

Research report

Risk factors for the incidence and persistence of suicide-related outcomes: A 10-year follow-up study using the National Comorbidity Surveys[☆]

Guilherme Borges^{a,b}, Jules Angst^c, Matthew K. Nock^d,
Ayelet Meron Ruscio^f, Ronald C. Kessler^{f,*}

^a National Institute of Psychiatry, Mexico

^b Universidad Autonoma Metropolitana, Mexico City, Mexico

^c Zurich University Psychiatric Hospital, Zurich, Switzerland

^d Department of Psychology, Harvard University, Cambridge, MA, United States

^e Department of Psychology, University of Pennsylvania, Philadelphia, PA, United States

^f Department of Health Care Policy, Harvard Medical School, Boston, MA, United States

Received 31 October 2006; received in revised form 26 January 2007; accepted 31 January 2007

Available online 16 May 2007

Abstract

Background: We report prospective associations of baseline risk factors with the first onset and persistence of suicide-related outcomes (SROs; ideation, plans, gestures, and attempts) over a 10-year interval among respondents who participated in both the 1990–02 National Comorbidity Survey (NCS) and the 2000–02 National Comorbidity Survey follow-up (NCS-2).

Methods: A total of 5001 NCS respondents were re-interviewed (87.6% of baseline sample) in the NCS-2. Three sets of baseline (NCS) risk factors were considered as predictors of the first onset and persistence of SROs: socio-demographics, lifetime DSM-III-R disorders, and SROs.

Results: New onsets included 6.2% suicide ideation, 2.3% plan, 0.7% gesture, and 0.9% attempts. More than one-third of respondents with a baseline history of suicide ideation continued to have suicide ideation at some time over the intervening decade. Persistence was lower for other SROs. The strongest predictors of later SROs were baseline SROs. Prospective associations of baseline mental disorders with later SROs were largely limited to the onset and persistence of ideation.

Limitations: Although data were gathered prospectively, they were based on retrospective reports at both baseline and follow-up.

[☆] Address reprint requests to NCS Coordinator, Department of Health Care Policy, Harvard Medical School, 180 Longwood Avenue, Boston MA 02115; NCS@hcp.med.harvard.edu. Contributors: Guilherme Borges carried out the statistical analyses, collaborated in the literature review, wrote the first draft of the manuscript, and collaborated in revision of the manuscript. Jules Angst, Matthew Nock, and Ayelet Ruscio all collaborated in the literature review, interpretation of results, and revision of the manuscript. Ronald Kessler designed the study and collaborated in the interpretation of results and revision of the manuscript. Conflict of interest: Professor Kessler has been a consultant for Astra Zeneca, Bristol-Myers Squibb, Eli Lilly and Company, GlaxoSmithKline, Pfizer, and Wyeth and has had research support for his epidemiological studies from Bristol-Myers Squibb, Eli Lilly and Company, Ortho-McNeil, Pfizer, and the Pfizer Foundation. All other authors declare that they have no conflicts of interest.

* Corresponding author.

E-mail address: kessler@hcp.med.harvard.edu (R.C. Kessler).

Conclusions: Baseline history of SROs explained much of the association of mental disorders with later SROs. It is important clinically to note that many of the risk factors known to predict onset of SROs also predict persistence of SROs.

© 2007 Elsevier B.V. All rights reserved.

Keywords: Suicide, Suicide attempts, Mental disorder, Epidemiology, Prospective studies, Longitudinal research

Nonfatal suicide-related outcomes (SROs), including suicide ideation, plans, gestures, and attempts, are prevalent in the U.S. and around the world (Kessler et al., 1999; 2005; Moscicki, 1999; Nock & Kessler, 2006; WHO, 2005). Prior research has aimed at identifying risk factors that can be used to inform scientific understanding of this problem as well as clinical prediction and prevention efforts (e.g., Beautrais et al., 1996; Dilsaver et al., 1994; Goldstein et al., 1991; Gould et al., 1996; Kessler et al., 1999; Nock and Kessler, 2006; Shaffer et al., 1996). This prior work has been limited in several important ways. First, most studies used cross-sectional designs that restricted the inferences that could be drawn about temporal order between predictors and outcomes. Second, most studies, including the few that used prospective designs (e.g., Bourgeois et al., 2004; Kuo et al., 2001; Pokorny, 1983), relied on non-representative samples, limiting the generalizability of results. Third, virtually all prior studies focused on a limited range of SROs and failed to examine predictors of transitions among different SROs. The last of these limitations is especially important for clinical purposes, as clinicians often are faced with the task of determining the likelihood that a patient with suicide ideation subsequently will make a suicide plan or attempt.

This study addresses each of these limitations with data on the associations of baseline socio-demographics, SROs, and lifetime DSM-III-R mental disorders with the subsequent first onset and persistence of SROs over the 10-year interval among respondents who participated in both the 1990–02 National Comorbidity Survey (NCS) (Kessler et al., 1994) and the 2000–02 National Comorbidity Survey follow-up (NCS-2) (Kessler and Walters, 2002; Kessler et al., 2003).

