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Understanding Suicide Risk: Identification of High Risk Groups during High Risk Times

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Abstract

Background—The assessment of suicide risk is a complex task for mental health professionals. Certain demographic groups are associated with completed suicide including males, divorced adults, and Caucasians. However, demographic variables alone provide a crude assessment of suicide risk. Psychiatric diagnosis and recent life events may improve the identification of high risk individuals.

Method—The current study evaluated 148 individuals who died by suicide compared to 257 adults who died suddenly from accidents or medical problems. Psychological autopsy was used to assess Axis I psychiatric diagnosis and recent stressful life events.

Results—Suicide completers were significantly more likely than comparison subjects to have a depressive disorder, a substance abuse disorder, and to have experienced interpersonal conflict in the months leading up to their death. A discriminant function analysis revealed that the combination of demographic variables, recent stressful life events, and psychiatric diagnoses best discriminated between suicide completers and comparison subjects.

Conclusions—Proper assessment of suicide risk should include a comprehensive evaluation of demographic characteristics, recent life stressors, and psychiatric diagnosis.

Keywords

suicide; prevention; psychological autopsy; stressful life events

Understanding Suicide Risk: Identification of High Risk Groups during High Risk Times

The prediction of suicide remains a complex and difficult task. Adequate approaches to suicide assessment integrate a constellation of personal demographics, psychiatric symptoms, and situational factors (Packman, Marlitt, Bongar, & Pennuto, 2004). Although psychiatric diagnosis is important to understanding suicide risk, many patients with psychiatric disorders never attempt or complete suicide. Demographic variables and life events should also be evaluated (Mann, 2003) in order to understand the interpersonal context and situational triggers that may elicit a suicidal crisis. In a study examining suicide completers, a precipitating event was identified in almost all cases (Maltsberger, Hendin, Haas, & Lipschitz, 2003). Evaluating stressful life events can help to explain why the suicidal crisis unfolds at a specific moment in time.

The study of suicide risk has explored a wide variety of social, biological, and psychological factors. Certain factors may reflect a long-standing risk, whereas other variables may

represent current distress (Rudd et al., 2006). Thus, a combination approach appears to be most useful for identifying individuals who may be at current risk of suicidal behavior. Proposed models of suicide assessment often include a comprehensive list of risk factors. However, many studies evaluate risk factors in suicide attempters instead of suicide completers. Data gathered on suicide attempters cannot always be generalized to suicide completers (Dejong, Overholser, & Stockmeier, 2010). It seems essential to empirically validate risk factors with samples of individuals who have died by suicide.

The present study examines an empirical approach to suicide assessment that includes demographic factors, recent stressful life events, and current psychiatric diagnoses that may be related to suicide risk. The present study builds upon a diathesis-stress model (Mann, Waternaux, Haas, & Malone, 1999), by conceptualizing the stressor as a significant life event instead of a form of psychiatric illness. Thus, demographic factors set the stage by identifying groups who may be at risk for experiencing a suicidal crisis. For example, unmarried elderly white males are at increased risk of suicidal behavior. However, each demographic predictor (i.e., marital status, age, race, gender) used alone tends to be weak and imprecise, and results in a high rate of false positive prediction errors. Then, stressful life events may play a central role in explaining why a suicidal crisis has occurred at a specific point in time. For example, there is an increase risk of suicidal behavior in the months following an important loss, such as recently after a divorce or death of a loved one (Hall, Platt, & Hall, 1999). The stressful life event may serve as the breaking point that acts upon a person's pre-existing vulnerabilities. Thus, precipitating events play a pivotal role in the process whereby the situation deteriorates from a dormant state of long-term risk into an acute suicidal crisis (Maltsberger, Hendin, Haas, & Lipschitz, 2003). Finally, psychiatric symptoms (e.g., depression, addiction) may reflect the manner in which a person displays their excessive strain and emotional distress. The combination of demographic factors with psychiatric symptoms reveals a substantial vulnerability to suicide and the assessment can help to guide early intervention for suicidal individuals (Williams & Pollack, 1993).

