior disorders. There was a lack of gender difference in rates of ODD and CD. Discussion and conclusion While the findings reported here are broadly compatible with those of other studies, there may be cross-cultural differences in rates of some individual disorders, e.g., GAD, depressive disorders, ODD, CD, and substance use disorders, as well as in gender difference regarding rates of ODD and CD. However, exact comparison between studies is confounded by methodological differences in sample characteristics, measures, and case definition. Standardization of methodology in epidemiological surveys should allow more
Introduction

Adolescence is a period of life transition during which there are rapid physiological and psychological changes, preparing individuals for the challenges of independent living in adulthood. Given such changes and demands, it is not surprising to find that about half of all lifetime mental disorders begin by age 14 years [19]. These observations are of significance for both clinicians and service planners. In a review of the literature, the mean prevalence of psychiatric morbidity among adolescents was 16.5% (range = 6.2–41.3%) [32]. Another review of studies since 1993 found that the median estimates of children/adolescents having psychiatric disorders were 25.3/26.0% (range = 8.2–42.0%) [9]. Regarding individual disorders/diagnostic groupings, median estimates for anxiety disorders, depressive disorders, attention-deficit/hyperactivity disorder (ADHD), oppositional defiant disorder (ODD), conduct disorder (CD), and substance use disorders were 5.5/8.1% (range = 1.9–23.8%), 3.8/4.7% (range = 0.2–18.2%), 2.7% (range = 0.3–11.3%), 3.5/3.7% (range = 1.3–7.4%), 3.0/3.7% (range = 1.1–10.6%), and 4.5% (range = 0.8–24.0%), respectively. In some of the latest studies involving the use of an impairment criterion, as required by DSM-IV, prevalence estimates were lowered to between 4.4 and 18.7% [7, 11, 12, 34].

Among the large number of studies available, only a handful involves Chinese children/adolescents. Moreover, most of them employ questionnaires, e.g., Rutter Questionnaire [28, 44], and Child Behavior Checklist/Teacher Report Form (CBCL/TRF) [22, 25, 48]. Despite their well-established psychometric properties, they are not diagnostic tools and their results do not necessarily map on to formal psychiatric diagnosis. For the few studies that provide a diagnosis, they are not examining adolescents; one surveyed preschool children [26], while another investigated pre-adolescent elementary school children [47].

Only recently has a study on Chinese adolescents in Taiwan been published [14]. Its DSM-IV diagnosis was based on the Schedule for Affective Disorders and Schizophrenia for School-Age Children–Epidemiologic Version (K-SADS-E) administered to high school students. Overall prevalence rates of 20.3, 22.7, and 14.8% were reported for seventh, eighth, and ninth graders respectively. Regarding individual disorders/diagnostic groupings, estimates for anxiety disorders, depressive disorders, ADHD, ODD, CD, and substance use disorders were 3.1–9.2, 0.7–4.8, 3.3–7.5, 1.3–2.8, 2.5–2.9, and 2.2–5.3%, respectively. More boys had CD, ADHD, and substance use disorders, while more girls suffered from depressive disorders. The authors concluded that the prevalence estimates and gender differences were largely compatible with those reported in other cultures/countries.

No one study can claim to represent the huge, diverse and geographically spread Chinese population. Studies from different Chinese communities will contribute to the growth of our knowledge on the mental health of Chinese adolescents. This pilot study is an attempt with a moderate sample size (>500) to explore common DSM-IV disorders on another sample of Chinese adolescents, this time from Hong Kong. The preliminary prevalence estimates will help in estimating the necessary sample size for any future large-scale epidemiological study in Hong Kong or other Chinese communities. We will employ a single-stage design in order to avoid the potential pitfalls of inefficient first-stage screening and the resulting loss of precision [12]. This study also has the additional strength of relying upon multiple informants (i.e., parents and youths) for diagnosis, balancing potential under-reporting from either one source, e.g., under-reporting of disruptive behavior disorders by youths [18]. Last but not least, we will examine the effects of applying an impairment criterion, as required by DSM-IV, on the prevalence estimates of various disorders.

