Published in final edited form as:
Arch Gen Psychiatry. 2005 June ; 62(6): 617–627. doi:10.1001/archpsyc.62.6.617.

Prevalence, Severity, and Comorbidity of Twelve-month DSM-IV Disorders in the National Comorbidity Survey Replication (NCS-R)

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Abstract

Context—Little is known about the general population prevalence or severity of DSM-IV mental disorders.

Objective—To estimate 12-month prevalence, severity, and comorbidity of DSM-IV anxiety, mood, impulse-control, and substance disorders in the recently completed US National Comorbidity Survey Replication (NCS-R).

Design and Setting—Nationally representative face-to-face household survey conducted between February 2001 and April 2003 using a fully structured diagnostic interview, WHO World Mental Health (WMH) Survey version of the Composite International Diagnostic Interview (WMH-CIDI).

Participants—9282 English-speaking respondents ages 18 and older.

Main Outcome Measures—Twelve-month DSM-IV disorders.

Results—Twelve-month prevalence estimates are anxiety 18.1%, mood 9.5%, impulse-control 8.9%, substance 3.8%, and any disorder 26.2%. 22.3% of 12-month cases are classified serious, 37.3% moderate, and 40.4% mild. 55% carry only a single diagnosis, 22% two, and 23% three or more. Latent class analysis detects seven multivariate disorder classes, including three highly comorbid classes representing 7% of the population.

Conclusions—Although mental disorders are widespread, serious cases are concentrated among a relatively small proportion of cases with high comorbidity.

Community epidemiological surveys estimate that as many as 30% of the adult population in the US meet criteria for a 12-month DSM mental disorder.[1, 2] Clinical reappraisal studies confirm these estimates.[3] Although fewer than half these people receive treatment,[4, 5] unmet need for treatment may not be a major problem, as a high proportion of untreated cases might be mild or self-limiting. No definitive epidemiological data exist on this possibility, though, as severity has not been a focus of previous psychiatric epidemiological surveys. Although secondary analysis of surveys in the US[6] and other countries[7, 8] suggests that many 12-month cases are mild, this conclusion is based on crude post hoc severity indicators.

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The authors appreciate the helpful comments on earlier drafts of William Eaton, Kathleen Merikangas, and Michael Von Korff, and Hans-Ulrich Wittchen.

Recognizing the importance of obtaining more refined disorder severity data as well as of updating available data on the epidemiology of mental disorders in a number of other ways, the World Health Organization recently expanded its Composite International Diagnostic Interview (CIDI),[9] the interview used in almost all major psychiatric epidemiological surveys in the world over the past decade, to include detailed questions about severity.[10] This expanded CIDI was used in a coordinated series of epidemiological surveys carried out under WHO auspices known as the World Mental Health (WMH) Survey Initiative.[8] The current report presents WMH-CIDI data on prevalence, comorbidity, and severity of 12-month DSM-IV disorders from the US National Comorbidity Survey Replication (NCS-R),[11, 12] the WMH survey carried out in the US.

METHODS

Sample

As described in more detail elsewhere,[12, 13] the NCS-R is a nationally representative household survey of English speakers ages 18+ in the coterminous United States. Respondents were confined to English-speakers because two parallel surveys are currently underway in nationally representative samples of Hispanics (in Spanish or English, depending on the preference of the respondent) and Asian Americans (in a number of Asian languages or English, again depending on the preference of the respondent). These surveys are using the same diagnostic instrument as the NCS-R and are covering the major groups of non-English speakers in the US population. NCS-R respondents were selected from a multi-stage clustered area probability sample of households. Face-to-face interviews were carried out between February 2001 and April 2003 by professional interviewers from the Institute for Social Research at the University of Michigan. The response rate was 70.9%. The survey was administered in two parts. Part I included a core diagnostic assessment (n = 9282). Part II included questions about risk factors, consequences, and other correlates along with assessments of additional disorders that were administered to all Part I respondents who met lifetime criteria for any disorder plus a probability sub-sample of other respondents (n = 5692). Interviewers explained the study and obtained verbal informed consent prior to beginning each interview. The NCS-R recruitment, consent, and field procedures were approved by the Human Subjects Committees of both Harvard Medical School and the University of Michigan.

Measures

Diagnostic assessment—DSM-IV diagnoses were based on the WMH-CIDI,[10] a fully structured lay interview that generates diagnoses according to ICD-10[14] and DSM-IV[15] criteria. DSM-IV criteria are used here. Twelve-month disorders considered here include anxiety disorders (panic disorder, generalized anxiety disorder, agoraphobia without panic disorder, specific phobia, social phobia, post-traumatic stress disorder, obsessive-compulsive disorder, separation anxiety disorder), mood disorders (major depressive disorder, dysthymia, bipolar disorder I or II), impulse-control disorders (oppositional-defiant disorder, conduct disorder, attention-deficit/hyperactivity disorder, intermittent explosive disorder), and substance use disorders (alcohol and drug abuse and dependence). Minor corrections to diagnostic algorithms were made subsequent to previously reported aggregate analyses, leading to small differences in aggregate prevalence estimates.[8] The disorders assessed in Part II include the four childhood disorders (separation anxiety disorder, oppositional-defiant disorder, conduct disorder, and attention-deficit/hyperactivity disorder), post-traumatic stress disorder, obsessive-compulsive disorder, and the substance use disorders. Assessment of the childhood disorders in Part II was limited to respondents in the age range 18–44 based on concerns about recall bias among older respondents. As all but one of the impulse-control disorders were assessed only among respondents in the age range

18–44, overall prevalence of any impulse-control disorder was limited to that age range, leading to a much higher prevalence estimate than in a previously reported aggregate analysis (where prevalence was reported for the total sample).[8] DSM-IV organic exclusion rules were used in making diagnoses. Diagnostic hierarchy rules were also used in making all diagnoses other than substance use disorders, where abuse was defined with or without dependence in recognition of abuse often being a stage in the progression to dependence. Hierarchy-free diagnoses were consistently used in analyses of comorbidity. As described elsewhere,[12] blind clinical re-interviews using the Structured Clinical Interview for DSM-IV (SCID)[16] with a probability sub-sample of NCS-R respondents found generally good concordance between WMH-CIDI diagnoses and SCID diagnoses.