1. Methods

1.1. Sample

The baseline NCS was a nationally representative survey of 8098 respondents ages 15–54 carried out between September 1990 and February 1992. Respondents were selected from a stratified, multistage area probability sample of US households as well as a supplemental sample of students living in campus housing. The response rate was 82.4%. Interviews were con-

ducted by professional survey interviewers and were administered in two parts. Part I included the core diagnostic interview and core correlates and was administered to all NCS respondents. Part II included additional disorders and risk factors and was administered to a probability sub-sample of 5877 respondents including (a) all respondents ages 15–24, (b) all others with any lifetime DSM-III-R disorder assessed in Part I, and (c) a random sub-sample of remaining Part I respondents. The Part II sample was weighted to adjust for differential probabilities of selection and for non-response bias (Kessler et al., 1995). Further details about the NCS design are reported elsewhere (Kessler et al., 1994).

The NCS-2 sought to trace and re-interview the Part II NCS respondents a decade after the baseline NCS. Of the original 5877 respondents, 5463 were successfully traced, of whom 166 were deceased. A total of 5001 respondents were re-interviewed, yielding a conditional response rate of 87.6%. The unconditional response rate, which takes into account the baseline NCS response rate of 82.4%, is 72.2% (0.876×0.824). NCS-2 respondents were assessed using an expanded version of the baseline NCS interview that asked about the onset, course, and severity of mental illness during the years between the two surveys. Relative to other baseline NCS respondents, NCS-2 respondents were significantly more likely to be female, well educated, and residents of rural areas. A propensity score adjustment weight (Rosenbaum and Rubin, 1983) was used to correct the NCS-2 sample for these discrepancies. Importantly, there was no difference between NCS-2 respondents and non-respondents in their reports of suicide-related outcomes at the baseline assessment ($\chi^2_6 = 7.08, p = .313$).

1.2. Measures of suicide-related outcomes

SROs were assessed using parallel questions in the NCS and NCS-2. At the baseline NCS assessment, respondents were asked about lifetime experiences of suicidal ideation (“Have you ever seriously thought about committing suicide?”), suicide plans (“Have you ever made a plan for committing suicide?”), and suicide attempts (“Have you ever attempted suicide?”). Because self-administered surveys have been shown to yield

higher rates of reporting of embarrassing behaviors than interviewer-administered surveys (Turner et al., 1998), these experiences were listed in a self-administered booklet and referred to by number (Events 13, 14, and 15) for respondents who were able to read. Respondents were asked whether each experience ever happened to them and, if so, the age of onset and recency of the experience. Those who reported “Event 15” (a suicide attempt) were presented with three statements and asked to identify the one that best described their experience: “1. I made a serious attempt to kill myself and it was only luck that I did not succeed; 2. I tried to kill myself but I knew the method was not fool-proof; 3. My attempt was a cry for help, I did not want to die.” In line with contemporary distinctions between suicidal and self-injurious behavior (see Nock and Kessler, 2006; O’Carroll et al., 1996; APA, 2003), respondents endorsing statements 1 or 2 were considered to have made a suicide attempt, whereas respondents endorsing statement 3 were considered to have made a suicide gesture.

At the NCS-2 assessment, respondents were asked a similar series of questions, this time focusing on the interval between the two surveys (“Did Experience [A or B or C] happen to you at any time since [NCS YEAR]?”) rather than on a lifetime assessment. We distinguished between new onsets (i.e., SROs at follow-up among those who denied ever having such experiences at baseline); and persistence (i.e., SROs at follow-up among respondents who also reported such experiences at baseline).

1.3. Risk factors

We considered three sets of risk factors, each assessed at the baseline NCS: socio-demographics, lifetime history of SROs, and lifetime history of DSM-III-R mental disorders. Socio-demographics included age, sex, race–ethnicity, marital status, employment status, religious affiliation, education, family income, and having/not having a young child. SROs included lifetime suicidal ideation, plans, gestures, and attempts, as well as years since first onset of ideation as of the baseline assessment.

DSM-III-R disorders included mood disorders (major depressive, bipolar I, and dysthymic disorders), anxiety disorders (panic disorder, agoraphobia without panic, social phobia, simple phobia, generalized anxiety disorder, post-traumatic stress disorder), substance use disorders (alcohol or other drug abuse or dependence), and antisocial spectrum disorders (conduct disorder and antisocial personality disorder as well as adult antisocial behavior). These lifetime disorders were assessed with a modified version of the World Health Organization Composite International Diagnostic Interview (CIDI) (WHO, 1990; Robins et al., 1988; Kessler et al., 1998).

1.4. Statistical analyses

Cross-tabulations were used to estimate cumulative incidence and persistence of SROs at the NCS-2 assessment. Multivariate logistic regression analysis (Hosmer and Lemeshow, 1989) was used to estimate prospective associations of assessed risk factors with suicidal ideation and, among ideators, with suicide plan, gesture, and attempt. Continuous variables were divided into categories to minimize effects of extreme values, and categories were combined to stabilize associations when odds ratios (OR’s) did not differ meaningfully. Standard errors and significance tests were estimated using the Taylor series method (Wolter, 1985) implemented in the SUDAAN software system (SUDAAN, 2002) to adjust for design effects. Multivariate significance was evaluated using Wald χ^2 tests based on design-corrected coefficient variance–covariance matrices. Statistical significance was evaluated using two-tailed .05-level tests.