Methods

Participants

The target sample consisted of Grades 7, 8 and 9 students from mainstream high schools in Hong Kong. Thirty-six schools were randomly selected from a list of all local high schools and approached. Eventually, 28 schools (78%) agreed to participate in the study. In each class of the relevant grades, students were randomly sampled from the class list until two students (one boy and one girl) were recruited. In our originally planned sampling procedure, we provided the class teachers of the participating schools with a list of random numbers corresponding to the class student numbers. The class teachers were asked to follow the random numbers to recruit the students as participants in our study. Invitation to participate first went to the first two random numbers in the list...
that represented a boy and a girl. If the parents of one or both sampled students declined the invitation, the class teachers would go down the list to find replacements until the target of recruiting two students per class was reached. Unfortunately, many teachers found the procedure cumbersome and time-consuming, given their daily heavy workload. They decided without notifying us to send off five to ten invitation letters to parents in one go. Very often, more than two students’ parents agreed to participate and the teachers just picked two of them for us. Most teachers claimed afterward that they could not provide us with exact figures of parents’ response rate. It was prudent to expect a sizable degree of non-responding, in line with the current trend of declining response rates in epidemiological surveys [17].

The final sample, consisting of 541 Chinese adolescents, exceeded the minimum number of 450 required to identify disorders with a prevalence of 1% or above within acceptable limits [30]. The mean age of our sample was 13.8 years (SD = 1.2) with 48.2% being boys. The mean ages of their fathers and mothers were respectively 46 and 43 years. Roughly 70% of the parents had high school or above education. Only about 20% of them were semi-skilled/ unskilled labor. Most adolescents (close to 90%) were living in a nuclear family with a mean size of 4.2 persons. In terms of these demographic characteristics, the sample was largely representative of local adolescents studying Grades 7, 8 and 9, according to the Hong Kong 2000 Census data.

Another test of the representativeness of our sample was to compare its scores on measures of psychopathology to locally available norms. Besides the diagnostic measure of DISC-IV (Diagnostic Interview Schedule for Children-Version 4), the Chinese versions of the parent-informant CBCL [1] and its parallel, Youth Self Report (YSR) [2], were also administered in this study. These two questionnaires had been re-validated and re-normed with a large random, representative sample of Chinese youths in Hong Kong (N > 1,500) [21]. The CBCL Internalizing, Externalizing, and Total Problems scores of our sample were tested to be almost identical to local normative data of relevant ages; effect sizes of the differences (Cohen’s d) were very small (0.09 to –0.02) (Table 1). With respect to YSR, our sample had lower Internalizing and Total Problems scores of small-to-moderate effect sizes (−0.33 and −0.23, respectively) (Table 1). Differences of such magnitude were in fact no larger than those differences found between Time 1 and Time 2 administration of YSR in its local test-retest reliability study [21]. On the other hand, they might also imply that our Youth DISC-IV diagnostic data might correspondingly underestimate anxiety/mood and total problems. However, the more representative Parent DISC-IV data might provide the necessary mechanism to offset at least in part the underestimation, when data from parents and youths were combined, using an “or” rule (details see below).

### Table 1 CBCL and YSR scores of our sample compared to local (Hong Kong) normative data of relevant ages

<table>
<thead>
<tr>
<th></th>
<th>This study</th>
<th>Local norms</th>
<th>Cohen’s d</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>CBCL</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Internalizing</td>
<td>49.0(9.3)</td>
<td>49.0(9.4)</td>
<td>0.01</td>
</tr>
<tr>
<td>Externalizing</td>
<td>50.4(9.8)</td>
<td>49.3(9.6)</td>
<td>0.09</td>
</tr>
<tr>
<td>Total</td>
<td>49.6(10.1)</td>
<td>49.8(9.6)</td>
<td>–0.02</td>
</tr>
<tr>
<td><strong>YSR</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Internalizing</td>
<td>45.3(9.7)</td>
<td>48.5(9.9)</td>
<td>–0.33</td>
</tr>
<tr>
<td>Externalizing</td>
<td>48.5(10.6)</td>
<td>48.7(10.0)</td>
<td>–0.02</td>
</tr>
<tr>
<td>Total</td>
<td>46.1(10.1)</td>
<td>48.4(9.8)</td>
<td>–0.23</td>
</tr>
</tbody>
</table>