Demographic Characteristics

Unmarried, elderly, males are often believed to be the demographic group at highest risk of completed suicide. Although females are more likely than males to attempt suicide (Nock et al., 2008), males are more likely than females to die by suicide (Beautrais, 2001), even if it is their first suicidal act (Isometsa & Lonnqvist, 1998). Suicide completers are more likely than individuals who make a serious suicide attempt to be of older age (Beautrais, 2001). Even though adolescence is a high-risk period for suicide attempts, individuals aged from mid 50's to early 60's were 41% more likely to die by suicide than youths between the ages of 15 and 24 (Kposowa, 2000). Elevated suicide risk has been associated with being widowed (Borges et al., 2006; Robertson et al., 2008), and separated or divorced (Kposowa, 2000). The negative effect of divorce, separation, and widowhood on suicide risk has been found in 12 developing countries (Cutright, Stack, & Fernquist, 2006). Demographic variables alone provide a preliminary but crude assessment of suicide risk. Other variables, such as life stressors and psychiatric diagnoses, are needed to expand the model and improve the identification of high risk groups.

Stressful Life Events

Precipitating events help to explain what compels high risk individuals to commit suicide. Stressful life events are significantly more common among suicide completers than living controls (Khan, Mahmud, Karim, Zaman, & Prince, 2008). Furthermore, negative life events are related to intense and persistent suicidal crises (Joiner & Rudd, 2000). A variety of stressful, negative life events may serve as situational triggers for suicide. Prolonged illness, financial stress, and relationship problems are typical stressors experienced by individuals

who make serious suicide attempts (Hall, Platt, & Hall, 1999) and individuals who have died by suicide (Bastia & Kar, 2009; Bhatia, Verma, & Murty, 2006). Suicide completers are more likely than attempters to have poor social support (Innamorati et al., 2008). Suicide risk in bereaved individuals is high in the months after losing loved one (Ajdacic-Gross et al., 2008). Job loss is a critical factor that heightens suicide risk (Chen, et al., 2006; Khan, et al., 2008). Unemployment was the strongest socio-demographic predictor of eventual death by suicide in a large-scale prospective study of psychiatric outpatients (Brown, Beck, Steer, & Grisham, 2000). A comprehensive assessment of suicide risk should include an evaluation of recent life stressors.

Psychiatric Diagnosis

Approximately 80–90% of individuals who die by suicide meet criteria for a psychiatric disorder (Arato, Demeter, Rihmer, & Somogyi, 1988; Cavanagh, Carson, Sharpe, & Lawrie, 2003). A 10-year follow-up study revealed that mental illness predicts future suicidal behaviors including ideation, plans, gestures, and attempts even after controlling for demographic factors (Borges, Angst, Nock, Ruscio, & Kessler, 2008).

Mood disorders are commonly observed in suicide completers. Depression and bipolar depression are the most typical psychiatric disorders present among suicide completers (Chen et al., 2006; Khan, Mahmud, Karim, Zaman, & Prince, 2008). In addition, among patients with a past suicide attempt, the risk of eventual death by suicide is ten times greater for alcoholics compared to non-alcoholics (Beck & Steer, 1989). Alcohol dependence is found in about 50% of cases of completed suicide (Kolves, Varnik, Tooding, & Wasserman, 2006). Suicide completers are more likely than attempters to meet criteria for a non-affective psychosis (Beautrais, 2001; Carlborg, Jokinen, Jonsson, Nordstrom, & Nordstrom, 2008).

A prior suicide attempt can be a strong predictor of completed suicide. Among depressed suicide completers, 48% had previously attempted suicide (Isometsa et al., 1994). Prior suicide attempt is more common among suicide completers as compared to living control subjects. In a retrospective study of 127 individuals who died by suicides, more than one-third (38%) of depressed suicide completers had a history of suicidal behavior, as compared to only 21% of non-suicide completers (Sinclair et al., 2005). Furthermore, roughly two-thirds of suicide completers die during their first suicide attempt (Rihmer, 2007), suggesting that one third of suicide completers have attempted suicide at an earlier time in life.

One study (Fushimi, Sugawara, & Saito, 2006) compared 138 suicide completers to 105 suicide attempters. When examining personal history risk factors, a history of a previous suicide attempt was more common in recent attempters (25.7%) as compared to suicide completers (8.7%). However, Fushimi et al., (2006) did not use psychological autopsy assessment procedures. Instead, all data was collected from the patients' attending physicians who completed a simple retrospective survey about their patient. Furthermore, participating physicians were instructed to complete the survey for patients who had displayed suicidal ideation during the course of their treatment. Thus, such a biased selection procedure may limit the generalizability of the findings. The investigators pointed out that the primary "difficulty associated with psychological autopsy studies is that it is often not easy to carry out" and it is especially difficult to obtain consent from families in Japan. Such "limitations" of the psychological autopsy research should not deter investigators from important projects.

