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Parental Psychopathology and the Risk of Suicidal Behavior in their Offspring: Results from the World Mental Health Surveys

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CONFLICT OF INTEREST Dr. Kessler has been a consultant for GlaxoSmithKline Inc., Kaiser Permanente, Pfizer Inc., Sanofi-Aventis, Shire Pharmaceuticals, and Wyeth-Ayerst; has served on advisory boards for Eli Lilly & Company and Wyeth-Ayerst; and has had research support for his epidemiological studies from Bristol-Myers Squibb, Eli Lilly & Company, GlaxoSmithKline, Johnson & Johnson Pharmaceuticals, Ortho-McNeil Pharmaceuticals Inc., Pfizer Inc., and Sanofi-Aventis. The remaining authors report no financial or other relationship relevant to the subject of this article.

Abstract

Prior research suggests that parental psychopathology predicts suicidal behavior among offspring; however, the more fine-grained associations between specific parental disorders and distinct stages of the pathway to suicide are not well-understood. We set out to test the hypothesis that parental disorders associated with negative mood would predict offspring suicide ideation, whereas disorders characterized by impulsive-aggression (e,g., antisocial personality) and anxiety/agitation (e.g., panic disorder) would predict which offspring act on their suicide ideation and make a suicide attempt. Data were collected during face-to-face interviews conducted on nationally representative samples (*N*=55,299; age 18+) from 21 countries around the world. We tested the associations between a range of parental disorders and the onset and persistence over time (i.e., time-since-most-recent-episode controlling for age-of-onset and time-since-onset) of subsequent suicidal behavior (suicide ideation, plans, and attempts) among offspring. Analyses tested bivariate and multivariate associations between each parental disorder and distinct forms of suicidal behavior. Results revealed that each parental disorder examined increased the risk of suicide ideation among offspring, parental generalized anxiety and depression emerged as the only predictors of the onset and persistence (respectively) of suicide plans among offspring with ideation, whereas parental anti-social personality and anxiety disorders emerged as the only predictors of the onset and persistence of suicide attempts among ideators. A dose-response relation between parental disorders and respondent risk of suicide ideation and attempt also was found. Parental death by suicide was a particularly strong predictor of persistence of suicide attempts among offspring. These associations remained significant after controlling for comorbidity of parental disorders and for the presence of mental disorders among offspring. These findings should inform future explorations of the mechanisms of inter-generational transmission of suicidal behavior.

Keywords

suicide; parent and family history; intergenerational transmission

INTRODUCTION

Suicide and suicidal behavior (i.e., suicide ideation, plans and attempts) are major public health problems and are reportedly on the increase worldwide especially among young people.1, 2 Suicide was the 14th leading cause of death globally in the year 2002 and accounts for 1.5% of all deaths.2 It is projected to increase by as much as 50% from 2002 to 2030 and become the 12th leading cause of death by 2030.3, 4 Despite the public health impact of suicidal behaviors, our understanding of the factors that lead to suicide is still limited. Even though suicide and suicidal behavior have been shown to run in families,5 the mechanism through which this risk is transmitted remains poorly understood.6-10

Family, adoption, and twin studies have demonstrated higher rates of suicidal behavior in biological relatives of persons with suicidal behavior suggesting a genetic component to this increased risk.5, 6, 11 There is accumulating evidence that part of this elevated risk can be accounted for by increased familial rates of psychiatric disorders; however, only a few studies have been able to examine which parental or familial mental disorders are associated

with suicidal behavior.8, 12-17 Importantly, prior studies suggest that a family history of psychopathology is predictive of suicide ideation among offspring, but not of which offspring with ideation go on to make a suicide attempt.6, 11 It has been suggested that the transition from suicide ideation to attempt may be predicted by a familial history of impulsive-aggressive traits;18, 19 however, such a model has not been tested. Indeed, carefully testing the unique associations among multiple forms of familial psychopathology and different stages in the pathway to suicide requires very large samples not available in most studies. The current study was designed to test the effect of different parental psychiatric psychopathology on distinct stages of the pathway to suicide.

Guiding such efforts, recent research has shown that when carefully examined in multivariate analyses, different mental disorders predict distinct stages in the pathway to suicide. For instance, several studies have shown that although major depression reliably predicts the onset of suicide ideation, it does not consistently predict which people with ideation go on to make a suicide attempt. Instead, it is disorders characterized by poor impulse control (e.g., bipolar, conduct and substance use disorders) and anxiety/agitation (e.g., panic and posttraumatic stress disorders [PTSD]) that predict this transition.20, 21 In line with this, we hypothesized that parental disorders characterized by depressive symptoms will more likely predict the onset and persistence of suicidal thinking among offspring while disorders characterized by impulsive and anxious traits will better predict suicide attempts. Such a finding would point toward distinct mechanisms through which the tendency to engage in different forms of suicidal behavior are transmitted across generations.

The current study is designed to examine: (a) the associations between specific forms of parental psychopathology and distinct steps in the suicidal behavior pathway, and (b) the associations between parental psychopathology and the persistence of suicidal behavior. The specific forms of parental psychopathology examined are major depression, panic disorder, generalized anxiety disorder, substance dependence, and antisocial behavior (e.g., illegal behavior, arrest, imprisonment), as well as parental suicide attempt or suicide death; and the steps in the suicidal pathway are suicidal attempt, suicidal ideation, suicidal plan, and both planned and unplanned (i.e., impulsive) suicide attempts. We examined these associations in the World Mental Health (WMH) surveys, a coordinated series of large-scale community-based studies conducted in 21 countries around the world. The size and scope of the WMH surveys provide a unique opportunity to explore in great detail the specific aspects of parental psychopathology that are most strongly predictive of offspring suicidal behavior and to examine the extent to which the accumulation of parental disorders may have a bearing on the links.