### Measurement

Prevalence rates of DSM-IV adolescent disorders were estimated by DISC-IV. It is a respondent-based structured interview schedule with parallel parent and youth versions, based upon parent and youth informants respectively. Given the respondent-based nature of DISC-IV, there is no requirement of clinical judgment by the interviewers. Thus, it can be administered by trained layman interviewers. There are 358 stem questions to be asked of every respondent. There are almost 1,300 contingent questions to be asked if a stem or previous contingent question has been positively answered. There are other questions for age of onset, impairment, and treatment, etc. DISC-IV generates more than 30 DSM-IV child/adolescent diagnoses based upon a 12-month time-frame, thus providing point prevalence rates for disorders under investigation in this study. An extensive literature exists to support the reliability and validity of its various versions [39]. Apart from a single-informant (parent or youth) computerized scoring algorithm, another algorithm exists to combine data from the two informants, using an “or” rule. Under this rule, a symptom is considered present when either the parent or the youth endorses it. This rule helps to redress under-reporting by one informant [18]. However, it may also be criticized as overinclusive. One alternative is to use an “and” rule, under which a diagnosis is conferred only when both informants individually endorse symptoms meeting the diagnostic threshold. This would be a very stringent demand, rarely required by the DSM-IV for diagnosis. So an “or” rule seems to be more justified.

DISC-IV also contains functional impairment questions addressed to each disorder. The DISC
Development Group (2001, personal communication) recommended an impairment score of three, equivalent to one severe or at least two intermediate impairments in six domains of daily functioning. This threshold was considered to be indicative of clinically significant functional impairment. The “or” rule is also applied to impairment questions when combining data from parents and youths. DISC-IV had been translated into Cantonese for use in Hong Kong with comparable test-retest reliability to its original American version [18].

### Procedure

Ethical approval was obtained from the relevant institutional board on human subjects. The principals of the sampled schools were then contacted. Following their agreement to assist in the study, a letter of invitation to participate and a consent form were passed via the schools to parents. When the parents gave their written consent, they and their adolescent child were contacted and arrangements made to administer separately the respective Parent and Youth DISC-IV, involving modules on anxiety disorders, mood disorders, disruptive behavior disorders, and alcohol/substance use disorders. The administration of Parent and Youth DISC-IV generally took around one-and-a-half to two hours. The length varied considerably depending on the number and severity of the problems reported. Completing the CBCL or YSR took a further 20–30 min. A fee of US$45.00 was paid to each parent-adolescent pair.

### Results

Table 2 presents prevalence estimates of various common DSM-IV disorders in our sample of Chinese adolescents, based upon the combined scoring algorithm of Parent and Youth DISC-IV. Because of the requirement for an impairment criterion in DSM-IV, prevalence estimates based only upon symptom criteria are considered to fulfill only partial DSM-IV diagnosis. Instead, those incorporating an additional impairment criterion are considered to meet full DSM-IV diagnosis [7]. Given the low prevalence of

<table>
<thead>
<tr>
<th>DSM-IV/DISC-IV Diagnosis</th>
<th>Total (n = 541)</th>
<th>Male (n = 261)</th>
<th>Female (n = 280)</th>
<th>Odds ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>% (95% CI)</td>
<td>N</td>
<td>% (95% CI)</td>
</tr>
<tr>
<td>Any disorder</td>
<td></td>
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<tr>
<td>Symptom criteria only + impairment</td>
<td>205</td>
<td>38.4 (34.3–42.5)</td>
<td>82</td>
<td>31.7 (26.0–37.4)</td>
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<tr>
<td>Any anxiety disorder</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Symptom criteria only + impairment</td>
<td>162</td>
<td>30.2 (26.3–34.1)</td>
<td>55</td>
<td>21.2 (16.2–26.2)</td>
</tr>
<tr>
<td>Any depressive disorder</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Symptom criteria only + impairment</td>
<td>9</td>
<td>1.7 (0.6–2.8)</td>
<td>2</td>
<td>0.8 (0.3–1.9)</td>
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<tr>
<td>ADHD</td>
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<tr>
<td>Symptom criteria only + impairment</td>
<td>24</td>
<td>4.4 (2.7–6.1)</td>
<td>15</td>
<td>5.7 (2.9–8.5)</td>
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<tr>
<td>ODD</td>
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<tr>
<td>Symptom criteria only + impairment</td>
<td>47</td>
<td>8.7 (6.3–11.1)</td>
<td>18</td>
<td>6.9 (3.8–10.0)</td>
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<tr>
<td>CD</td>
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<tr>
<td>Symptom criteria only + impairment</td>
<td>14</td>
<td>2.6 (1.3–3.9)</td>
<td>9</td>
<td>3.4 (1.2–5.6)</td>
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<tr>
<td>Any substance use disorder</td>
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</tr>
<tr>
<td>Symptom criteria only + impairment</td>
<td>17</td>
<td>3.2 (1.7–4.7)</td>
<td>7</td>
<td>2.7 (0.7–4.7)</td>
</tr>
</tbody>
</table>