The present study was designed to evaluate a psychological autopsy approach to the assessment of suicide risk. A statistical model was used to compare a sample of suicide completers to individuals who died by sudden causes. Conceptualizing suicide assessment in three domains is a logical, organized, and concise approach to evaluating suicide risk. The

present study builds upon prior research that has used psychological autopsy procedures in several ways. First, many studies have relied on small samples of suicide completers. Some studies have included fewer than 90 suicide victims (Isometsa et al., 1994; Johnsson et al., 1996; Lesage et al., 1994; Suokas et al., 2001), and other studies have examined fewer than 50 suicide victims (e.g., Beck et al., 1989; Brown et al., 2000; Coryell et al., 2002; Hawton et al., 1993; Kelly & Mann, 1996; Kilseth, Ekeberg, & Steihaug, 2010; Maltzberger et al., 2003). Second, many prior studies have not included any comparison group. Third, problems arise when suicide completers have been compared to subjects who are still alive (Pouliot & DeLeo, 2006). Different information may be obtained when interviewing a suicide attempter versus family members who are grieving the suicidal death of a loved one. Fourth, there is a wide variability of information obtained from different coroner's reports (Bennewith et al., 2005). Therefore, the present study included coroner's reports as only one small part of a more comprehensive assessment protocol.

The present study was designed to evaluate a model of suicide risk that includes demographic variables, stressful life events, psychiatric diagnoses, and a history of a previous suicide attempt. Psychological autopsy procedures were used to assess demographic variables, stressful life events, psychiatric diagnoses, and past suicide attempts that were present in suicide completers as compared to comparison subjects who had died suddenly, typically by natural causes. It was hypothesized that a variety of suicide risk factors would be significantly more likely to be present in suicide completers compared to deceased individuals who died suddenly of causes unrelated to suicide. Suicide completers were expected to be older, Caucasian, male, and unmarried, as compared to the control subjects. It was hypothesized that suicide completers would be significantly more likely than comparison subjects to experience bereavement, interpersonal difficulties, legal trouble, financial problems, occupational stress, and health problems in the six months prior to death. In terms of psychiatric diagnosis and history of suicidal actions, it was hypothesized that suicide completers would be significantly more likely than comparison subjects to meet criteria for a depressive diagnosis, bipolar disorder, a substance use disorder, a psychotic disorder at the time of death, and to have a history of a suicide attempt. Finally, it was hypothesized that the combination of demographic variables, recent negative life events, psychiatric diagnosis, and suicide attempt history would differentiate suicide completers from comparison subjects.

Method

Participants

Participants in the current study were men and women who died in Cuyahoga County, Ohio, during the years 1994–2006. Next-of-kin consented to study participation in all cases. A total of 405 deceased individuals were included in the study. Of the sample, 148 individuals died by suicide. Suicide methods included self-inflicted gunshot wound (37.2%), hanging (28.4%), Carbon Monoxide poisoning (14.2%), drug overdose (8.8%), cutting (4.1%), drowning (2.0%), and electrocution (1.4%). The comparison group consisted of 257 subjects who died unexpectedly of natural causes (81.7%), accident (13.2%), or homicide (5.1%).

Measures

The Structured Clinical Interview for the DSM-IV (SCID v2.0; First, Spitzer, Gibbon, & Williams, 1995) is a semi-structured clinical interview designed to assess Axis I diagnoses based on DSM-IV criteria (American Psychiatric Association, 1994). The interview includes a series of questions regarding the frequency, severity, and duration of psychiatric symptoms. The SCID is used to identify affective, anxiety, psychotic, and substance abuse disorders. In the current study, the SCID was administered by a master's level social worker.

The same interviewer conducted all assessment sessions. The interviewer (L.D.) was a master's level social worker who had extensive experience conducting diagnostic interviews. She was trained and supervised by a board certified licensed clinical psychologist (J.C.O.) who has skill and expertise in DSM diagnostic criteria, structured clinical interviewing, and has taught diagnostic skills for more than 20 years. Before joining the present research group, the clinical interviewer had obtained training in DSM diagnostic criteria, had extensive experience interviewing live psychiatric patients and had diagnosed most forms of major mental illness in both inpatient psychiatry and outpatient mental health clinics. The interviewer received training using the SCID training videotapes, was observed conducting a structured diagnostic interview and given extensive feedback. All of these prior activities had been supervised by the same board certified clinical psychologist who is involved in the present research study.