2. Results

2.1. Cumulative incidence and persistence

At baseline, 13.3% (664 weighted cases) of the respondents who subsequently participated in the NCS-2 reported lifetime suicidal ideation, while 4.0% reported a lifetime suicide plan, 2.3% a suicide gesture, and 2.2% a

Table 1
Onset (cumulative incidence) and persistence of suicide-related outcomes in the NCS-2

	Onset since NCS			Persistence given NCS lifetime prevalence		
	<i>n</i> (unweighted)	<i>n</i> (weighted)	% (SE)	<i>n</i> (unweighted)	<i>n</i> (weighted)	% (SE)
Ideation	324/4104	269/4337	6.2 (0.5)	322/897	232/664	35.0 (1.8)
Plan	147/4736	108/4800	2.3 (0.2)	50/265	43/201	21.2 (3.2)
Gesture	41/4858	34/4888	0.7 (0.2)	14/143	12/112	10.8 (0.9)
Attempt	65/4845	45/4889	0.9 (0.1)	19/156	17/112	15.4 (3.4)

Table 2
Baseline socio-demographics and lifetime SROs as predictors of suicide ideation, plans, gestures and attempts in the NCS-2^a

	Total sample			Among NCS-2 lifetime suicidal ideators								
	Ideation			Plan			Gesture			Attempt		
	646/5001			197/1221			55/1221			84/1221		
	OR	(95% CI)	χ^2	OR	(95% CI)	χ^2	OR	(95% CI)	χ^2	OR	(95% CI)	χ^2
Baseline age												
15–24	1.3 *	(1.0–1.8)		1.3	(0.8–2.2)		2.4 *	(1.0–6.0)		1.1	(0.5–2.4)	
25–55	1.0			1.0			1.0			1.0		
Sex												
Female	1.2	(0.9–1.6)		1.3	(0.9–1.9)		2.6	(0.9–7.6)		1.0	(0.6–1.6)	
Male	1.0			1.0			1.0			1.0		
Race/ethnicity			12.21 *			7.82 *			1.51			2.28
Non-Hispanic White	1.0			1.0			1.0			1.0		
Non-Hispanic Black	0.6 *	(0.4–0.8)		1.1	(0.5–2.2)		0.6	(0.1–2.9)		1.6	(0.8–3.7)	
Hispanic	1.0	(0.7–1.5)		0.6	(0.3–1.2)		1.1	(0.5–2.5)		0.7	(0.2–2.5)	
Other	1.4	(0.7–2.7)		0.4	(0.2–1.1)		0.4	(0.0–3.7)		0.8	(0.2–4.3)	
Baseline marital status			21.65 *			1.57			2.33			0.87
Married or cohabiting	1.0			1.0			1.0			1.0		
Previously married	1.9 *	(1.4–2.5)		0.8	(0.5–1.3)		0.4	(0.1–1.4)		1.2	(0.7–2.1)	
Never married	1.3	(0.8–1.9)		1.3	(0.7–2.3)		0.6	(0.1–2.7)		1.5	(0.6–4.1)	
Baseline employment status			41.74 *			3.12			1.93			1.72
Working or student	1.0			1.0			1.0			1.0		
Homemaker	1.0	(0.6–1.5)		1.9	(0.9–3.9)		1.5	(0.6–3.9)		0.8	(0.2–3.5)	
Other	2.7 *	(1.9–3.7)		1.1	(0.6–2.1)		1.4	(0.6–3.4)		1.6	(0.7–3.7)	
Baseline education			3.10			2.67			2.62			14.14 *
0–11 years	1.0	(0.7–1.5)		0.7	(0.3–1.4)		1.7	(0.6–4.8)		1.6	(0.5–4.8)	
12 years	0.8	(0.6–1.2)		0.7	(0.4–1.2)		0.9	(0.3–2.1)		0.7	(0.3–1.8)	
13–15 years	1.1	(0.8–1.5)		0.8	(0.5–1.4)		1.3	(0.5–3.9)		2.3	(0.9–5.6)	
16 and more	1.0			1.0			1.0			1.0		
Baseline poverty level												
Poverty	1.2	(0.9–1.6)		1.0	(0.6–1.7)		1.8	(0.8–3.9)		0.9	(0.3–2.5)	
All others	1.0			1.0			1.0			1.0		
Baseline parenting status			19.74 *			2.48			10.88 *			6.68 *
No young child	1.0			1.0			1.0			1.0		
Child 0–4 years old	1.7 *	(1.3–2.4)		1.1	(0.6–1.9)		0.7	(0.2–1.8)		1.1	(0.5–2.6)	
Child 5–12 years old	1.7 *	(1.2–2.5)		1.5	(0.9–2.5)		3.0 *	(1.2–7.3)		0.4 *	(0.2–1.0)	
Religion			5.63			8.27 *			4.28			3.73
Protestant	1.0			1.0			1.0			1.0		
Catholic	0.9	(0.7–1.1)		0.6 *	(0.3–1.0)		1.5	(0.7–3.3)		0.6	(0.3–1.4)	
Other	1.4	(0.9–2.3)		1.1	(0.5–2.7)		1.5	(0.5–5.2)		0.5	(0.1–2.6)	
No preference	1.3	(0.8–2.1)		1.1	(0.5–2.7)		0.4	(0.1–1.4)		1.5	(0.8–3.0)	
Baseline lifetime suicide ideation	13.4 *	(10.5–17.2)		0.4 *	(0.3–0.8)		0.7	(0.3–1.8)		0.2 *	(0.1–0.5)	
Baseline years ($\times 10$) since first ideation	0.3 *	(0.2–0.4)		0.8 *	(0.6–0.9)		0.8	(0.5–1.3)		0.9	(0.7–1.2)	
Baseline lifetime suicide plan				2.8 *	(1.5–5.3)		2.5 *	(1.0–6.5)		1.1	(0.5–2.6)	
Baseline lifetime suicide gesture							2.5	(0.8–7.9)		2.4	(0.7–8.4)	
Baseline lifetime suicide attempt							1.5	(0.4–5.2)		8.8 *	(3.2–24.6)	