METHOD

Respondent samples

The WMH surveys were carried out in 21 countries in: Africa (Nigeria; South Africa), the Americas (Brazil; Colombia; Mexico; United States), Asia and the Pacific (India; Japan; New Zealand; Beijing, Shanghai, and Shenzhen in the Peoples Republic of China), Europe (Belgium; Bulgaria; France; Germany; Italy; the Netherlands; Romania; Spain; Ukraine),

and the Middle East (Israel; Lebanon). The World Bank22 classifies Belgium, France, Germany, Israel, Italy, Japan, the Netherlands, New Zealand, Spain, and the United States as high income; Brazil, Bulgaria, Lebanon, Mexico, Romania, and South Africa as upper-middle income (hereafter "middle income"); and China, Colombia, India, Nigeria, and Ukraine as low and lower-middle income (hereafter "low income") countries (Table 1). Respondents were selected in most WMH countries using a stratified multistage clustered-area probability sampling strategy in which samples of areas equivalent to counties or municipalities in the US were selected in the first stage followed by one or more subsequent stages of geographic sampling (e.g., towns within counties, blocks within towns, households within blocks) to arrive at a sample of households, in each of which a listing of household members was created and one person was selected from this listing to be interviewed. No substitution was allowed when the originally sampled household resident could not be interviewed. The total sample size was 109,381, with individual country sample sizes ranging from 2,357 in Romania to 12,790 in New Zealand. The weighted average response rate across all countries was 73.3%.

Procedures

Assessment consisted of face-to-face household interviews conducted by trained lay interviewers. Interviews were administered in two parts in all countries except Israel, Romania and South Africa, where all respondents were administered the entire survey. The Part I interview was administered to all respondents and it assessed the presence of DSM-IV mental disorders and suicidal behaviors (see below). Part II assessed potential correlates of mental disorders and suicidal behavior. It was administered to a probability sub-sample of Part I respondents that included 100% of those who met lifetime criteria for any mental disorder and a probability sub-sample of approximately 25% of other respondents. Internal sub-sampling was used to reduce respondent burden and average interview time and cost by dividing the interview into two parts. Part II respondents were weighted by the inverse of their probability of selection for Part II of the interview to adjust for differential sampling. Analyses in this article were based on the weighted Part II sub-sample (*N*=55,302). Additional weights were used to adjust for differential probabilities of selection within households, to adjust for non-response, and to match the samples to population socio-demographic distributions. A fuller description of these procedures is provided elsewhere. 23-25 In each survey, only people who provided informed consent were interviewed. All surveys sought and obtained relevant institutional ethical approvals before commencement.

Assessment of mental disorders and suicidal behavior

Lifetime mental disorders as well as suicidal behaviour were assessed using the World Health Organization (WHO) Composite International Diagnostic Interview version 3.0 (CIDI).26, 27 The Suicidality Module of the CIDI includes an assessment of the lifetime occurrence and age-of-first-onset of suicide ideation, plan, and attempt. For the purpose of the present report, data are provided on the following five dated lifetime history of suicidal behaviors: (i) *suicide ideation* (defined as seriously thinking about committing suicide) in the total sample; (ii) *suicide attempt* in the total sample; (iii) *suicide plan* (i.e. made a plan to commit suicide) among respondents with ideation; (iv) suicide attempt among respondents

with ideation who made a plan (*planned attempt*); and (v) suicide attempt among respondents with ideation but who made no plan (*unplanned* or *impulsive attempt*).

Parental psychopathology

We assessed parental psychopathology with the expanded version of the Family History Research Diagnostic Criteria Interview.28, 29 Five different forms of possible parental psychopathology during respondents' childhood are the focus of the present report: major depression, panic disorder, generalized anxiety disorder, substance dependence, and antisocial behavior (e.g., illegal behavior, arrest, imprisonment), as well as parental suicide attempt or suicide death. A parental psychiatric disorder was rated present if the respondent gave a positive response to questions on the core symptoms of that particular disorder occurring in the mother or the father. Thus for example, for the diagnosis of depression in the mother, the respondent was asked if their mother ever had periods lasting 2 weeks or more when she was sad or depressed for most of the time; whether, at the time her depression was at its worst, she also had other symptoms like low energy, changes in sleep or appetite and problems with concentration; whether she ever got professional treatment for her depression; and whether her depression interfered a lot with her life or activities. Missing values on parental psychopathology variables were estimated using multiple imputation.30 Logistic regression modeling was conducted to impute values for missing variables using other available parental variables. We chose to impute missing data rather than drop these cases because even though the dataset is large, missing values affect some countries and some disorders more than others.