SCID questions were adjusted to fit third-person phrasing, and informants rated the presence or absence of the DSM-IV symptoms during the month prior to the individual's death. The interviewer also inquired about presence or absence of prior suicide attempts. As recommended for psychological autopsy procedures (Ebert, 1987), final diagnoses were determined during a consensus meeting with a board certified psychiatrist, a licensed clinical psychologist, and the clinical social worker who completed the interviews. All available information was reviewed, including the coroner's report, police reports, any available medical records, and the SCID interview. Prior research has demonstrated that psychological autopsy is a reliable and valid method of determining Axis I diagnoses. Adequate agreement was found between diagnoses derived from SCID interviews with family members and from diagnoses based on a review of patients' medical records (Deep-Sobolsky et al., 2005; Kelly & Mann, 1996). Additionally, strong inter-rater reliability has been found when information gathered from depressed patients was compared to information collected from family members (McGirr et al., 2007) and when two interviewers have used the SCID to diagnose the same depressed patient (Dumais et al., 2005). A strong degree of agreement exists between family member informants and psychiatric inpatients on the diagnosis of a Major Depressive Episode as well as individual symptoms of depression (DeJong & Overholser, 2009).

A modified version of the Life Experiences Survey (LES: Sarason, Johnson, & Siegel, 1978) was used to assess the presence of stressful life events during the six months prior to death. Similarly to other studies (Leserman, et al., 2005), the LES was modified to omit positive life events and remove the evaluation of the subjective impact of the stressful life event. Of the 47 original items, 27 were retained for the modified version, classified into five groups of life stressors: relationship conflicts, occupational troubles, financial distress, health problems, and recent bereavement.

Procedures

The current study is part of a larger, multi-site, IRB approved project examining biological and psychological factors associated with suicide (xxx et al., 2004). When the county coroner's office was notified of a sudden death, the clinical interviewer contacted the next-of-kin approximately 45 days after the death to request permission to be included in the study. The order of contact for legal next-of-kin includes a surviving spouse, any children over 18, a parent, siblings, aunt/uncles, and cousins. In all cases full informed consent for study participation was obtained by the legal next-of-kin, which primarily included either a spouse, a child over 18, or a parent of the deceased.

The structured interview was usually conducted 4–8 weeks after consent was obtained. A master's level social worker spent 2 to 3.5 hours conducting the diagnostic interview. Because of the procedures used to obtain informed consent for the research, next-of-kin

were relied upon for the interviews. In almost all cases, for both the suicide completers and the comparison subjects, the informant interviews were restricted to close family members (spouse, parent, adult child, or sibling). Often, several family members were present during the interview. In rare cases, a close friend (e.g. an unmarried partner) was interviewed which occurred when the next-of-kin believed the friend was better able to provide necessary information.

In accordance with recommended psychological autopsy procedures (Ebert, 1987; Hawton, 1998), information regarding demographics, psychiatric diagnosis, significant life events, medical details from the coroner's report, laboratory findings of recent substance use, suicide notes, employment history, educational attainment, and family psychiatric history was included in an extensive report for each individual. Detailed clinical summary reports were reviewed individually by members of the research team prior to a consensus meeting. During the consensus meeting, data was evaluated based on the quality of the informant and diagnoses were discussed. Respondents were rated for the quality of the assessment interview, based on the amount of contact the informant had with the deceased, the consistency of answers that were obtained throughout the interview, and the degree to which with interview responses were supported by collateral information. No differences were noted in the quality of information that was obtained from family members of suicide victims as compared to responses from family members of individuals who died by natural causes. During the consensus meeting, a master's level social worker, a licensed clinical psychologist, and a board certified psychiatrist evaluated all evidence for each case. Each case was discussed until agreement on the most accurate multi-axial diagnosis was reached.

Data Analytic Plan

Chi-square analyses were used to compare suicide completers and comparison subjects on demographic characteristics, recent stressful life events, psychiatric diagnosis, and suicide attempt history. In order to control for multiple comparisons, the alpha level for statistical significance was adjusted using a Bonferroni correction per each domain of predictor variables. When a Bonferroni adjustment focuses on the study-wide error rate, it is likely to become overly conservative and inflate the Type II error rate (Pernager, 1998). Thus, a Bonferroni correction is best reserved to control for comparisons across variables that are logically related to one another (Bland & Altman, 1995). By including variables from each of the four domains, the statistical prediction can access variables that should be independent instead of confounding factors. Thus, demographic factors should be largely independent from stressful life events. However, studies that rely exclusively on different psychiatric symptoms as predictors may end up with many predictor variables that conceptually and statistically overlap with each other. Then, the results from the chi-square analyses were used to guide multivariate statistics and the selection of predictor variables. A Hierarchical Discriminant Function Analysis was conducted to identify variables that distinguish suicide completers from comparison subjects. Only variables that reached significance in the chi-square analyses were included the discriminant function analysis. A final analysis examined presence of suicide risk factors (i.e., demographic characteristics, recent stressful life events, and psychiatric diagnoses) in suicide completers and comparison subjects. In the final analyses, the two groups were examined separately, in order to facilitate a visual display of the prevalence of different risk factors across the two groups.