^a Odds ratios (OR) from logistic regression coefficients. The 95% Confidence Interval (95% CI) were obtained using the Taylor series linearization method.

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

suicide attempt. The vast majority of baseline respondents (4337 weighted cases) denied ever having any SRO. During the intervening decade, 6.2% of the respondents who previously denied any lifetime SRO reported a first onset of ideation, while 2.3% reported a first suicide plan, 0.7% a first suicide gesture, and 0.9% a first suicide attempt (Table 1). Of the 664 respondents with a lifetime history of suicidal ideation at baseline, 35.0% also reported ideation during the follow-up period. The persistence of suicide plans (21.2%), gestures (10.8%), and attempts (15.4%) was lower, but still substantial in light of the low base rates of these behaviors.

2.2. Effects of risk factor

The baseline risk factors considered here were found generally not to differ in their associations with first onset and persistence of SROs. As a result, only pooled results are presented here. (Results disaggregated by onset and persistence are available on request.) For the socio-demographics, the only exception to the above statement is age. The youngest respondents (ages 15–24 at baseline) were significantly more likely than older respondents to report a subsequent first onset of ideation in the NCS-2 (OR=2.2, 95% Confidence Interval [CI]=1.7–2.8) but less likely than older respondents to report

Table 3
Mental disorders at baseline NCS as predictors of suicide ideation, plans, gestures and attempts in the NCS-2^a

	Total sample		Among NCS-2 lifetime suicidal ideators					
	Ideation		Plan		Gesture		Attempt	
	646/5001		197/1221		55/956		84/1221	
	OR	(95% CI)	OR	(95% CI)	OR	(95% CI)	OR	(95% CI)
Mood disorders								
Major depressive	1.4 *	(1.0–1.9)	1.2	(0.8–1.9)	1.1	(0.5–2.3)	1.0	(0.5–2.0)
Bipolar	1.5	(0.7–3.0)	2.1	(0.9–4.8)	0.9	(0.2–3.2)	0.4	(0.1–1.9)
Dysthymia	1.9 *	(1.1–3.3)	1.0	(0.5–2.0)	0.9	(0.3–3.5)	1.0	(0.2–3.8)
Any mood disorder	1.6 *	(1.2–2.0)	1.5 *	(1.0–2.2)	1.1	(0.6–2.1)	0.9	(0.5–1.8)
Anxiety disorders								
Panic disorder	2.1 *	(1.4–3.3)	1.6	(0.9–2.6)	1.8	(0.8–4.0)	0.7	(0.2–2.2)
Agoraphobia without panic	1.3	(0.8–2.1)	1.4	(0.7–2.6)	1.6	(0.7–3.3)	0.6	(0.2–1.4)
Social phobia	1.6 *	(1.2–2.2)	1.4	(0.9–2.3)	1.0	(0.5–2.2)	1.0	(0.6–1.9)
Simple phobia	1.6 *	(1.0–2.4)	1.3	(0.9–1.9)	1.0	(0.4–2.4)	0.7	(0.3–1.5)
Generalized anxiety disorder	2.1 *	(1.4–3.1)	1.9 *	(1.1–3.3)	1.3	(0.4–4.2)	0.5	(0.2–1.2)
Post-traumatic stress disorder	1.8 *	(1.1–2.8)	1.3	(0.8–2.1)	0.8	(0.3–1.9)	1.1	(0.4–2.9)
Any anxiety disorder	1.7 *	(1.3–2.2)	1.4	(0.9–2.0)	0.7	(0.3–1.4)	0.8	(0.4–1.7)
Substance disorder								
Alcohol abuse	1.0	(0.7–1.4)	0.7	(0.4–1.4)	0.2 *	(0.1–0.7)	1.2	(0.5–3.0)
Alcohol dependence	1.5 *	(1.0–2.1)	1.5 *	(1.0–2.2)	1.3	(0.7–2.5)	1.1	(0.6–2.1)
Alcohol abuse/dependence	1.3 *	(1.0–1.8)	1.2	(0.8–1.8)	0.9	(0.5–1.6)	1.2	(0.6–2.3)
Drug abuse	1.4	(0.8–2.3)	1.5	(0.7–3.2)	1.4	(0.3–6.3)	0.9	(0.3–3.0)
Drug dependence	1.9 *	(1.3–2.8)	0.9	(0.6–1.6)	0.9	(0.4–1.8)	1.3	(0.6–2.7)
Drug abuse/dependence	1.8 *	(1.2–2.5)	1.1	(0.7–1.8)	1.0	(0.5–2.1)	1.2	(0.6–2.3)
Any substance disorder	1.6 *	(1.2–2.2)	1.1	(0.7–1.7)	0.9	(0.5–1.7)	1.1	(0.6–2.3)
Impulse-control disorders								
Adult antisocial behavior	1.7 *	(1.0–2.8)	1.6 *	(1.1–2.6)	0.9	(0.4–2.3)	1.2	(0.5–2.4)
Conduct disorder	1.7 *	(1.2–2.3)	1.4	(0.8–2.4)	0.5	(0.2–1.3)	1.3	(0.7–2.4)
Antisocial personality disorder	1.9 *	(1.0–3.6)	1.7	(1.0–3.1)	1.3	(0.5–3.7)	1.2	(0.4–3.1)
Any disorder	1.8 *	(1.3–2.6)	1.3	(0.7–2.2)	0.7	(0.3–1.7)	0.8	(0.3–1.9)
Exactly one disorder	1.4 *	(0.9–2.1)	1.1	(0.5–2.4)	0.7	(0.2–2.5)	0.8	(0.3–2.1)
Exactly two disorders	1.7 *	(1.1–2.7)	1.6	(0.7–3.2)	0.5	(0.2–1.4)	0.7	(0.2–2.3)
Three or more disorders	2.6 *	(1.8–3.9)	1.7	(0.9–3.2)	0.6	(0.3–1.6)	0.9	(0.4–2.4)
χ^2_b	26.57 *		5.31		2.01		0.82	