Analysis methods

We first examined the prevalence of parental psychopathology among respondents with each of the five suicidal outcomes using cross-tabulations. The associations between parental psychopathology and suicidal behavior were estimated in a series of discrete-time survival models that were bivariate (in which each type of parental psychopathology was considered individually) as well as multivariate (in which all parental disorders were considered simultaneously) in predicting each suicidal behavior. Next, we estimated models testing the relationship between the number of parental disorders with the likelihood of each suicidal behavior. We then estimated a series of multivariate models in which both the type and number of parental disorders were included in order to examine the unique contribution of both specific forms of parental psychopathology and the total number of parental disorders. These predictive associations were all tested using discrete-time survival models in which person-year was the unit of analysis.31 To aid interpretation, these results are presented in the form of odds ratios (ORs) and their standard errors were generated by exponentiating the survival coefficients.

We next conducted a series of analyses to test the associations between parental psychopathology and the persistence of suicidal behavior over time. We used a special class of survival models called backward recurrence models for this purpose.32-34 These models use a person-year survival approach (consistent with the models described above in which years preceding the event of interest are coded 0, the year of the event is coded 1, and all years following the event are censored). However, rather than predicting the occurrence of a

future event, we predicted the most recent episode of the event of interest (e.g., age at most recent suicide ideation) among those who ever had an initial event looking backwards in time from the year of interview. For instance, a person who had suicide ideation for the first time at age 18, for the last time at age 25, and who is currently 30 years-old would have six years in their data file coded: 1 (year 25) and 0, 0, 0, 0, 0 (years 26, 27, 28, 29, 30). A person who experienced suicide ideation for the first time at age 18, never had another episode, and currently is 30 years-old would have 12 time-since-onset (TSO) person-years in their data file all coded 0. In these models, age of onset (AOO) and TSO are statistically controlled and the models provide an indirect estimate of the persistence of each outcome of interest. The literature comparing results from backward recurrence models with prospective time-to-next-event survival models suggests that backward recurrence models provide generally good approximations of the coefficients obtained in prospective models.33

To adjust for the weighting and clustering of the sample design, standard errors of prevalence estimates (i.e. estimates of both of the parental disorders and of the suicidal behaviors) and survival coefficients were estimated in all the analyses with the Taylor series method35 using SUDAAN software.36 Multivariate significance was evaluated with Wald χ^2 tests based on design-corrected coefficient variance–covariance matrices. All significance tests were evaluated using .05 level two-sided tests.

RESULTS

Preliminary analyses

As a preliminary step, we first explored the possibility that the association between parental psychopathology and suicidal behavior in the offspring was different depending on which parent (mother, father, or both) had the disorder. Using bivariate survival models to predict each suicidal behavior, our results showed that neither the type of parent (mother vs. father) nor the number of parents with the disorder (one vs. both) bore a consistent relationship with suicidal behavior in the respondent, with one exception. Parental suicide was associated with respondent suicidal behavior only when parent and respondent gender were the same. Specifically, a history of paternal suicide was associated with significantly increased odds of respondent suicidal behavior among male respondents (OR=3.4 [95% CI: 1.4-8.1]) but not female respondents (OR=1.4 [0.5-3.9]), whereas maternal suicide was associated with significantly increased odds of suicidal behavior among female (OR=2.8 [1.2-6.6]) but not male (OR=0.0 [0.0-0.0]) respondents. Therefore, subsequent analyses test the effects of the presence versus absence of psychopathology in either parent, but parental suicide is considered present only if it occurred in the parent of the same gender (i.e., fathers among male respondents and mothers among female respondents).

Prevalence of parental psychopathology in the suicidal groups

The prevalence of each parental disorder among respondents with each suicidal behavior is presented in Table 2. There was a clear trend for parents of respondents who were positive for each of the suicidal outcomes to have a higher prevalence of mental disorders than the parents of respondents without each suicidal outcome. This observation is similar for both type of psychopathology and number of disorders.

Associations between parental psychopathology and suicidal behavior

Bivariate survival models revealed that each form of parental psychopathology examined is significantly associated with increased odds of the subsequent first onset of both suicide ideation and attempt (Table 3). In bivariate models, only parental GAD predicted the development of a plan among those with suicide ideation, whereas parental panic and GAD predicted both planned and unplanned suicide attempt among those with ideation (although the association was negative in the case of GAD and unplanned attempts among ideators). Parental antisocial behavior also predicted unplanned (i.e., impulsive) attempts. Multivariate analyses, in which each form of parental psychopathology was entered simultaneously, produced similar but slightly attenuated results to those of bivariate analyses. In these models, parental GAD remained protective against planned attempts among ideators, parental panic remained the only positive predictor of planned attempts among ideators, and parental antisocial behavior emerged as the only predictor of impulsive attempts.

Number of parental disorders and suicidal behavior

The associations between the number of parental disorders present and the risk of suicidal behavior among offspring are presented in Table 4. The results show a dose-response relationship between number of parental disorders and suicide ideation and attempt. A similar, albeit less consistent, pattern is seen for suicide plans and attempts among ideators.

Associations between type and number of parental disorders and suicidal behavior

We next conducted multivariate analyses in which both type and number of parental disorders were included in the model and in which we also controlled for the presence of any mental disorder in the offspring (Table 5). Even after taking into account the number of parental disorders present, each form of parental psychopathology continued to predict suicide ideation and attempts. Parental GAD remained protective against suicide attempt among those with a plan, and was joined by parental substance abuse in this regard. Parental antisocial behavior remained a significant predictor of impulsive attempt, and was joined by parental panic disorder and GAD in this regard.