Severity—Twelve-month cases were classified serious if they had any of the following: a 12-month suicide attempt with serious lethality intent; work disability or substantial limitation due to a mental or substance disorder; a positive screen for non-affective psychosis; bipolar I or II disorder; substance dependence with serious role impairment (as defined by disorder-specific impairment questions); an impulse-control disorder with repeated serious violence; or any disorder that resulted in 30+ days out of role in the year. Cases not defined serious were defined moderate if they had any of the following: suicide gesture, plan or ideation; substance dependence without serious role impairment; at least moderate work limitation due to a mental or substance disorder; or any disorder with at least moderate role impairment in two or more domains of the Sheehan Disability Scales (SDS).[17] (The SDS assessed disability in work role performance, household maintenance, social life, and intimate relationships on 0–10 visual analogue scales with verbal descriptors, and associated scale scores, of: none 0; mild 1–3; moderate 4–6; severe 7–9; and very severe 10.) All other cases were classified mild. This classification scheme is somewhat more refined than the one used in comparative analyses of all WMH surveys[8] due to the NCS-R having more detailed information than the other WMH surveys. To assess the meaning of the severity ratings, we compared number of days in the past 12 months respondents were totally unable to carry out their normal daily activities because of mental or substance problems. The mean of this variable was significantly higher ($F_{2,5689} = 17.7$, $p < .001$) among respondents classified serious (88.3) than those classified moderate (4.7) or mild (1.9).

Socio-demographic correlates—Socio-demographic correlates include cohort (defined by age at interview in categories 18–29, 30–44, 45–59, 60+), gender, race-ethnicity (Non-Hispanic White, Non-Hispanic Black, Hispanic, Other), completed years of education (0–11, 12, 13–15, 16+ years), marital status (married-cohabitating, previously married, never married), family income, and urbanicity. Family income was defined in relation to the federal poverty line.[18] Low income was less than or equal to 1.5 times the poverty line, low-average was 1.5–3 times the poverty line, high-average as 3–6 times the poverty line, and high was greater than 6 times the poverty line. Urbanicity was coded according to 2000 Census definitions[19] and distinguished large (at least 2 million residents) vs. smaller Metropolitan Statistical Areas (MSAs) by central cities, suburbs, adjacent areas (areas outside the suburban belt, but within 50 miles of the central business district of a central city), and rural areas (more than 50 miles from the central business district of a central city).

Analysis methods

Weights were used to adjust for differences in within-household probability of selection, non-response, and differences between the sample and 2000 Census on socio-demographic variables. As described in more detail elsewhere, [13] socio-demographic matching was based on the full 2000 Census (which includes non-English speakers and non-household residents, who were excluded from the NCS-R sample) because it was impractical to refine the 2000

Census data to have the same restrictions as the NCS-R while still using tract-level Census geo-code data to adjust for geographic variation in non-response. This failure to make exclusions from the Census data comparable to those in the NCS-R introduced a small bias into the last part of the weight adjustment.

Prevalence and severity were estimated by calculating means for dichotomous variables. Standard errors were obtained using the Taylor series linearization method[20] implemented in the SUDAAN software system to adjust for the effects of weighting and clustering on the precision of estimates.[21] Comorbidity was studied initially by calculating tetrachoric correlations of disorders among Part II respondents ages 18–44. The restriction to Part II was because some disorders were only assessed in Part II, while the restriction to ages 18–44 was because childhood disorders were assessed only in that age range. Exploratory factor analysis, implemented in SAS v8.2,[22] was used to reduce the dimensionality of the correlation matrix.

The additivity of associations among the 19 WMH-CIDI disorders was investigated by using log-linear analysis to evaluate the fit of a saturated two-way marginal model to the 2^{19} logically possible multivariate profiles of disorders.[23] As described below, this analysis documented significant higher-order interactions among the disorders. Based on this result, latent class analysis (LCA),[24, 25] a data reduction method that allows for non-additive associations among comorbid conditions, was used to study multivariate comorbidity among the NCS-R disorders.. LCA postulates a discrete latent variable defining class membership that explains covariance among observed disorders. When this model holds, the observed cell probabilities in the cross-classification among disorders will equal the product of the within-class marginal disorder probabilities multiplied by the class prevalence and summed across classes. This model contains one parameter for the probability of each disorder in each of k classes of the latent variable in addition to k parameters for class prevalence. The latent class model was fit for values of k between one and eight using the iterative-fitting NAG FORTRAN library routine E04UCF[26] and the method of maximum likelihood.[27] The comparative fit of LCA models with successively higher values of k was assessed by evaluating the Bayes Information Criterion.[28]

Socio-demographic correlates were examined by transforming the seven predicted probabilities of class membership from the LCA solution into logits, the natural logarithm of the odds $p_{ic}/(1-p_{ic})$, where p_{ic} is the probability that respondent i is in class c, that were then used as dependent variables in linear regression equations for effects of socio-demographic variables on the odds of class membership. The Taylor series method was used to estimate standard errors. Regression coefficients were exponentiated and interpreted as odds-ratios (OR's) with design-based 95% confidence intervals. Multivariate significance was evaluated with Wald χ^2 tests using Taylor series design-based coefficient variance – covariance matricies. Statistical significance was evaluated using two-sided design-based .05-level tests.

RESULTS

Prevalence and severity

The more prevalent 12-month disorders (Table 1) are specific phobia (8.7%), social phobia (6.8%), and major depressive disorder (6.7%). Anxiety disorders are the most prevalent class (18.1%), followed by mood disorders (9.5%), impulse-control disorders (8.9%), and substance disorders (3.8%). Twelve-month prevalence of any disorder is 26.2%, with more than half of cases (14.4% of the total sample) meeting criteria for only one disorder and smaller proportions for two (5.8%) or more (6.0%) disorders.