^a Odds ratios (OR) from logistic regression coefficients. The 95% Confidence Interval (95% CI) were obtained using the Taylor series linearization method. Based on separate multivariate logistic regression equations for each DSM-III-R disorder and a single equation for number of disorders, controlling for baseline demographics and the baseline SROs in Table 2.

^b The χ^2_3 test evaluates the significance of a count of number of lifetime baseline disorders (1, 2, 3+) predicting NCS-2 outcomes.

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

persistence of ideation (OR=0.5, 95% CI=0.3–0.8). The few mental disorders that differentially predicted first onset and persistence were inconsistent across different SROs.

2.2.1. Socio-demographic predictors

The strongest prospective socio-demographic predictor of suicidal ideation is “other” employment status (OR=2.7), which consists largely of the disabled and otherwise unemployed. (Table 2) Other significant predictors (OR’s in parentheses) include being younger than 25 years (1.3), Non-Hispanic Black race–ethnicity (0.6), previously married (1.9), and the parent of a young child (1.7). Only a few socio-demographics predict SROs among NCS-R ideators: Catholic religious affiliation predicts suicide plan (0.6); being younger than 25 years predicts suicide gestures (2.4); having a young child predicts suicide gesture (3.0) and attempts (0.4).

2.2.2. Baseline SROs

By far the strongest predictor of suicidal ideation at follow-up (OR’s in parentheses) is a history of prior ideation (13.4). Prior ideation is negatively related, though, to plan (0.4) and attempt (0.2) at follow-up. With increasing years since first onset of ideation, the risk of subsequent ideation (0.3) and plan (0.8) decreases. In contrast, prior suicide planning is associated with higher risk of subsequent suicide plan (2.8) and gesture (2.5). Prior gesture is meaningfully related to subsequent gesture [2.5 (95% CI=0.8–7.9)] and attempt [2.4 (95% CI=0.7–8.4)], although neither association is statistically significant. Only a history of prior suicide attempt is significantly and positively related to future suicide attempt (8.8).

2.2.3. Baseline lifetime DSM-III-R disorders

Nearly all baseline lifetime DSM-III-R disorders significantly and positively predict suicidal ideation at follow-up, even after controlling for baseline socio-demographics and SROs (Table 3). OR’s for individual disorders are in the range 1.0–2.1, with odds of subsequent ideation increasing monotonically with number of disorders ($\chi^2=26.6$, $p<.001$). In contrast, mental disorders among ideators do not consistently predict subsequent suicide plan, with only three disorders significant and the monotonic relationship and number of disorders no longer significant ($\chi^2=5.3$, $p=.151$). Neither individual disorders nor number of disorders significantly predicts subsequent gesture or attempt. It should be noted that this lack of significance is not due merely to the reduced statistical power to predict the rarer outcomes, as inspection of OR’s shows that the associations of baseline disorders with subse-

quent plans and especially gestures and attempts are substantially weaker than with ideation.