ADHD Attention Deficit and Hyperactivity Disorder, ODD Oppositional Defiant Disorder, CD Conduct Disorder

*P < 0.05, **P < 0.01, ***P < 0.001
some individual disorders (below 1% particularly after the application of an impairment criterion), they were grouped together to form diagnostic groupings. This was because our sample size, as noted above, would give rather wide confidence intervals (CI) for disorders of below 1% prevalence [30]. Such wide CI would undercut confidence in the credibility of the estimates. Specifically, social phobia (SoPh), separation anxiety disorder (SAD), specific phobia (SpPh), agoraphobia (AgPh), generalized anxiety disorder (GAD), and obsessive-compulsive disorder (OCD) formed a diagnostic grouping of “any anxiety disorder,” major depressive disorder and dysthymia “any depressive disorder”, and alcohol or nicotine use “any substance use disorder”. The diagnostic grouping of “any disorder” included all disorders surveyed in this study, which involved, besides those listed above, ADHD, CD, and ODD. Any adolescent who suffered one or more of those disorders in a diagnostic grouping was counted toward that grouping for prevalence estimation.

There were considerable differences in prevalence estimates of some DSM-IV disorders upon the application of an impairment criterion (Table 2). The prevalence estimate for “any disorder” (i.e., the overall prevalence of the sample) was 16.4%, down from 38.4% when only symptom criteria were considered (57% reduction). Among diagnostic groupings/individual disorders, anxiety disorders were most affected by the application of an impairment criterion. The prevalence of “any anxiety disorder” was 6.9%, down from 30.2% (77% reduction). Among individual anxiety disorders, the prevalence estimates of AgPh, SpPh, OCD, SoPh, GAD, and SAD were respectively 0.4, 3.4, 0.7, 2.6, 0.4, and 0.7%, dropping from 4.4, 22.0, 2.0, 7.2, 0.9, and 1.5%. The range of reduction was from 90 to 53%. “Any substance use disorder” also demonstrated marked reduction; its prevalence estimate was 1.1%, reduced from 3.2% (65% reduction).

Contrarily, prevalence estimates of some other disorders were less affected by the application of an impairment criterion. Prevalence estimates of “any depressive disorder”, ADHD, ODD, and CD were respectively 1.3, 3.9, 6.8, and 1.7%, reduced from 1.7, 4.4, 8.7, and 2.6% (23, 11, 21 and 34% reduction), when an impairment criterion was added to the symptom criteria for diagnosis.

When the diagnosis of the disorders was based upon symptom criteria only, significant gender differences in prevalence estimates were found for “any disorder” and “any anxiety disorder”. More girls presented with disorders (44.7 vs. 31.7%), particularly anxiety disorders (38.6 vs. 21.2%); see Table 2. The application of an impairment criterion eliminated the significant gender differences found with the above partial DSM-IV diagnosis.

Discussion

Before we discuss and compare our current results with those from other studies, some methodological considerations are warranted here. First, we have been unable to report precisely the parents’ response rate. So it is difficult to determine if any bias has been introduced to our sample and thus to our prevalence estimates. Attempts have been made to assess the representativeness of our sample. As indicated above, demographically our sample appears to represent well local adolescents studying Grade 7, 8 and 9 according to the Hong Kong 2000 Census data. On a second measure, the CBCL scores of our participants match well to local norms, while their YSR total and internalizing scores are somewhat lower. So the Youth DISC-IV may underestimate the prevalence rates of the overall and anxiety/mood disorders. However, the “or” rule in combining data from Parent and Youth DISC-IV may help to redress at least partly the under-reporting by the youths.

Recently, with the trend of declining response rates [17], concern is raised on how this trend leads to bias in prevalence estimates. However, studies suggest that there is no straightforward relationship between the non-response rate and bias. First, bias may not necessarily be introduced from non-respondents [10, 13, 15, 17]. Second, even if bias in survey results does occur, the non-response rate alone is a poor predictor of the bias [10, 13, 15, 17]. A high non-response rate does not necessarily suggest bias, while the reverse does not guarantee absence of bias. It is argued that many non-respondents decline participation for reasons unrelated to the dependent measures of the study, e.g., lack of time or interest [15]. So their non-participation does not affect the end results of the study. Or excessive efforts to increase the response rate may bring into the study participants who are less conscientious in participating, thus confounding the results [13]. In one study, the authors concluded that rejection of any studies based upon high non-response rates lacked a scientific basis [15]. In short, the complexity between the response rate and bias defies a simple solution to interpret our prevalence estimates, despite an uncertain parents’ response rate.