Among respondents with a disorder, 22.3% were classified serious, 37.3% moderate, and 40.4% mild. Severity is strongly related to comorbidity: 9.6% of respondents with one diagnosis, 25.5% with two, and 49.9% with three or more diagnoses classified serious. The distribution of severity is quite different from the distribution of prevalence across classes of disorder: mood disorders have the highest percent serious (45.0%) and anxiety disorders the lowest (22.8%). The anxiety disorder with the highest percent serious is obsessive-compulsive disorder (50.6%), while bipolar disorder has the highest percent serious (82.9%) among mood disorders, oppositional-defiant disorder the highest (49.6%) among impulse-control disorders, and drug dependence the highest (56.5%) among substance disorders.

Bivariate comorbidity

Tetrachoric correlations between hierarchy-free 12-month disorders (Table 2) are almost all positive (98%) and statistically significant (72%). Of only four negative correlations, all involve either OCD or separation anxiety disorder (SAD), both of which are very uncommon. The twelve highest correlations, each exceeding .60, represent well-known syndromes: bipolar disorder (major depressive episode with mania-hypomania), double-depression (major depressive episode with dysthymia), anxious-depression (major depressive episode with generalized anxiety disorder), comorbid mania-hypomania and attention-deficit/hyperactivity disorder, panic disorder with agoraphobia, comorbid social phobia with agoraphobia, and comorbid substance disorders (both alcohol abuse and dependence with drug abuse and dependence).

Exploratory factor analysis of the correlation matrix was carried out after excluding the disorders associated with negative correlations (OCD and SAD). Two factors had eigenvalues greater than one (7.3, 2.3), while the eigenvalue of the third factor (0.8) was substantially smaller. Both rigid and oblique rotations of the two-factor solution yielded similar patterns, with high factor loadings on the first factor (Table 2) for internalizing disorders (anxiety disorders, major depressive episode) and on the second factor for externalizing disorders (conduct disorder, substance disorders). Five disorders have factor loadings of .30 or higher on both factors (dysthymia, mania-hypomania, ODD, ADHD, and IED), although all five have higher loadings on the internalizing than externalizing factor.

Multivariate comorbidity

Of the 524,288 (2^{19}) logically possible multivariate disorder profiles among the 19 NCS-R disorders, 433 were observed. Nearly 80% involve highly comorbid cases (three or more disorders) (Table 3), accounting for 27.0% of all respondents with a disorder and 55.9% of all instances of these disorders. Importantly, the distribution of comorbidity is significantly different ($\chi^2_3 = 110.2$, $p < .001$) from the distribution we would expect to find if the multivariate structure among the disorders was due entirely to the two-way associations that are the focus of factor analysis. This finding led us to reject the use of confirmatory factor analysis to carry out more in-depth exploration of comorbid profiles. Instead, LCA was used to study non-additive comorbid profiles. Alcohol abuse and dependence were collapsed into a single category for purposes of this analysis because their separation violates the LCA assumption of conditional independence within classes. Similarly for drug abuse and dependence. Major depressive episode and dysthymia were collapsed based on their extremely high tetrachoric correlation.

A seven-class LCA model provided the best fit to the data. The seven classes differ greatly in prevalence (Table 4, Part I), from 68.5% in Class I to 0.7% in Class VII. Prevalence is inversely related both to number of disorders (Table 4, Part III) and severity (Table 4, Part IV), although there are meaningful inversions between Classes IV and V. Although subsets of the classes form a general hierarchy (e.g., Classes II, IV, and VI represent profiles of

increasingly comorbid internalizing disorders), some disorders are more prevalent in the lower than higher classes (e.g., oppositional-defiant disorder and conduct disorder are more prevalent in Class II than Class IV, while panic disorder and all three types of phobia are more prevalent in Class IV than Class VI). These inversions show that the classes are not merely points of density on the two factor analysis dimensions.

The seven LCA classes can be interpreted by examining the mean number ($\bar{x}_d$) and content of within-class disorders. Class I represents unaffected respondents ($\bar{x}_d = 0.1$). Class II represents pure ($\bar{x}_d = 1.2$) internalizing disorders. Class III represents pure ($\bar{x}_d = 1.2$) externalizing disorders. Class IV represents comorbid ($\bar{x}_d = 2.9$) internalizing disorders. Class V represents comorbid ($\bar{x}_d = 2.0$) internalizing-externalizing disorders dominated by comorbid social phobia and attention-deficit/hyperactivity disorder. Class VI represents highly comorbid ($\bar{x}_d = 4.9$) major depressive episodes. Class VII represents highly comorbid ($\bar{x}_d = 7.5$) bipolar disorder. Although the classes with high comorbidity (Classes IV, VI, and VII) include only about 7% of the sample, 43.6% of serious cases are in these classes.

Socio-demographic correlates

Using the predicted probabilities of LCA class membership as outcomes, correlates of being largely unaffected (Class I) include male, Non-Hispanic Black or Hispanic, married, college education, high income, and residing in a rural area. (Table 5) Correlates of pure internalizing disorders (Class II) include female, married, high education, and residing in the suburbs of small metropolitan areas. Correlates of pure externalizing disorders (Class III) include young, male, Hispanic, not low income, and residing in a rural area. Correlates of comorbid internalizing disorders (Class IV) include female, previously married, and residing either in suburbia or in an outlying non-rural area. Correlates of comorbid internalizing-externalizing disorders (Class V) include young, male, married, and residing in a non-rural area. Correlates of highly comorbid major depression (Class VI) include female, Non-Hispanic White or other Non-Hispanic/Non-Black race-ethnicity, unmarried, low education, less than high income, and residing in a non-rural area. Correlates of highly comorbid bipolar disorder (Class VII) include termination of schooling with the completion of high school and residing in cities or suburbs. Socio-demographic variation is strongest and most diverse in predicting either being unaffected (Class I) or having highly comorbid major depression (Class VI). Socio-demographic variation is weakest in predicting pure internalizing disorders (Class II) and highly comorbid bipolar disorder (Class VII).

COMMENT

Four limitations of the NCS-R are relevant to the analyses reported here. First, the sample under-represents several important population segments, including the homeless, those in institutions, and those who cannot speak English. The first two of these exclusions reduce prevalence estimates. In addition, mentally ill people might be more reluctant than others to participate in a mental health survey. This is relevant because the 70.9% response rate means that nearly 30% of eligible respondents are not represented in the sample. Evidence for selection bias related to mental illness has been reported in other community surveys,[29–31] although no evidence for it was found in an NCS-R non-response survey.[13] To the extent that this bias exists, it will make NCS-R estimates conservative.