Further analyses (results not shown, but available on request) showed that the 15 baseline mental disorders, when considered as a set, have substantially stronger associations with subsequent SROs in models that do not control for baseline SROs than in models that do control for baseline SROs. Furthermore, after controlling for baseline SROs number of baseline disorders is consistently more important than types of disorders in predicting subsequent SROs. No consistent differences in the OR’s associated with baseline disorders were found in analyses that examined predictive associations separately in sub-samples defined on the basis of age of onset, duration, severity, or recency of disorder.

3. Discussion

These results are limited in four important ways. First, although data were gathered prospectively, they were based on retrospective reports at both baseline and follow-up. Respondents may have forgotten events, made errors regarding the timing of events, or may have been biased by current mood states at the time of the interviews. If such factors played a role they are most likely to have led to an underestimate of the incidence of suicide-related outcomes. Second, although we examined a wide range of risk factors measured during the baseline interviews, we were unable to carefully assess changes in these factors (such as marriage, or onset of a new mental disorder) over the 10-year follow-up period. Future studies in this area would be strengthened with the use of more frequent assessment and the examination of if and how changes in these constructs influence subsequent suicide-related outcomes. Third, several study constructs, including the presence of each suicide-related outcome, were assessed using single items. The single NCS item used to distinguish suicide gestures from attempts, in particular, doubtlessly yielded a less accurate classification of intent than one based on clinical assessment. Fourth, we considered only a restricted set of self-injurious behaviors and DSM-IV disorders. We did not examine non-suicidal self-injury (i.e., self-mutilation) (Nock and Prinstein, 2005) and several mental disorders known to be associated with suicide-related outcomes (e.g., schizophrenia; Hawton et al., 2005). Each of these limitations restricts the inferences that can be drawn from this study and represents areas for improvement in future studies.

These limitations notwithstanding, the study provides important information about the incidence and persistence of suicide-related outcomes. Our estimates

of new onsets of suicide ideation (6.2%), plan (2.3%), gesture (0.7%), and attempt (0.9%) during the 10-year time interval between the two surveys are consistent with estimates from prior studies using similar time frames (Kuo et al., 2001; Sareen et al., 2005; Wang and Mortensen, 2006), but extend these earlier studies by using nationally representative data and by examining a broader range of suicide-related outcomes (i.e., suicide plans and gestures). Importantly, more than one-third of the respondents who reported a history of suicide ideation at baseline continued to experience suicide ideation during the follow-up period. The other SROs also persisted during follow-up for a sizeable minority of cases. Interestingly, we found that the factors associated with SRO persistence were very similar to the ones related to new onsets. This is an important finding for both scientists and clinicians as it suggests that many of the risk factors known to predict the onset of SROs in prior studies will be useful in predicting the continuation of these outcomes over time.

Many of the findings from the risk factor analyses are consistent with prior research on the prediction of SROs; however, several aspects of these results merit further comment. The finding that the presence of a young child in the home is associated with a decreased risk of suicide attempt is consistent with prior work on this topic (Marzuk et al., 1997; Qin and Mortensen, 2003). However, our results show that this same factor is also associated with a significantly *increased* risk of suicide ideation and of suicide gesture among ideators. This finding underscores the high levels of stress that can be associated with having young children in the home (Abidin and Wilfong, 1989), suggests a need for increased monitoring and prevention efforts aimed at parents of young children, and highlights the importance of examining distinct types of suicide-related outcomes when attempting to predict such outcomes.

Our results support and extend the well-documented finding among both adults (Brown et al., 2000; Goldstein et al., 1991; Moscicki, 1997, 1999) and adolescents (Nock and Kazdin, 2002) that the strongest predictor of SROs is past history of the same outcomes. Beyond replicating this result, we found that a prior history of suicide ideation predicts subsequent ideation, but that history of suicide ideation in the absence of a plan or attempt is *negatively* related to subsequent risk of suicide plan and attempt. Only prior history of a suicide plan is associated with subsequent plan and gestures, and only prior history of a suicide attempt is associated with subsequent risk of suicide attempt. In other words, a history of not acting on suicide ideation is a significant predictor of continuing not to do so. This

finding is consistent with our previous work based on cross-sectional analysis (Kessler et al., 1999; Borges et al., 2006). This consistent finding provides empirical support for the clinical view that persistent suicide ideation in the absence of making suicide plans or attempts does not increase the risk of suicide plans and attempts, and may actually decrease such risk.

Our results regarding the considerably weaker associations of baseline mental disorders with subsequent plans, gestures, and attempts than with ideation suggest that the effects of mental disorders on SROs are largely mediated by effects on ideation and that the determinants of the transition from ideation to plans, gestures, and attempts are controlled by other factors. It is interesting to note in this regard that our finding that the predictive effects of baseline mental disorders on subsequent SROs become substantially smaller when baseline SROs are controlled suggests that mental disorders are important risk factors for SROs at least partly because earlier SROs were associated with those baseline disorders. This pattern is indirectly consistent with the finding that within-episode SROs have considerable consistency across depressive episodes (Williams et al., 2006) and raises the possibility that the same consistency might also exist for other disorders. But this possibility fails to account for the initial onset of SROs and, importantly, for the transition from ideation to plans, gestures, and attempts. It is clear from our results that these critical transitions are controlled by factors other than those examined here. The determinants of these transitions would seem to be the most important focus for future research.