As shown, the multivariate model revealed sub-additive effects of increasing number of parental disorders such that, as the number of parental disorders increases, the relative-odds of respondent suicidal behavior increase but with some dampening of the trend. For example, the odds of lifetime attempt is 1.5 times as great for respondents with parental history of depression and 2.0 times as great for respondents with parental history of panic, but for respondents with parental history of both depression and panic the odds would be 70% of the product of the odds of the two disorders. For those with parental history of depression, panic, and antisocial personality the odds would be 30% of the product of all three odds.

Associations between parental psychopathology and the persistence of suicidal behavior

A final multivariate model estimated the risk of persistence of suicidal behavior given the occurrence of specific types of parental psychopathology as well as the co-occurrence of parental disorders. The model also controlled for respondent with mental disorders. The results show that parental depression predicts the persistence of suicide ideation and

offspring plan (Table 6). Parental panic and suicidal behavior both predict the persistence of offspring suicide attempt overall, as well as attempt among ideators with a plan. Even though parental death by suicide was not a significant predictor of suicidal ideation, it was a particularly strong predictor of suicidal plan and attempt among ideators.

DISCUSSION

This study provides new information about the relationship between parental psychopathology and the risk of suicidal behavior among offspring. Specifically, the study examines the effect of different forms of parental psychopathology on distinct stages of the pathway to suicide. We tested the hypothesis that parental disorders characterized by depressive symptoms would predict the onset of suicide ideation among offspring whereas disorders characterized by impulsive and anxious/agitated traits would predict suicide attempts. Using data from a coordinated series of nationally representative surveys conducted in 21 different countries around the world, the primary findings from this study were that: (1) each parental disorder examined increased the risk of suicide ideation among offspring; (2) parental generalized anxiety and depression emerged as the only predictors of the onset and persistence, respectively, of suicide plans among offspring with ideation; and (3) parental anti-social personality and anxiety disorders (specifically GAD and panic) emerged as the only predictors of the onset and persistence of suicide attempts among ideators. These findings were strengthened by the demonstration that most associations remained significant even after controlling for the presence of other parental disorders, the number of parental disorders, and the presence of mental disorders among offspring themselves.

Our findings should be considered in the context of several study limitations. First, all of the information relating to parental disorders and suicidal behavior was obtained with retrospective self-report provided by offspring, and so could be affected by recall bias or forgetting. Even though there is evidence suggesting that past events can be recalled with sufficient accuracy to support their validity,37 the data presented here must still be considered as open to some degree of bias. Second, our assessment of parental psychopathology did not include all possible and potentially relevant disorders (e.g., psychotic disorders, borderline personality disorder). Third, we did not account for the chronicity or severity of parental disorders, a factor that could have led to our underestimating the associations between parental disorders and respondent suicidal behavior. Fourth and finally, in view of the cross-sectional design of the surveys, we were unable to provide a direct measure of the persistence of each episode of suicidal behaviors. Instead, our estimate of persistence used the time from first onset to most recent occurrence of each type of suicidal behavior. This information provides an advance over prior studies given that virtually nothing is known about the persistence of suicidal behaviors; however, future studies are needed to provide a direct measure of the persistence of suicidal behaviors.

Notwithstanding these limitations, these results advance understanding of suicidal behavior. Although prior research has suggested a trend for suicidal behavior to run in families, an understanding of the mode of transmission has been limited.11 Our results provide empirical support for prior suggestions that while parental depression is the strongest predictor of

suicide ideation among offspring, a history of parental impulse-control problems and anxious arousal may better predict suicide attempts.6, 11, 38 The current findings suggest that different parts of the pathway to suicide may have different genetic origins and that studies of suicide may be more fruitfully conducted with this understanding. The observation that parental depression and GAD had similar association with offspring suicidal outcomes whereas the effect of parental panic was manifest at a different point in the suicidal behavior pathway supports the suggestion that depression and GAD overlap, and that GAD belongs to a different cluster of disorders than panic disorder39 and, if replicated, may provide another lead for examining the genetic basis of these phenotypes. The observation that parental GAD protected against progression from plan to attempt while parental panic predicted progression from plan to attempt seems to further underscore a fundamental difference in the nature of these two disorders which had traditionally been classified as anxiety disorders.

One interpretation of these findings is that whereas all disorders are associated with increased distress that may lead to suicidal thinking, it is the persistent negative thinking and ruminative style—characteristic of depression and GAD—that lead people to plan to kill themselves. The high degree of worry among those with GAD may actually decrease the likelihood of carrying out the planned behavior, which is why we observed consistently that GAD is associated with higher odds of suicide planning, but lower odds of planned attempts. Acting on one's suicidal thoughts may require some degree of impulsiveness or fearlessness as well as high emotional arousal (e.g., fight or flight response) such as that seen in those with antisocial behavior or anxiety disorders. This may help to explain why a parental history of antisocial behavior and panic disorder consistently emerged as strong predictors of suicide attempts among those with suicide ideation. This interpretation is speculative, but consistent with prior research and the current findings. Future studies should advance on this work by examining the associations between individual traits/symptoms and suicidal behavior to further test the proposed associations. The complexity of the association between parental psychopathology and offspring suicidal behavior is shown by the observation that parental suicide was associated with suicidal behavior only in the offspring of the same sex. It could be that parental suicide is different from other forms of psychopathology in that it carries with it not only the possibility of genetic predisposition in the offspring but also a risk of some form of gender-related learning.