Second, participants might have under-reported 12-month prevalence. This possibility is consistent with evidence in the methodology evidence that embarrassing behaviors are often under-reported.[32] Experimental studies show that this under-reporting bias can be reduced by using strategies aimed at decreasing embarrassment[3, 33] a number of which were used in the NCS-R.[10] To the extent these strategies were unsuccessful, the NCS-R estimates are likely to be conservative.

Third, the WMH-CIDI is a lay-administered interview. As reported elsewhere,[34] though, a clinical reappraisal study using the Structured Clinical Interview for DSM-IV (SCID)[16] found generally good individual-level concordance between the WMH-CIDI and SCID and conservative estimates of prevalence compared to the SCID.

Fourth, the NCS-R did not include all DSM-IV diagnoses. Schizophrenia and other non-affective psychoses (NAP) are notably missing. NAP was excluded from the NCS-R core because previous studies have shown it is dramatically over-estimated in lay-administered interviews.[35–39] These same studies showed that the vast majority of respondents with NAP meet criteria for CIDI anxiety, mood, or substance disorders and are consequently captured as cases. If severity is under-estimated in the WMH-CIDI, though results will be conservative.

Within the context of these limitations, NCS-R results are generally consistent with the earlier Epidemiologic Catchment Area (ECA) Study and National Comorbidity Survey (NCS)[1] in finding 12-month mental disorders to be highly prevalent. The 26.2% estimate of any disorder in the NCS-R is very close to estimates of 28.1% in the ECA[2] and 29.5% in the NCS.[1] This great similarity should not be over-interpreted, though, as the three surveys differed greatly in sampling frames, age ranges, diagnostic systems used to define disorders, and measures that it is impossible to draw firm conclusions about time trends in prevalence from these comparisons. It is nonetheless noteworthy, in light of these different design elements, that the three most prevalent NCS-R disorders (specific phobia, social phobia, and major depressive disorder) are identical to the three most prevalent disorders in the NCS and to two of the three in the ECA. The exception is social phobia, which was not comprehensively assessed in the ECA.

The NCS-R findings that anxiety disorders are more prevalent than mood disorders and that mood disorders are more prevalent that substance disorders are also consistent with both ECA and NCS findings. The NCS-R prevalence estimates can also be directly compared to those in over a dozen countries that participated in the WHO World Mental Health (WMH) Survey Initiative.[8] NCS-R prevalence estimates are consistently higher than in these other countries. However, as with the ECA and NCS, within-country differences in disorder prevalence in the NCS-R are quite similar to those reported so far in other WMH countries.[40, 41]

The externalizing disorders in NCS-R have been much less well studied than anxiety, mood, and substance disorders in previous adult surveys. The limited evidence on intermittent explosive disorder[42] is consistent with the NCS-R prevalence estimate of 2.6%, but we are aware of no comparable information on other impulse-control disorders among adults. These disorders are routinely assessed in surveys of children.[43–45] NCS-R 12-month prevalence estimates of all but one of the childhood-onset impulse disorders are much smaller than in surveys of youth. The exception is ADHD, with 12-month NCS-R prevalence approximately 50% as high as the estimates in surveys of youth. This is consistent with independent evidence that as many as half of children with ADHD continue to have symptoms as adults.[46]

The NCS-R results regarding severity support the secondary analyses in showing that many mental disorders are mild. Indeed, nearly twice as high a proportion of NCS-R cases are mild (40.4%) as serious (22.3%). Nonetheless, the 14.0% of respondents with serious or moderate disorder is substantial. The 5.7% with a serious disorder (22.3% of the 26.2% overall prevalence) is almost identical to the estimated prevalence of Serious Mental Illness (SMI), using the SAMHSA definition of that term, in the baseline NCS.[47] The finding that mood disorders are more likely than anxiety disorders to be classified serious is consistent

with a cross-national comparative analysis of five earlier CIDI surveys that used a less precise measure of severity[7] as well as with the results of the more recent WMH Surveys.[8]

Patterns of bivariate comorbidity are broadly consistent with the ECA and NCS in showing the vast majority of disorders positively correlated. Relative magnitudes of associations are also quite similar across the three surveys, with high rank-order correlations of odds-ratios among comorbid pairs in the NCS versus published odds-ratios[48] in both the NCS (.79) and the ECA (.57). Major internal patterns of comorbidity are also quite consistent across surveys, such as the stronger odds-ratios within the mood disorders than the anxiety disorders, very high odds-ratios between anxiety and mood disorders, and odds-ratios between anxiety and mood disorders generally being higher than between pairs of anxiety disorders.

The factor analysis found a very similar two-dimensional solution as in the NCS.[49] A similar structure was found in a stud of comorbidity among primary care patients.[50] The log-linear analysis showed clearly, though, that powerful interactions exist among NCS-R disorders that are not captured by the additive model on which factor analysis is based. LCA was used to study these profiles. This is a departure from the confirmatory factor analysis approach used in other recent studies of comorbidity (CITES: Kreuger papers #1–2 that are already in the bib; Vollebergh WA et al. Arch Gen Psych 2001). The LCA results documented progression within and overlap between internalizing and externalizing disorders, with a clear divergence from a simple two-dimensional progression due to panic and phobia being considerably more prevalent in the comorbid internalizing class than in the highly comorbid internalizing and externalizing classes. This is an intriguing specification that was also found a decade ago in an LCA analysis of the NCS data.[51] It is conceivable that this pattern reflects a protective effect of comorbid panic and phobias against externalizing disorders, possibly through risk aversion.

The NCS-R LCA results share several other features with the earlier NCS LCA results. Both include separate classes of pure and comorbid internalizing disorders with low prevalence of bipolarity. Both have highly comorbid classes with a small proportion of the sample (4.9% in NCS and 7.3% in NCS-R) having a high concentration of severe cases. The implicit progression among these classes warrants a more fine-grained investigation of transitions in lifetime comorbidity. Such an investigation goes beyond the scope of the current report.