The figures from the two reviews cited above [9, 32] indicate wide ranges of prevalence estimates, e.g., figures for the overall prevalence ranging from 8.2 to 42.0% and 6.2 to 41.3%, respectively. These may partly be due to methodological differences prevalent in epidemiological surveys [20]. First, there are differences in sample characteristics, e.g., the age ranges covered. Being older increases the risk for many disorders rather consistently across even different ethnic groups, e.g., European, African and Mexican Americans [33]. Then there are differences in the
Instruments used, e.g., questionnaires versus diagnostic interviews, with the former giving higher prevalence estimates [42]. In terms of survey strategy, there is a difference between a two-stage and a single-stage approach. Those studies using a two-stage design generally report lower prevalence estimates [32]. Studies also differ in terms of the number of informants for diagnosis. Those studies combining information from multiple informants record higher prevalence estimates than those relying on data from single informants [45]. Finally, diagnostic systems also change over time. In DSM-IV, there is the additional requirement for an impairment criterion, the application of which lowers the prevalence estimates [7, 11, 12]. Furthermore, there is little agreement on how to operationalize an impairment criterion, and different operational definitions produce accordingly different prevalence estimates. For example, global measures (e.g., Child Global Assessment Scale, CGAS) and the clinical vignette approach in assessing impairment appear to give lower prevalence estimates than those dependent on disorder-specific impairment in DISC-IV [29, 34]. Given such methodological diversity, we can appreciate the wide range of prevalence estimates prevalent in previous studies and can hardly expect our current estimates to be strictly identical to those of other studies.

In order to be more focused in comparing our findings to the existing literature, efforts have been made to look for studies employing the same measure, DISC-IV, or samples of the same ethnicity. Unfortunately, some recent studies still use previous versions of DISC, generating either DSM-III or DSM-III-R diagnosis [3, 30, 36]. Only a handful of studies use DISC-IV, but most rely on data from single informants, youths themselves or the parents, to generate DSM-IV diagnosis [33, 34, 41, 45]. The only exception is a study in Puerto Rico by Canino et al. [7], but it still differs from our study by using a less stringent DISC impairment criterion and covering children from 4 to 17 years. In terms of Chinese studies, the most comparable one was the recent study in Taiwan by Gau et al. [14], but, as mentioned above, it used a different measure, K-SADS-E, to generate DSM-IV diagnosis, adopted a two-stage design, and relied mostly on single informants, youths themselves. It added selectively only a teacher questionnaire for ascertainment of externalizing disorders. We should take note of this methodological diversity in discussing our results in relation to the existing literature.

Relying solely on symptom criteria, our sample’s overall prevalence of 38.4% is high, casting doubt on its credibility. The MEGA (Methods for the Epidemiology of Child and Adolescent Mental Disorders) study in the USA encountered a similar dilemma, reporting a staggering rate of 50.6% when only symptom criteria were considered [38]. The application of impairment criteria brought it down to a more reasonable rate of 20.9%. A sizable group of individuals who, despite meeting symptom criteria, was functioning normally, in line with reports of some other community studies [6, 8]. It is considered dubious to confer a diagnosis onto these individuals. Caseness is thus best defined by the presence of both symptoms and impairment; DSM-IV is therefore not without reason in demanding an additional impairment criterion in diagnosis.

Previous studies [7, 29, 32, 36, 38] also report reduction of prevalence estimates when an impairment criterion is applied. In our study, anxiety and substance use disorders are most affected, while depressive and disruptive behavior disorders are least affected. This pattern of differential reduction is in line with the results of some previous studies [8, 29], including the findings that SpPh and SoPh are among the anxiety disorders most affected. The exception is substance use disorders. Since the substances surveyed in this study are only cigarettes and alcohol, they may be less impairing as other soft and hard drugs. So an impairment criterion will drastically reduce the rate of the substance use disorders as investigated in this study.