The observed dose-response relation between parental disorders and respondent risk of suicide ideation and attempt is a novel and important finding. It suggests that parental comorbidity itself increases the risk of suicidal behavior among offspring, even after controlling for type of parental disorder and for the presence of mental disorders among offspring themselves. Regarding this last point, it is notable that the associations between parental psychopathology and offspring suicidal behavior more broadly were not fully explained by the presence of offspring mental disorders. This may be because it is not the disorders themselves that are important in explaining offspring suicidal behavior, but the traits—transmitted intergenerationally—that underlie them. Future studies should incorporate the use of measures of the psychological traits proposed to lead to suicidal behavior, which do not map perfectly onto psychiatric diagnoses, in order to test the explanatory power of these constructs.

Our findings are relevant for future efforts to understand the genetic basis of suicidal behavior and may help to focus research in this area more appropriately. These results suggest that explorations of the genetics of suicide spectrum behavior need to target different psychopathological phenotypes that have strong associations with distinct suicidal outcomes. Thus, genetic studies of suicide ideation and plans may be better focused on the possibility of some genetic link between depression and anxious rumination, while studies on the progression from suicidal ideation to attempt may be enhanced by the possibility of its genetic link with traits of high sympathetic arousal and impulse dyscontrol. This shift in focus from the effects of psychiatric disorders to the traits that underlie them may offer new insights in the factors that contribute to this leading cause of death around the world.

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Table 1

WMH sample characteristics by World Bank income categories

Country by income category[1]	Survey[2]	Sample Characteristics[3]	Field Dates	Age Range	Sample Size			Response Rate[4]
					Part I	Part II	Part II and Age ≤ 44[5]	
Low and Lower-middle								
Colombia	NSMH	Stratified multistage clustered area probability sample of household residents in all urban areas of the country (approximately 73% of the total national population).	2003	18-65	4426	2381	1731	87.7
India	WMHI	Stratified multistage clustered area probability sample of household residents in Pondicherry region. Nationally Representative (NR)	2003-5	18+	2992	1373	642	98.8
Nigeria	NSMHW	Stratified multistage clustered area probability sample of households in 21 of the 36 states in the country, representing 57% of the national population. The surveys were conducted in Yoruba, Igbo, Hausa and Efik languages.	2002-3	18+	6752	2143	1203	79.3
PRC	B-WMH S-WMH	Stratified multistage clustered area probability sample of household residents in the Beijing and Shanghai metropolitan areas.	2002-3	18+	5201	1628	570	74.7
PRC	Shenzhen	Stratified multistage clustered area probability sample of household residents and temporary residents in the Shenzhen area.	2006-7	18+	7134	2476	1993	80.0
Ukraine	CMDPSD	Stratified multistage clustered area probability sample of household residents. NR	2002	18+	4725	1720	541	78.3
Upper-middle								
Brazil	São Paulo Megacity	Stratified multistage clustered area probability sample of household residents in the São Paulo metropolitan area.	2005-7	18+	5037	2942	--	81.3
Bulgaria	NSHS	Stratified multistage clustered area probability sample of household residents. NR	2003-7	18+	5318	2233	741	72.0
Lebanon	LEBANON	Stratified multistage clustered area probability sample of household residents. NR	2002-3	18+	2857	1031	595	70.0
Mexico	M-NCS	Stratified multistage clustered area probability sample of household residents in all urban areas of the country (approximately 75% of the total national population).	2001-2	18-65	5782	2362	1736	76.6
Romania	RMHS	Stratified multistage clustered area probability sample of household residents. NR	2005-6	18+	2357	2357	--	70.9
South Africa	SASH	Stratified multistage clustered area probability sample of household residents. NR	2003-4	18+	4351	4351	--	87.1
High								
Belgium	ESEMeD	Stratified multistage clustered probability sample of individuals residing in households from the national register of Belgium residents. NR	2001-2	18+	2419	1043	486	50.6
France	ESEMeD	Stratified multistage clustered sample of working telephone numbers merged with a reverse directory (for listed numbers). Initial recruitment was by telephone, with supplemental in-person recruitment in households with listed numbers. NR	2001-2	18+	2894	1436	727	45.9
Germany	ESEMeD	Stratified multistage clustered probability sample of individuals from community resident registries. NR	2002-3	18+	3555	1323	621	57.8

Country by income category[1]	Survey[2]	Sample Characteristics[3]	Field Dates	Age Range	Sample Size			Response Rate[4]
					Part I	Part II	Part II and Age ≤ 44[5]	
Israel	NHS	Stratified multistage clustered area probability sample of individuals from a national resident register. NR	2002-4	21+	4859	4859	--	72.6
Italy	ESEMeD	Stratified multistage clustered probability sample of individuals from municipality resident registries. NR	2001-2	18+	4712	1779	853	71.3
Japan	WMHJ2002-2006	Un-clustered two-stage probability sample of individuals residing in households in nine metropolitan areas (Fukiage, Higashi-ichiki, Ichiki, Kushikino, Nagasaki, Okayama, Sano, Tamano, Tendo, and Tochigi).	2002-6	20+	3417	1305	425	59.2
Netherlands	ESEMeD	Stratified multistage clustered probability sample of individuals residing in households that are listed in municipal postal registries. NR	2002-3	18+	2372	1094	516	56.4
New Zealand	NZMHS	Stratified multistage clustered area probability sample of household residents. NR	2003-4	16+	12992	7435	--	73.3
Spain	ESEMeD	Stratified multistage clustered area probability sample of household residents. NR	2001-2	18+	5473	2121	960	78.6
United States	NCS-R	Stratified multistage clustered area probability sample of household residents. NR	2002-3	18+	9282	5692	3197	70.9