Acknowledgements

The National Comorbidity Survey Replication (NCS-R) is supported by NIMH (U01-MH60220) with supplemental support from the National Institute on Drug Abuse (NIDA), the Substance Abuse and Mental Health Services Administration (SAMHSA), the Robert Wood Johnson Foundation (RWJF; Grant 044780), and the John W. Alden Trust. Collaborating NCS-R 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 (New York State Psychiatric Institute, College of Physicians and Surgeons of Columbia University), 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; Technical University of Dresden). NCS-2 is funded by National Institute of Drug Abuse (NIDA) grant DA12058, with supplemental support from NIMH. 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 National Institute of Mental Health (R01 MH070884), the John D. and Catherine T. MacArthur Foundation, the Pfizer Foundation, the US Public Health Service (R13-MH066849, R01-MH069864, and R01 DA016558), the Fogarty International Center (FIRCA R03-TW006481), the Pan American Health Organization, Eli Lilly and Company, Ortho-McNeil Pharmaceutical, Inc., GlaxoSmithKline, and Bristol-Myers Squibb. A complete list of WMH publications can be found at <http://www.hcp.med.harvard.edu/wmh/>.

References

- Abidin, R.R., Wilfong, E., 1989. Parenting stress and its relationship to child health care. *Child Health Care* 18, 114–116.
- American Psychiatric Association, 2003. Practice guideline for the assessment and treatment of patients with suicidal behaviors. *Am. J. Psychiatry* 160, 1–60.
- Beautrais, A.L., Joyce, P.R., Mulder, R.T., Fergusson, D.M., Deavoll, B.J., Nightingale, S.K., 1996. Prevalence and comorbidity of mental disorders in persons making serious suicide attempts: a case-control study. *Am. J. Psychiatry* 153, 1009–1014.
- Borges, G., Angst, J., Nock, M.K., Ruscio, A.M., Walters, E.E., Kessler, R.C., 2006. A risk index for 12-month suicide attempts in the National Comorbidity Survey Replication (NCS-R). *Psychol. Med.* 36, 1747–1757.
- Bourgeois, M., Swendsen, J., Young, F., Amador, X., Pini, S., Cassano, G.B., Lindenmayer, J.P., Hsu, C., Alphas, L., Meltzer, H.Y., 2004. Awareness of disorder and suicide risk in the treatment of schizophrenia: results of the international suicide prevention trial. *Am. J. Psychiatry* 161, 1494–1496.
- Brown, G.K., Beck, A.T., Steer, R.A., Grisham, J.R., 2000. Risk factors for suicide in psychiatric outpatients: a 20-year prospective study. *J. Consult. Clin. Psychol.* 68, 371–377.
- Dilsaver, S.C., Chen, Y.W., Swann, A.C., Shoab, A.M., Krajewski, K.J., 1994. Suicidality in patients with pure and depressive mania. *Am. J. Psychiatry* 151, 1312–1315.
- Goldstein, R.B., Black, D.W., Nasrallah, A., Winokur, G., 1991. The prediction of suicide. Sensitivity, specificity, and predictive value of a multivariate model applied to suicide among 1906 patients with affective disorders. *Arch. Gen. Psychiatry* 48, 418–422.
- Gould, M.S., Fisher, P., Parides, M., Flory, M., Shaffer, D., 1996. Psychosocial risk factors of child and adolescent completed suicide. *Arch. Gen. Psychiatry* 53, 1155–1162.
- Hawton, K., Sutton, L., Haw, C., Sinclair, J., Deeks, J.J., 2005. Schizophrenia and suicide: systematic review of risk factors. *Br. J. Psychiatry* 187, 9–20.
- Hosmer, D.W., Lemeshow, S., 1989. *Applied Logistic Regression*. Wiley & Sons, New York, NY.
- Kessler, R.C., Walters, E.E., 2002. The National Comorbidity Survey. In: Tsang, M.T., Tohen, M. (Eds.), *Textbook in Psychiatric Epidemiology*. 2nd ed. John Wiley & Sons, New York, NY, pp. 343–362.
- Kessler, R.C., McGonagle, K.A., Zhao, S., Nelson, C.B., Hughes, M., Eshleman, S., Wittchen, H-U., Kendler, K.S., 1994. Lifetime and 12-month prevalence of DSM-III-R psychiatric disorders in the United States: results from the National Comorbidity Survey. *Arch. Gen. Psychiatry* 51, 8–19.
- Kessler, R.C., Little, R.J., Groves, R.M., 1995. Advances in strategies for minimizing and adjusting for survey nonresponse. *Epidemiol. Rev.* 17, 192–204.
- Kessler, R.C., Wittchen, H.U., Abelson, J.M., McGonagle, K.A., Schwarz, N., Kendler, K.S., Knäuper, B., Zhao, S., 1998. Methodological studies of the Composite International Diagnostic Interview (CIDI) in the US National Comorbidity Survey. *Int. J. Methods Psychiatr. Res.* 7, 33–55.
- Kessler, R.C., Borges, G., Walters, E.E., 1999. Prevalence of and risk factors for lifetime suicide attempts in the National Comorbidity Survey. *Arch. Gen. Psychiatry* 56, 617–626.
- Kessler, R.C., Merikangas, K.R., Berglund, P., Eaton, W.W., Koretz, D.S., Walters, E.E., 2003. Mild disorders should not be eliminated from the DSM-V. *Arch. Gen. Psychiatry* 60, 1117–1122.
- Kessler, R.C., Berglund, P., Borges, G., Nock, M., Wang, P.S., 2005. Trends in suicide ideation, plans, gestures, and attempts in the United States, 1990–1992 to 2001–2003. *JAMA* 293, 2487–2495.
- Kuo, W.H., Gallo, J.J., Tien, A.Y., 2001. Incidence of suicide ideation and attempts in adults: the 13-year follow-up of a community sample in Baltimore, Maryland. *Psychol. Med.* 31, 1181–1191.
- Marzuk, P.M., Tardiff, K., Leon, A.C., Hirsch, C.S., Portera, L., Hartwell, N., Iqbal, M.I., 1997. Lower risk of suicide during pregnancy. *Am. J. Psychiatry* 154, 122–123.
- Moscicki, E.K., 1997. Identification of suicide risk factors using epidemiologic studies. *Psychiatr. Clin. North Am.* 20, 499–517.
- Moscicki, E.K., 1999. Epidemiology of suicide. In: Jacobs, D.G. (Ed.), *The Harvard Medical School Guide to Suicide Assessment and Intervention*. Jossey-Bass, San Francisco, CA, pp. 40–51.
- Nock, M.K., Kazdin, A.E., 2002. Examination of affective, cognitive, and behavioral factors and suicide-related outcomes in children and young adolescents. *J. Clin. Child. Adolesc. Psychol.* 31, 48–58.
- Nock, M.K., Kessler, R.C., 2006. Prevalence of and risk factors for suicide attempts versus suicide gestures: analysis of the National Comorbidity Survey. *J. Abnorm. Psychol.* 115, 616–623.
- Nock, M.K., Prinstein, M.J., 2005. Clinical features and behavioral functions of adolescent self-mutilation. *J. Abnorm. Psychol.* 114, 140–146.
- O’Carroll, P.W., Berman, A.L., Maris, R., Moscicki, E., 1996. Beyond the tower of Babel: a nomenclature for suicidology. *Suicide Life-Threat. Behav.* 26, 237–252.
- Pokorny, A.D., 1983. Prediction of suicide in psychiatric patients. Report of a prospective study. *Arch. Gen. Psychiatry* 40, 249–257.