The results regarding socio-demographic correlates are broadly consistent with previous surveys in finding that mental disorders (i.e., low probability of membership in Latent Class I) are associated with a general pattern of disadvantaged social status, including being female, unmarried, and having low socioeconomic status.[8, 52–59] The finding that Non-Hispanic Blacks and Hispanics have significantly lower risk of disorders is inconsistent with this general pattern, but the same relationship was found in the baseline NCS.[1] It is not clear whether the associations of achieved social statuses (i.e., marital status, socioeconomic status) with prevalence are due to effects of environmental experiences on mental disorders, to effects of mental disorders on achieved social status, to unmeasured common biological causes, or to some combination. In the case of the ascribed social statuses (i.e., sex and race-ethnicity), the causal effects clearly flow from the statuses and their correlates to the disorders, although the relative importance of environmental and biological mediators is unclear. The significant associations of race-ethnicity, marital status, education, and income with positive disorder classes are largely confined to predicting highly comorbid major depression (Class VI). This means the associations of these important socio-demographic variables with 12-month DSM-IV disorders are due largely to effects on a comparatively rare (16% of the population) profile of highly comorbidity.

CONCLUSION

The NCS-R results show 12-month DSM-IV disorders to be highly prevalent in the US. Although over one-third of cases are mild, the prevalence of moderate and serious cases is substantial (14.0% of the population). Although anxiety disorders are by far the most common mental disorders, the proportion serious is lower than for other classes of disorder. Mood disorders are next most common and have the highest proportion serious. Impulse-control disorders, which have been neglected in previous epidemiological studies of adult mental disorders, are found in over one-third of cases and have a higher proportion serious than either anxiety or substance disorders. More than 40% of 12-month cases are comorbid. Multivariate comorbidity profiles generally conform to a two-dimensional model of progression and overlap between internalizing and externalizing disorders, but with notable exceptions that are masked in conventional additive analysis. Severity is strongly related to comorbidity. Many of the most consistently documented socio-demographic correlates of disorder are related largely to a relatively small proportion of the population made up of people with highly comorbid major depression. Clarification of the implications of these results for public health interventions requires more dynamic analysis of the lifetime onset and cumulation of comorbid disorders.

Acknowledgments

The National Comorbidity Survey was supported by the National Institute of Mental Health (NIMH; R01 MH46376, R01 MH49098, and RO1 MH52861) with supplemental support from the National Institute of Drug Abuse (NIDA; through a supplement to MH46376) and the W.T. Grant Foundation (90135190). The National Comorbidity Survey Replication (NCS-R) is supported by NIMH (U01-MH60220) with supplemental support from NIDA, the Substance Abuse and Mental Health Services Administration (SAMHSA), the Robert Wood Johnson Foundation (RWJF; Grant 044708), and the John W. Alden Trust. Collaborating investigators include Ronald C. Kessler (Principal Investigator, Harvard Medical School), Kathleen Merikangas (Co-Principal Investigator, NIMH), James Anthony (Michigan State University), William Eaton (The Johns Hopkins University), Meyer Glantz (NIDA), Doreen Koretz (Harvard University), Jane McLeod (Indiana University), Mark Olfson (Columbia University College of Physicians and Surgeons), Harold Pincus (University of Pittsburgh), Greg Simon (Group Health Cooperative), Michael Von Korff (Group Health Cooperative), Philip Wang (Harvard Medical School), Kenneth Wells (UCLA), Elaine Wethington (Cornell University), and Hans-Ulrich Wittchen (Max Planck Institute of Psychiatry). The views and opinions expressed in this report are those of the authors and should not be construed to represent the views of any of the sponsoring organizations, agencies, or U.S. Government. A complete list of NCS publications and the full text of all NCS-R instruments can be found at http://www.hcp.med.harvard.edu/ncs. Send correspondence to NCS@hcp.med.harvard.edu. The NCS-R is carried out in conjunction with the World Health Organization World Mental Health (WMH) Survey Initiative. We thank the staff of the WMH Data Collection and Data Analysis Coordination Centres for assistance with instrumentation, fieldwork, and consultation on data analysis. These activities were supported by the John D. and Catherine T. MacArthur Foundation, the Pfizer Foundation, the US Public Health Service (R13-MH066849, R01-MH069864, and R01 DA016558), the Pan American Health Organization, Eli Lilly and Company, and GlaxoSmithKline. A complete list of WMH publications can be found at http://www.hcp.med.harvard.edu/wmh/.

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Table 1

Twelve-month prevalence and severity of DSM-IV/WMH-CIDI disorders (n=9282)

		Severity[1]		
	Total	Serious	Moderate	Mild
	% (se)	% (se)	% (se)	% (se)
I. Anxiety Disorders				
Panic disorder	2.7 (0.2)	44.8 (3.2)	29.5 (2.7)	25.7 (2.5)
Agoraphobia without panic	0.8 (0.1)	40.6 (7.2)	30.7 (6.4)	28.7 (8.4)
Specific phobia	8.7 (0.4)	21.9 (2.0)	30.0 (2.0)	48.1 (2.1)
Social phobia	6.8 (0.3)	29.9 (2.0)	38.8 (2.5)	31.3 (2.4)
Generalized anxiety disorder	3.1 (0.2)	32.3 (2.9)	44.6 (4.0)	23.1 (2.9)
Post-traumatic stress disorder[2]	3.5 (0.3)	36.6 (3.5)	33.1 (2.2)	30.2 (3.4)
Obsessive-compulsive disorder[3]	1.0 (0.3)	50.6 (12.4)	34.8 (14.1)	14.6 (5.7)
Separation anxiety disorder[4]	0.9 (0.2)	43.3 (9.2)	24.8 (7.5)	31.9 (12.2)
Any anxiety disorder[5]	18.1 (0.7)	22.8 (1.5)	33.7 (1.4)	43.5 (2.1)
II. Mood Disorders				
Major depressive disorder	6.7 (0.3)	30.4 (1.7)	50.1 (2.1)	19.5 (2.1)
Dysthymia	1.5 (0.1)	49.7 (3.9)	32.1 (4.0)	18.2 (3.4)
Bipolar I-II disorders	2.6 (0.2)	82.9 (3.2)	17.1 (3.2)	0.0 (0.0)
Any mood disorder	9.5 (0.4)	45.0 (1.9)	40.0 (1.7)	15.0 (1.6)
III. Impulse-control Disorders				
Oppositional-defiant disorder[4]	1.0 (0.2)	49.6 (8.0)	40.3 (8.7)	10.1 (4.8)
Conduct disorder[4]	1.0 (0.2)	40.5 (11.1)	31.6 (7.5)	28.0 (9.1)
Attention-deficit/hyperactivity disorder[4]	4.1 (0.3)	41.3 (4.3)	35.2 (3.5)	23.5 (4.5)
Intermittent explosive disorder	2.6 (0.2)	23.8 (3.3)	74.4 (3.5)	1.7 (0.9)
Any impulse-control disorder[4, 6]	8.9 (0.5)	32.9 (2.9)	52.4 (3.0)	14.7 (2.3)
IV. Substance Disorders				
Alcohol abuse[2]	3.1 (0.3)	28.9 (2.6)	39.7 (3.7)	31.5 (3.3)
Alcohol dependence[2]	1.3 (0.2)	34.3 (4.5)	65.7 (4.5)	0.0 (0.0)