[1] Definition: *Income group:* Economies are divided according to 2007 GNI per capita, calculated using the World Bank Atlas method. The groups are: low income, $935 or less; lower middle income, $936 - $3,705; upper middle income, $3,706 - $11,455; and high income, $11,456 or more. http://web.worldbank.org/WBSITE/EXTERNAL/DATASTATISTICS/0,,contentMDK:20420458~menuPK:64133156~pagePK:64133150~piPK:64133175~theSitePK:239419,00.html

[2] NSMH (The Colombian National Study of Mental Health); WMHI (World Mental Health India); NSMHW (The Nigerian Survey of Mental Health and Wellbeing); B-WMH (The Beijing World Mental Health Survey); S-WMH (The Shanghai World Mental Health Survey); CMDPSD (Comorbid Mental Disorders during Periods of Social Disruption); NSHS (Bulgaria National Survey of Health and Stress); LEBANON (Lebanese Evaluation of the Burden of Ailments and Needs of the Nation); M-NCS (The Mexico National Comorbidity Survey); RMHS (Romania Mental Health Survey); SASH (South Africa Health Survey); ESEMeD (The European Study Of The Epidemiology Of Mental Disorders); NHS (Israel National Health Survey); WMHJ2002-2006 (World Mental Health Japan Survey); NZMHS (New Zealand Mental Health Survey); NCS-R (The US National Comorbidity Survey Replication).

[3] Most WMH surveys are based on stratified multistage clustered area probability household samples in which samples of areas equivalent to counties or municipalities in the US were selected in the first stage followed by one or more subsequent stages of geographic sampling (e.g., towns within counties, blocks within towns, households within blocks) to arrive at a sample of households, in each of which a listing of household members was created and one or two people were selected from this listing to be interviewed. No substitution was allowed when the originally sampled household resident could not be interviewed. These household samples were selected from Census area data in all countries other than France (where telephone directories were used to select households) and the Netherlands (where postal registries were used to select households). Several WMH surveys (Belgium, Germany, Italy) used municipal resident registries to select respondents without listing households. The Japanese sample is the only totally un-clustered sample, with households randomly selected in each of the four sample areas and one random respondent selected in each sample household. Sixteen of the 21 surveys are based on nationally representative (NR) household samples, while two others are based on nationally representative household samples in urbanized areas (Colombia, Mexico).

[4] The response rate is calculated as the ratio of the number of households in which an interview was completed to the number of households originally sampled, excluding from the denominator households known not to be eligible either because of being vacant at the time of initial contact or because the residents were unable to speak the designated languages of the survey. The weighted average response rate is 73%.

[5] Brazil, Israel, New Zealand, Romania, and South Africa did not have an age restricted Part II sample. All other countries, with the exception of India, Nigeria, People's Republic of China, and Ukraine (which were age restricted to ≤ 39) were age restricted to ≤ 44.

[6] New Zealand interviewed respondents 16+ but for the purposes of cross-national comparisons we limit the sample to those 18+.

Table 2

Prevalence of parental psychopathology among suicidality outcomes

	%[3] (SE) with parental disorder among the total sample		%[3] (SE) with parental disorder among the total sample		%[3] (SE) with parental disorder among ideators		%[3] (SE) with parental disorder among ideators with a plan		%[3] (SE) with parental disorder among ideators without a plan	
Type of parental disorders	**Attempt**	**No attempt**	**Ideation**	**No ideation**	**Plan**	**No plan**	**Attempt**	**No attempt**	**Attempt**	**No attempt**
Depression	6.2 (0.6)	1.6 (0.1)	4.6 (0.3)	1.6 (0.1)	6.0 (0.5)	4.0 (0.4)	6.1 (0.7)	7.1 (0.9)	6.0 (1.1)	3.3 (0.4)
Panic	15.8 (0.9)	4.7 (0.1)	11.6 (0.5)	4.6 (0.1)	14.5 (0.8)	10.4 (0.7)	15.7 (1.1)	12.7 (1.4)	15.1 (1.5)	8.8 (0.7)
Generalized anxiety disorder	6.8 (0.6)	1.6 (0.1)	5.1 (0.4)	1.5 (0.1)	6.7 (0.6)	4.0 (0.4)	6.4 (0.6)	9.2 (1.4)	7.2 (1.2)	3.3 (0.4)
Substance abuse	13.5 (0.8)	4.1 (0.1)	11.0 (0.4)	3.9 (0.1)	13.0 (0.8)	9.9 (0.7)	13.6 (1.1)	12.7 (1.5)	13.7 (1.4)	8.9 (0.7)
Antisocial behavior	7.1 (0.6)	1.6 (0.1)	4.7 (0.3)	1.5 (0.1)	5.8 (0.5)	3.7 (0.4)	6.9 (0.7)	4.9 (0.9)	8.3 (1.3)	2.9 (0.4)
Suicide [1]	0.9 (0.2)	0.5 (0.0)	0.7 (0.1)	0.5 (0.0)	0.9 (0.2)	0.7 (0.3)	1.1 (0.4)	0.5 (0.2)	0.6 (0.3)	0.8 (0.4)
Number of parental disorders [2]										
1	14.2 (0.8)	5.6 (0.1)	12.1 (0.5)	5.5 (0.1)	12.8 (0.8)	11.7 (0.7)	13.3 (1.0)	12.7 (1.5)	15.6 (1.5)	11.1 (0.8)
2	9.0 (0.7)	2.4 (0.1)	6.8 (0.4)	2.3 (0.1)	9.0 (0.7)	6.0 (0.5)	9.2 (0.9)	8.7 (1.2)	8.3 (1.0)	5.1 (0.5)
3	2.2 (0.4)	0.5 (0.0)	2.0 (0.2)	0.5 (0.0)	2.5 (0.3)	1.7 (0.3)	2.2 (0.4)	3.1 (0.5)	4.8 (1.0)	2.0 (0.3)
4	2.7 (0.4)	0.5 (0.0)	0.8 (0.1)	0.4 (0.0)	2.0 (0.3)	0.9 (0.2)	2.7 (0.4)	1.8 (0.5)		
5+			0.5 (0.1)	0.1 (0.0)						
	(2831)	(52468)	(8382)	(46917)	(3324)	(5058)	(1894)	(1430)	(937)	(4121)