In short, symptom criteria, as currently defined in DSM-IV nomenclature, do not necessarily define impairing behaviors/emotions as assumed [40]. Those symptoms of disruptive behavior disorders and depression appear to be impairing, but not necessarily those of anxiety. In future studies, we should follow up those adolescents with partial DSM-IV diagnoses (i.e., those meeting symptom criteria but not the impairment criterion) to investigate their short- and long-term outcomes diagnostically. Several hypotheses can be explored. First, these adolescents simply do not have a clinical condition severe enough to cause significant psychosocial impairments. Second, the disorders that these adolescents are suffering from may be in the early stage of development; given time, they will cause significant psychosocial impairments. Third, these adolescents have found ways to cope with their symptoms and prevent them from becoming seriously impairing. In the long run, they may even help themselves out of the symptoms. These are hypotheses which cannot be tested in a cross-sectional study like that reported here. Instead, a prospective follow-up study is called for.

Our overall prevalence estimate of 16.4% matches well the mean rate of Roberts et al.’s [32] review (16.5%) and that of Canino et al.’s study [7] (16.4%). It is close to those of Gau et al. [14] (20.3/22.7/14.8%), while Costello et al.’s [9] review reports higher median rates (25.3/26.0%). It seems fair to say that
our overall prevalence rate of adolescent disorders is generally in line with many studies. It may be considered to be leaning toward the lower end, but this appears to be the trend when an impairment criterion is applied [7, 11, 12, 34].

Regarding individual diagnostic groupings/disorders, an elevated rate of anxiety has been suggested for Chinese children because of strict socialization processes to encourage self-control and emotional restraint. This prediction is supported by some investigations [43, 48]. However, these are all questionnaire studies without consideration of impairment. Our study and that of Gau et al. [14], using diagnostic interviews involving due assessment of impairment, do not seem to confirm this expected heightened anxiety. Our 6.9% prevalence rate of “any anxiety disorder” matches well with those of the Canino et al.’s study [7] (6.9%), Costello et al.’s review [9] (5.5/8.1%), and Gau et al.’s study [14] (9.2/7.4/3.1%). It is also interesting to note that for those anxiety disorders with prevalence estimates above 1%, i.e., SpPh (3.4%) and SoPh (2.6%), their rates match reasonably well with those reported by Costello et al. [9] (2.4/2.5% and 2.0%) and Gau et al. [14] (5.0/5.6/0.7% and 3.4/1.9/2.0%), respectively. Canino et al. [7] did not report on SpPh and their estimate of SoPh was a similar 2.5%. For those anxiety disorders with prevalence estimates below 1%, i.e., SAD, AgPh, GAD, and OCD, Gau et al. [14] reported similar rates below 1%. Costello et al. [9] reported somewhat higher rates, respectively, 2.4, 1.1, 1.3/2.4%, and 0.5/0.6%, while Canino et al. [7] similarly recorded 3.1% for SAD and 2.2% for GAD. Their rates of SAD are higher as expected because younger children instead of merely adolescents are involved in studies reviewed by Costello et al. [9] and in Canino et al.’s study [7]. However, it appears that the Chinese adolescents in both Hong Kong and Taiwan [14] have lower rates of GAD, despite that the overall rate of anxiety disorders has been quite compatible with those of other studies. The reason for the lower rates is not immediately self-evident. Few studies take note of them, not to mention offering an explanation.

Regarding ADHD, our finding (3.9%) is somewhat higher than the median rate reported by Costello et al. (2.7%) [9]. Gau et al. [14] and Canino et al. [7] both reported even higher rates (7.5/6.1/3.3%) and (8.0%), respectively. Gau et al. [14] reasoned that the rates of ADHD had increased from DSM-III-R to DSM-IV due to the creation of subtypes and since then, higher rates were reported in Australia and Brazil [16, 35]. This hypothesis was supported by a previous study in Hong Kong [22] in which both DSM-III-R and DSM-IV ADHD diagnoses were applied to the same group of Chinese children, and more children were diagnosed as having DSM-IV ADHD.