		Severity[1]		
	Total	Serious	Moderate	Mild
	% (se)	% (se)	% (se)	% (se)
Drug abuse[2]	1.4 (0.1)	36.6 (5.0)	30.4 (5.8)	33.0 (6.8)
Drug dependence[2]	0.4 (0.1)	56.5 (8.2)	43.5 (8.2)	0.0 (0.0)
Any substance disorder[2]	3.8 (0.3)	29.6 (2.8)	37.1 (3.5)	33.4 (3.2)
V. Any Disorder				
Any[5]	26.2 (0.8)	22.3 (1.3)	37.3 (1.3)	40.4 (1.6)
One disorder[5]	14.4 (0.6)	9.6 (1.3)	31.2 (1.9)	59.2 (2.3)
Two disorders[5]	5.8 (0.3)	25.5 (2.1)	46.4 (2.6)	28.2 (2.0)
Three or more disorders[5]	6.0 (0.3)	49.9 (2.3)	43.1 (2.1)	7.0 (1.3)

[1] Percentages in the three severity columns are repeated as proportions of all cases and sum to 100% across each row.

[2] Assessed in the Part II sample (n = 5692).

[3] Assessed in a random one-third of the Part II sample (n = 1808).

[4] Assessed in the Part II sample among respondents in the age range 18–44 (n = 3199).

[5] Estimated in the Part II sample. No adjustment is made for the fact that one or more disorders in the category were not assessed for all Part II respondents.

[6] The estimated prevalence of any impulse-control disorder is larger than the sum of the individual disorders because the prevalence of intermittent explosive disorder, the only impulse-control disorder that was assessed in the total sample, is reported here for the total sample rather than for the sub-sample of respondents among whom the other impulse-control disorders were assessed (Part II respondents in the age range 18–44). The estimated prevalence of any impulse-control disorder, in comparison, is estimated in the latter sub-sample. Intermittent explosive disorder has a considerably higher estimated prevalence in this sub-sample than in the total sample.

Table 2

Tetrachoric correlations among hierarchy-free 12-month DSM-IV/WMH-CIDI disorders and factor loadings from a principal axis factor analysis of the correlation matrix (n=3199)[1]

	PD	AG	SP	SoP	GAD	PTSD	OCD	SAD	MDE	DYS	MHE	ODD	CD	ADHD	IED	AA	AD	DA	DD
I. Anxiety Disorders																			
Panic disorder (PD)	1.0																		
Agoraphobia (AG)	.64*	1.0																	
Specific phobia (SP)	.49*	.57*	1.0																
Social phobia (SoP)	.48*	.68*	.50*	1.0															
Generalized anxiety disorder (GAD)	.46*	.45*	.35*	.47*	1.0														
Post-traumatic stress disorder (PTSD)	.49*	.47*	.44*	.43*	.44*	1.0													
Obsessive-compulsive disorder (OCD)[2]	.42	.44	.21	.16	.33	.57*	1.0												
Separation anxiety disorder (SAD)	.39*	.31	.32*	.34*	.36*	.49*	−.79	1.0											
II. Mood Disorders																			
Major depressive episode (MDE)	.48*	.52*	.43*	.52*	.62*	.50*	.42*	.37*	1.0										
Dysthymia (DYS)	.54*	.44*	.44*	.55*	.55*	.50*	.36	.41*	.88*	1.0									
Manic-hypomanic episode (MHE)	.51*	.52*	.39*	.46*	.49*	.44*	.40	.40*	.63*	.56*	1.0								
III. Impulse-control Disorders																			
Oppositional-defiant disorder (ODD)	.40*	.48*	.45*	.47*	.27*	.53*	.52	.46*	.48*	.48*	.55*	1.0							
Conduct disorder (CD)	.26	.24	.17	.28*	.07	.27	−.81	−.07	.12	.31	.32*	.50*	1.0						
Attention-deficit/hyperactivity disorder[3]	.38*	.42*	.34*	.51*	.46*	.43*	.26	.37*	.50*	.51*	.60*	.58*	.39*	1.0					
Intermittent explosive disorder (IED)	.32*	.35*	.27*	.30*	.31*	.21*	.25	.29	.39*	.36*	.43*	.37*	.42*	.38*	1.0				
IV. Substance Disorders																			
Alcohol abuse (AA)	.27*	.22	.10	.22*	.25*	.27*	.31*	.09	.24*	.33*	.37*	.29	.40*	.27*	.41*	1.0			
Alcohol dependence (AD)	.25	.33	.21*	.31*	.31*	.34*	.25	.10	.37*	.38*	.41*	.36	.39	.30	.37*	1.0*	1.0		
Drug abuse (DA)	.16	.08	.07	.22*	.24*	.14	.32	.06	.25*	.42*	.43*	.40	.41	.36*	.30*	.67*	.63*	1.0	
Drug dependence (DD)	.27	.29	.26	.44*	.35*	.25	.36	−.81*	.40*	.56*	.38*	.43	.44	.55*	.38*	.63*	.71*	1.0*	1.0
Prevalence	3.4	1.6	10.1	8.8	4.4	3.7	1.3	0.9	10.3	2.4	3.8	1.1	1.0	4.1	6.6	5.0	2.2	2.4	0.7