[1] Mother only if respondent is female, or father only if respondent is male.

[2] For number of parental disorders, the last prevalence shown represents the prevalence of the number or more. For example, for lifetime attempt, 4 represents 4 or more (i.e., 4+).

[3] % represents the percentage of people with the parent disorder among the cases with the outcome variable indicated in the column header. For example: the first cell is the % of those with parent depression among those with ideation.

Table 3

Bivariate and multivariate associations between parental psychopathology and lifetime suicidality[1]

Type of parental disorders	Suicide attempt		Suicide ideation		Suicide plan among ideators		Suicide attempt among ideators with plan		Suicide attempt among ideators without plan	
	Bivariate OR(95%CI)	Multivariate OR(95%CI)	Bivariate OR(95%CI)	Multivariate OR(95%CI)	Bivariate OR(95%CI)	Multivariate OR(95%CI)	Bivariate OR(95%CI)	Multivariate OR(95%CI)	Bivariate OR(95%CI)	Multivariate OR(95%CI)
Depression	3.2*(2.6-4.0)	1.2(0.9-1.6)	3.0*(2.6-3.6)	1.3*(1.1-1.6)	1.3(1.0-1.7)	1.1(0.8-1.5)	0.8(0.6-1.2)	1.1(0.6-1.8)	1.4(0.9-2.2)	0.9(0.5-1.6)
Panic	3.0*(2.5-3.5)	2.2*(1.8-2.6)	2.3*(2.0-2.6)	1.7*(1.5-1.9)	1.2(1.0-1.5)	1.2(1.0-1.5)	1.5*(1.0-2.1)	1.6*(1.1-2.2)	1.5*(1.1-2.0)	1.3(1.0-1.8)
Generalized anxiety disorder	3.3*(2.6-4.2)	1.5*(1.2-2.0)	3.2*(2.7-3.7)	1.5*(1.3-1.9)	1.3*(1.0-1.8)	1.2(0.9-1.7)	0.6*(0.4-0.8)	0.5*(0.3-0.8)	1.8*(1.1-2.7)	1.5(0.8-2.7)
Substance abuse	2.2*(1.9-2.7)	1.3*(1.1-1.6)	2.1*(1.8-2.4)	1.5*(1.3-1.7)	1.0(0.8-1.3)	1.0(0.8-1.2)	0.9(0.6-1.3)	0.7(0.5-1.1)	1.3(0.9-1.9)	1.0(0.7-1.4)
Antisocial behavior	3.5*(2.9-4.2)	2.1*(1.6-2.6)	2.8*(2.5-3.3)	1.6*(1.4-1.9)	1.1(0.8-1.5)	1.0(0.8-1.4)	1.1(0.7-1.7)	1.4(0.9-2.2)	2.0*(1.3-3.2)	1.8*(1.1-3.0)
Suicide	2.8*(1.4-5.3)	1.2(0.6-2.3)	2.8*(1.7-4.4)	1.1(0.7-1.8)	0.6(0.2-1.4)	0.7(0.3-1.6)	2.5(0.2-26.6)	2.9(0.4-19.2)	0.4(0.1-2.0)	0.5(0.1-2.1)

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

[1]Assessed in Part II sample due to having Part II controls. Models control for person years and demographic variables, and also the significant interaction terms between person years and demographic variables.

Table 4

Multivariate associations between number of parental psychopathology disorders and lifetime suicidality[1]

Number of parental disorders[2]	Suicide attempt	Suicide ideation	Suicide plan among ideators	Suicide attempt among ideators with plan	Suicide attempt among ideators without plan
	OR(95%CI)	OR(95%CI)	OR(95%CI)	OR(95%CI)	OR(95%CI)
1	2.4*(2.1-2.7)	2.1*(1.9-2.3)	1.0(0.8-1.2)	0.9(0.7-1.3)	1.4*(1.1-1.8)
2	3.2*(2.7-3.8)	2.7*(2.4-3.1)	1.4*(1.1-1.8)	1.0(0.7-1.5)	1.5*(1.0-2.1)
3	3.2*(2.3-4.6)	3.5*(2.8-4.4)	1.3(0.9-1.9)	0.7(0.4-1.1)	1.7*(1.1-2.8)
4	6.2*(4.5-8.7)	2.5*(1.7-3.6)	1.4(0.8-2.5)	1.3(0.6-2.6)	-
5+	-	15.4*(10.3-23.0)	-	-	-

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

[1]Assessed in Part II sample due to having Part II controls. Models control for person years and demographic variables, and also the significant interaction terms between person years and demographic variables.