We find lower prevalence rates of depressive disorders, CD, and substance use disorders (1.3, 1.7 and 1.1%, respectively), compared to those reported by Costello et al. [9] (3.8/4.7%, 3.0/3.7% and 4.5%), Canino et al. [7] (3.4, 2.0 and 1.7%), and Gau et al. [14] (0.7/4.8%, 2.5/2.9% and 2.2/5.3%). Perhaps, since our sample involves mainly young adolescents, depressive disorders, severer forms of anti-social behavior exemplified in CD, and substance use disorders may not have been fully developed. Instead, milder forms of anti-social behavior represented by ODD predominate with a higher prevalence for both boys and girls (6.8%), compared to those reported by Costello et al. [9] (3.5/3.7%), Canino et al. [7] (5.5%), and Gau et al. [14] (1.3/2.8%). The above, however, may not be the full explanation, since the study by Gau et al. [14] also involves young adolescents. Despite previous suggestions of cross-cultural differences between Chinese and Western children or their informants on reporting psychopathology [27], a Chinese ethnicity cannot fully explain here our lower rates in depressive disorders, CD, and substance use disorders, given the higher rates reported in Taiwan by Gau et al. [14]. A recent study [35] also found that ethnicity did not appear to be a strong factor explaining differences in prevalence rates of various adolescent disorders. Ethnic differences in rates across African, European, and Mexican Americans disappeared or were significantly attenuated when controlled for a range of psychosocial adversities. So perhaps in future study, we may have to look for sociodemographic differences between Hong Kong and Taiwan as one of the potential factors to explain the lower rates of depressive disorders, CD, and substance use disorders in Hong Kong Chinese adolescents. Apparently, despite that Hong Kong and Taiwan are both Chinese communities, their development in socio-economic and political spheres has been quite different in recent centuries.

The application of an impairment criterion eliminates the significant gender differences found with the partial diagnosis on overall prevalence and “any anxiety disorder”. This may be due in part to the lower rates that resulted. Nonetheless, we can still see the expected trend, though not statistically significant, that more girls have anxiety and depressive disorders, while more boys have ADHD [9, 34]. Interestingly, there is no expected gender difference in rates of ODD and CD (see Table 2, 6.9 vs. 6.8% and 1.9 vs. 1.4%, respectively) [9, 34]. However, a Chinese ethnicity may not offer the full explanation, since significant gender differences in rates of these two disorders are reported by Gau et al. [14]. Once again, we have to look for other socio-economic and political differences between these two Chinese communities in Hong Kong and Taiwan as one of the potential sources of explanation.
Our findings are limited by a moderate sample size, despite that considerable resources have already been expended to recruit and interview at length 541 parents and adolescents. This limitation prevents us from reporting with confidence the prevalence of those individual disorders with rates below 1%. Second, we have not tested the validity of the DSM-IV system in psychiatric classification in a Chinese population. We are assuming a “universalist” position that the DSM-IV system is applicable to both American and Chinese cultures. This “universalist” position is not without its challenges and support [23, 31]. However, so far this is the position taken by many researchers in diverse cultures [12]. Furthermore, we must caution that, despite compatibility of some of our prevalence estimates with the existing literature, this does not mean that the DSM diagnostic system is necessarily valid across cultures. Nonetheless, despite the possibility of chance misclassification [4], Bird [5] still considered that major psychiatric disorders of DSM-IV appeared to exist in all cultural groups, regardless of the validity of DSM-IV as a diagnostic system. The latter topic is beyond the scope of this manuscript (see Rutter and Gould [37] regarding multiple criteria required for establishing the validity of a diagnostic system). Third, we must warn again that more exacting comparison and interpretation of results across studies are confounded by methodological diversity in sample characteristics, measures, and case definition, which partially masks or exaggerates those within- or between-culture differences. In future, we should work towards adopting a standardized research methodology (e.g., employing identical instruments and case definition) in order to compare prevalence estimates with confidence across studies. Until then, we will not be able to detect accurately those cultural, national or regional differences. As argued in a recent study [46], any differences detected can only be considered as intriguing, but far from conclusive. Our findings concerning lower rates of GAD, depressive disorders, CD, and substance use disorders, but a higher rate of ODD, as well as a lack of gender difference in rates of ODD and CD should thus be further pursued, using a standardized methodology. Hypotheses for the differences should also be developed and tested then.

Conclusion

Findings from this pilot study suggest that our preliminary prevalence estimates of various common DSM-IV disorders in Chinese adolescents are largely compatible with the existing literature. There may be lower rates of GAD, depressive disorders, CD, and substance use disorders, but a higher rate of ODD, as well as a lack of gender difference in rates of ODD and CD, pending future investigation. The prevalence estimates of this study also offer empirical guidelines for adolescent psychiatric service planning. With respect to research, such estimates provide sample size projections for any future large-scale epidemiological study of adolescents in Hong Kong and other Chinese communities.

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