	PD	AG	SP	SoP	GAD	PTSD	OCD	SAD	MDE	DYS	MHE	ODD	CD	ADHD	IED	AA	AD	DA	DD
Percent comorbid	80	97	62	74	85	75	65	71	76	99	87	93	70	78	70	77	100	79	100
Factor 1[4]	.70	.76	.65	.71	.63	.64	--	--	.80	.74	.66	.60	.26	.60	.39	.11	.21	.08	.29
Factor 2[4]	.12	.09	.03	.18	.17	.16	--	--	.19	.33	.34	.34	.47	.34	.37	.89	.86	.92	.88

*Significant at the .05 level, two-sided test.

[1]Part II respondents in the age range 18–44 (n=3199).

[2]Assessed in a random one-third of the Part II sample among respondents in the age range 18–44 (n = 1025).

[3](ADHD)

[4]Varimax rotation

Table 3

The distribution of hierarchy-free 12-month DSM-IV/WMH-CIDI disorders (n=3199)[1]

	Respondents	Cases	Diagnoses[2]	Profiles[3]
	% (se)	% (se)	% (se)	%
Disorders				
0	66.4 (0.9)	--	--	-
1	16.9 (0.7)	50.3 (1.5)	23.2 (1.4)	3.9
2	7.6 (0.4)	22.7 (1.2)	20.9 (1.4)	17.1
3+	9.1 (0.6)	27.0 (1.8)	55.9 (2.4)	79.0

[1]Part II NCS-R respondents in the age range 18–44.

[2]The proportion of respondents with more than two diagnoses ranged from 3.8% with exactly three to 0.03% with 15 and averaged 4.5 diagnoses per respondent with more than two. When the diagnosis is taken as the unit of analysis, the results in this column show that more than half of all 12-month diagnoses occurred to respondents with three or more disorders.

[3]The 19 disorders generate 2^{19} (524,288) logically possible multivariate disorder profiles, of which 433 are observed in the sample of Part II respondents in the age range 18–44.

Table 4

Conditional probabilities and distributions of hierarchy-free 12-month DSM-IV/WMH-CIDI disorders based on a seven-class Latent Class Analysis (n=3199)[1]

	Class 1	Class 2	Class 3	Class 4	Class 5	Class 6	Class 7
	%	%	%	%	%	%	%
I. Within-class disorder prevalences							
Panic disorder	0.9	1.5	2.5	32.8	0.0	10.9	73.0
Agoraphobia	0.0	0.0	0.0	23.7	1.5	3.0	45.8
Specific phobia	4.8	15.6	2.0	53.0	25.4	36.0	83.9
Social phobia	2.1	15.9	3.6	51.3	40.2	41.0	88.4
Generalized anxiety disorder	0.1	13.2	3.5	23.2	0.0	38.6	50.5
Post-traumatic stress disorder	1.0	5.8	1.5	19.5	14.1	22.8	54.8
Major depressive episode/dysthymia	0.0	40.7	5.3	40.7	0.0	94.6	89.3
Manic-hypomanic episode	0.0	6.5	11.1	10.2	0.0	54.1	93.8
Oppositional-defiant disorder	0.0	1.1	1.3	0.7	15.9	11.7	39.3
Conduct disorder	0.3	0.3	3.0	0.0	15.0	6.7	11.9
Attention-deficit/hyperactivity disorder	0.9	5.9	0.0	7.7	39.0	56.2	64.0
Intermittent explosive disorder	1.4	12.7	22.1	14.6	21.8	40.5	45.1
Alcohol abuse or dependence	0.2	0.0	43.6	13.2	14.4	42.5	5.6
Drug abuse or dependence	0.0	0.0	21.5	0.0	11.9	31.2	5.2
II. Class prevalence	68.5	14.5	7.4	5.0	2.3	1.6	0.7
III. Within-class disorder distributions							
0	88.9	25.7	24.4	2.6	9.7	0.0	0.9
1	10.5	40.1	40.9	12.2	26.1	0.8	0.2
2	0.6	25.4	25.6	27.0	35.2	4.2	0.0
3+	0.0	8.9	9.1	58.2	29.0	95.0	98.8
IV. Within-class severity distributions							
None	86.8	25.1	23.8	2.6	9.5	0.0	0.9
Mild	7.6	22.7	28.5	23.2	30.7	1.3	0.2
Moderate	4.5	37.3	30.7	40.0	44.5	28.1	5.2
Serious	1.1	14.9	17.0	34.2	15.2	70.5	93.8

[1]Part II respondents in the age range 18–44.

Table 5

Socio-demographic correlates (Odds-ratios) of Latent Class Analysis class membership probabilities (n=3199)[1]