[2]For number of parental disorders, the last odds ratio represents the odd of the number or more. For example, for lifetime attempt, 4 represents 4 or more (i.e., 4+).

Table 5

Final multivariate model for associations between parental psychopathology and lifetime suicidality[1]

	Suicide attempt	Suicide ideation	Suicide plan among ideators	Suicide attempt among ideators with plan	Suicide attempt among ideators without plan
Type of parental disorders	**OR(95%CI)**	**OR(95%CI)**	**OR(95%CI)**	**OR(95%CI)**	**OR(95%CI)**
Depression	1.5*(1.1-2.1)	1.8*(1.4-2.3)	0.9(0.6-1.3)	0.7(0.4-1.3)	1.3(0.7-2.5)
Panic	2.0*(1.6-2.4)	1.7*(1.5-1.9)	1.0(0.8-1.4)	1.4(0.9-2.2)	1.6*(1.1-2.3)
Generalized anxiety disorder	1.6*(1.2-2.0)	1.9*(1.5-2.3)	1.0(0.6-1.5)	0.4*(0.2-0.7)	2.2*(1.1-4.2)
Substance abuse	1.4*(1.2-1.8)	1.7*(1.5-2.0)	0.9(0.6-1.2)	0.6*(0.4-1.0)	1.2(0.8-1.9)
Antisocial behavior	1.9*(1.4-2.6)	1.8*(1.5-2.2)	0.9(0.6-1.3)	1.0(0.6-1.7)	2.2*(1.2-4.1)
Suicide	2.0*(1.0-4.2)	2.2*(1.4-3.4)	0.6(0.3-1.5)	1.7(0.3-11.3)	0.6(0.2-2.6)
Number of parental disorders [2]					
2	0.7*(0.5-1.0)	0.6*(0.5-0.8)	1.5(0.9-2.5)	1.3(0.7-2.5)	0.6(0.3-1.1)
3	0.3*(0.2-0.6)	0.4*(0.3-0.5)	1.4(0.6-3.0)	1.5(0.5-4.5)	0.3*(0.1-0.9)
4	0.3*(0.1-0.6)	0.1*(0.1-0.2)	1.9(0.6-6.0)	3.9(0.9-17.5)	-
5+	-	0.2*(0.1-0.4)	-	-	-

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

[1]Assessed in Part II sample due to having Part II controls. Models control for person years and demographic variables, significant interaction terms between person years and demographic variables, as well as for mental disorders in the offspring.

[2]For number of parental disorders, the last odds ratio represents the odd of the number or more. For example, for lifetime attempt, 4 represents 4 or more (i.e., 4+).

Table 6

Multivariate association between type and number of parental psychopathology with persistence of suicidal behavior[1]

	Suicide attempt among ideators	Suicide ideation	Suicide plan among ideators	Suicide attempt among ideators with plan	Suicide attempt among ideators without plan
Type of parental disorders	**OR(95%CI)**	**OR(95%CI)**	**OR(95%CI)**	**OR(95%CI)**	**OR(95%CI)**
Depression	1.1(0.6-2.2)	1.4*(1.1-1.8)	1.6*(1.0-2.6)	1.6(0.8-3.4)	0.6(0.1-2.8)
Panic	1.6*(1.1-2.3)	1.2*(1.0-1.4)	1.3(0.9-1.7)	1.9*(1.3-2.7)	1.2(0.6-2.2)
Generalized anxiety disorder	0.9(0.5-1.4)	1.0(0.7-1.3)	0.9(0.6-1.3)	1.1(0.6-2.1)	0.7(0.2-1.9)
Substance abuse	0.9(0.7-1.3)	1.0(0.8-1.2)	0.9(0.7-1.3)	1.0(0.7-1.6)	1.1(0.5-2.4)
Antisocial behavior	0.9(0.5-1.5)	1.1(0.8-1.6)	1.0(0.6-1.5)	1.0(0.5-2.0)	1.0(0.3-3.3)
Suicide	3.4*(1.0-11.5)	1.2(0.6-2.2)	2.9*(1.0-8.3)	5.4*(1.5-19.8)	-
Number of parental disorders [2]					
2	1.2(0.6-2.1)	1.0(0.7-1.3)	0.8(0.5-1.4)	0.8(0.4-1.5)	2.0(0.6-6.4)
3	0.7(0.2-2.2)	0.8(0.5-1.4)	0.5(0.2-1.2)	0.4(0.1-1.7)	1.5(0.2-12.7)
4	0.9(0.2-3.1)	0.9(0.4-1.8)	0.7(0.2-2.1)	0.4(0.1-1.6)	-
5+	-	0.5(0.2-1.2)	-	-	-

*OR significant at 0.05 level, two-sided test

[1]Models control for country differences, a set of age related variables (i.e., age, onset and time since onset), sex, educational attainment, marriage and mental disorders in the offspring.

[2]For number of parental disorders, the last odds ratio represents the odd of the number or more. For example, for suicide attempt among ideators, 4 represents 4 or more (i.e., 4+).