- Qin, P., Mortensen, P.B., 2003. The impact of parental status on the risk of completed suicide. *Arch. Gen. Psychiatry* 60, 797–802.
- Robins, L.N., Wing, J., Wittchen, H-U., Helzer, J.E., Babor, T.F., Burke, J., Farmer, A., Jablenski, A., Pickens, R., Regier, D.A., Sartorius, N., Towle, L.H., 1988. The Composite International Diagnostic Interview: an epidemiologic instrument suitable for use in conjunction with different diagnostic systems and in different cultures. *Arch. Gen. Psychiatry* 45, 1069–1077.
- Rosenbaum, P.R., Rubin, D.B., 1983. The central role of the propensity score in observational studies for causal effects. *Biometrika* 70, 41–55.
- Sareen, J., Cox, B.J., Affi, T.O., de Graaf, R., Asmundson, G.J., ten Have, M., Stein, M.B., 2005. Anxiety disorders and risk for suicidal ideation and suicide attempts: a population-based longitudinal study of adults. *Arch. Gen. Psychiatry* 62, 1249–1257.
- Shaffer, D., Gould, M.S., Fisher, P., Trautman, P., Moreau, D., Kleinman, M., Flory, M., 1996. Psychiatric diagnosis in child and adolescent suicide. *Arch. Gen. Psychiatry* 53, 339–348.
- SUDAAN, 2002. Professional Software for Survey Data Analysis [Computer Program]. Version 8.01. Research Triangle Institute, Research Triangle Park, NC.
- Turner, C.F., Ku, L., Rogers, S.M., Lindberg, L.D., Pleck, J.H., Sonenstein, F.L., 1998. Adolescent sexual behavior, drug use, and violence: increased reporting with computer survey technology. *Science* 280, 867–873.
- Wang, A.G., Mortensen, G., 2006. Core features of repeated suicidal behaviour. A long-term follow-up after suicide attempts in a low-suicide-incidence population. *Soc. Psychiatry Psychiatr. Epidemiol.* 41, 103–107.
- Williams, J.M., Crane, C., Barnhofer, T., Van der Does, A.J., Segal, Z.V., 2006. Recurrence of suicidal ideation across depressive episodes. *J. Affect. Disord.* 91, 189–194.
- Wolter, K., 1985. *Introduction to Variance Estimation*. Springer-Verlag, New York, NY.
- World Health Organization, 1990. Composite International Diagnostic Interview (CIDI), Version 1.0. World Health Organization, Geneva, Switzerland.
- World Health Organization, 2005. World Health Organization: Suicide Prevention. Retrieved 2005 October 26, from http://www.who.int/mental_health/prevention/suicide/suicideprevent/en/.