	Class 1	Class 2	Class 3	Class 4	Class 5	Class 6	Class 7
	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)
I. Age							
18–29	0.9 (0.7–1.1)	0.9 (0.7–1.0)	1.4*(1.2–1.6)	0.8 (0.7–1.0)	1.4*(1.2–1.7)	1.1 (0.8–1.4)	1.0 (0.9–1.1)
30–44	1.0 --	1.0 --	1.0 --	1.0 --	1.0 --	1.0 --	1.0 --
χ^2_1	1.9	2.4	15.5*	3.1	14.2*	0.3	0.4
II. Sex							
Female	0.7*(0.6–0.9)	1.6*(1.4–1.8)	0.6*(0.5–0.7)	1.9*(1.7–2.2)	0.6*(0.6–0.7)	1.4*(1.1–1.7)	1.1 (0.9–1.2)
Male	1.0 --	1.0 --	1.0 --	1.0 --	1.0 --	1.0 --	1.0 --
χ^2_1	9.3*	52.2*	51.3*	87.0*	46.1*	9.5*	1.0
III. Race-Ethnicity							
Non-Hispanic White	1.0 --	1.0 --	1.0 --	1.0 --	1.0 --	1.0 --	1.0 --
Non-Hispanic Black	2.1*(1.4–3.0)	1.2 (1.0–1.4)	0.9 (0.8–1.1)	0.9 (0.7–1.0)	1.2 (1.0–1.4)	0.5*(0.4–0.7)	1.1 (0.9–1.2)
Hispanic	2.0*(1.3–3.0)	1.0 (0.8–1.2)	1.3*(1.0–1.7)	0.9 (0.7–1.1)	1.1 (0.9–1.3)	0.5*(0.4–0.8)	0.9 (0.8–1.0)
Other	0.9 (0.4–1.8)	1.0 (0.7–1.3)	0.8 (0.6–1.1)	0.9 (0.7–1.3)	1.4 (0.9–2.0)	1.1 (0.6–2.1)	1.2 (0.9–1.5)
χ^2_3	23.4*	4.4	7.8*	3.3	6.2	32.7*	5.9
IV. Education							
0–11	0.3*(0.2–0.5)	0.7*(0.5–1.0)	1.0 (0.7–1.3)	1.2 (1.0–1.6)	1.0 (0.7–1.3)	2.6*(1.7–4.0)	1.1 (0.9–1.4)
12	0.5*(0.4–0.8)	0.8*(0.7–0.9)	1.0 (0.8–1.3)	1.0 (0.8–1.3)	1.0 (0.8–1.2)	1.6*(1.2–2.2)	1.2*(1.0–1.3)
13–15	0.6*(0.4–0.9)	0.9 (0.8–1.1)	1.0 (0.9–1.2)	1.2 (1.0–1.5)	1.0 (0.8–1.2)	1.4*(1.1–1.9)	1.0 (0.9–1.1)
16+	1.0 --	1.0 --	1.0 --	1.0 --	1.0 --	1.0 --	1.0 --
χ^2_3	25.2*	18.5*	0.4	5.9	0.2	21.2*	7.8
V. Marital Status							
Married-cohabitating	1.0 --	1.0 --	1.0 --	1.0 --	1.0 --	1.0 --	1.0 --
Previously married	0.2*(0.1–0.4)	0.9 (0.7–1.1)	0.8 (0.6–1.2)	1.7*(1.2–2.3)	0.6*(0.5–0.9)	3.0*(1.9–4.8)	1.2 (0.9–1.6)
Never married	0.6*(0.4–0.8)	0.8*(0.7–0.9)	1.2 (1.0–1.5)	1.1 (0.9–1.3)	0.7*(0.6–0.9)	1.5*(1.1–2.0)	1.0 (0.8–1.2)
χ^2_2	32.5*	9.1*	6.1*	8.8*	13.3*	28.0*	1.7

	Class 1	Class 2	Class 3	Class 4	Class 5	Class 6	Class 7
	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)
VI. Family Income[2]							
Low	0.7 (0.4–1.2)	1.0 (0.7–1.3)	0.7*(0.6–0.9)	1.2 (0.9–1.6)	1.0 (0.8–1.2)	1.4 (0.9–2.1)	1.2 (1.0–1.5)
Low average	0.6*(0.4–1.0)	1.0 (0.8–1.3)	0.9 (0.7–1.1)	1.2 (0.9–1.6)	0.9 (0.7–1.2)	1.4 (1.0–2.0)	1.1 (0.9–1.3)
High average	0.7*(0.5–1.0)	1.0 (0.8–1.2)	1.0 (0.8–1.3)	1.2 (0.9–1.5)	1.0 (0.8–1.3)	1.4*(1.0–1.8)	1.0 (0.9–1.1)
High	1.0 --	1.0 --	1.0 --	1.0 --	1.0 --	1.0 --	1.0 --
χ^2_3	6.4	0.2	9.4*	2.7	1.7	7.3	3.5
VII. County Urbanicity[3]							
Central City (CC) 2M+	0.6*(0.4–0.8)	1.0 (0.8–1.3)	0.7*(0.6–0.9)	1.0 (0.8–1.3)	1.6*(1.3–2.0)	2.0*(1.4–2.8)	1.2*(1.1–1.4)
Central City (CC) <2M	0.6*(0.4–1.0)	1.1 (1.0–1.4)	0.7*(0.6–0.9)	1.1 (0.9–1.3)	1.6*(1.4–1.8)	1.6*(1.2–2.2)	1.3*(1.1–1.4)
Suburbs of CC 2M+	0.6*(0.4–0.8)	1.1 (0.8–1.5)	0.7*(0.6–0.9)	1.3*(1.1–1.6)	1.6*(1.3–1.9)	1.7*(1.3–2.3)	1.2*(1.0–1.5)
Suburbs of CC <2M	0.5*(0.3–0.8)	1.3*(1.1–1.6)	0.6*(0.5–0.8)	1.4*(1.1–1.7)	1.6*(1.4–1.9)	2.1*(1.5–2.9)	1.2* (1.0–1.4)
Adjacent Area	0.6*(0.4–0.8)	1.1 (1.0–1.4)	0.7*(0.6–0.8)	1.2*(1.0–1.5)	1.6*(1.2–2.0)	1.7*(1.3–2.1)	1.1 (1.0–1.3)
Rural Area	1.0 --	1.0 --	1.0 --	1.0 --	1.0 --	1.0 --	1.0 --
χ^2_5	19.6*	9.0	40.2*	12.6*	74.4*	41.6*	23.0*

*Significant at the .05 level, two-sided test.

[1]Part II respondents in the age range 18–44.

[2]Family income is defined in relation to the official federal poverty line for families of the size and composition of the respondent's family.[18] Low income is defined as less than or equal to 1.5 times the poverty line, low-average as 1.5+ to 3 times the poverty line, high-average as 3+ to 6 times the poverty line, and high as greater than 6 times the poverty line.

[3]Coded according to the 2000 Census definitions.[19] Central Cities and Suburbs are defined by the Census Bureau for each consolidated Metropolitan Statistical Area and Metropolitan Statistical Area in the US. Adjacent Areas are defined as all area beyond the outer boundary of the suburban belt, but within fifty miles of the central business district of a Central City. Rural Areas include all territory more than fifty miles from the central business district of a Central City.