Results

Analyses examined demographic differences between suicide completers and controls in the four suicide risk domains (see Table 1). A Bonferroni correction was used to control for Type I error, adjusting for five predictor variables within the demographic variable group, and resulted in an adjusted alpha of .01 to be considered statistically significant. Suicide

completers ($n = 148$) and controls ($n = 257$) were not significantly different in terms of age ($t(401) = 1.33$, ns) or education ($\chi^2(5) = 5.52$, ns). However, suicide completers were more likely than controls to be Caucasian ($\chi^2(3) = 17.20$, $p < .01$), and divorced, separated, or widowed ($\chi^2(4) = 15.34$, $p < .01$).

Chi-square analyses revealed that suicide completers and controls were not significantly different on many stressor variables (see Table 2). A Bonferroni correction was used to adjust the alpha level, with six predictor variables, resulting in an alpha of .0083. Suicide completers were not more likely than controls to have experienced recent occupational stress, financial difficulties, or personal or family health problems. However, suicide completers were more likely than controls to have experienced interpersonal difficulties in the six months prior to their death ($\chi^2(1) = 19.44$, $p < .001$).

Significant differences between groups were observed when examining psychiatric diagnoses that were present at the time of death and suicidal history (see Table 3). A Bonferroni correction with five diagnostic predictor variables resulted in alpha of .01 to be considered significant. Suicide completers were more likely than controls to meet criteria for two psychiatric diagnoses at the time of death including depression ($\chi^2(1) = 101.73$, $p < .001$) and a substance abuse disorder ($\chi^2(1) = 7.42$, $p < .01$). Suicide completers were not more likely than controls to have suffered from a psychotic disorder or an anxiety disorder at the time of death. Suicide completers were significantly more likely than controls to have made at least one suicide attempt sometime before their eventual death ($\chi^2(2) = 52.33$, $p < .001$).

A Hierarchical Discriminant Function Analysis was calculated to assess prediction of membership in the two groups (suicide completers vs. comparison subjects). The goal was to integrate different predictors variables from non-overlapping sources, in order to reduce false positive prediction errors. Preliminary chi-square results were used to determine which variables would be included in the DFA. Only those variables that had reached statistical significance in the preliminary analyses were included as predictors. Because of the distal relationship between demographic background and suicidal behavior, two demographic predictors were necessary for an individual to be deemed at risk. Thus, a single demographic predictor is likely to be weak and overly inclusive (e.g., male gender), resulting in a high number of false positives (Hawton & van Heeringen, 2009). The use of two demographic predictors (e.g., unmarried males) helps to suppress the false positive rate, while not becoming overly exclusive. Because of the proximal relationship between mental illness and suicidal behavior, only one psychiatric diagnosis was needed for the individual to be deemed at risk. Order of entry was determined based on the presumed chronology of events. Demographic predictors were ethnicity (Caucasian, African-American, Asian, or Hispanic) and marital status (single, married, divorced, separated, or widowed). Recent stressor variables were coded as present or absent, and included interpersonal problems. Diagnostic variables were coded as present or absent at the time of death, and included depression and a substance abuse disorder. Finally, the history of a prior suicide attempt was coded as present or absent. Thus, prediction was evaluated with two demographic predictors, then with the addition of one life stress variable, next with the addition of two diagnostic categories, and finally with the addition of a prior suicide attempt.

Wilks' Lambda revealed a statistically significant separation between the suicide completers and control subjects based on the two demographic predictors alone ($\chi^2(2) = 11.40$, $p < .01$). The canonical correlation (.17) indicated that 2.79% of the variation in group membership was explained by demographic variables. Using demographic factors alone, 52.1% of the participants were correctly classified. After adding the single stress variable to the model, Wilks' Lambda revealed a significant discrimination between the two groups ($\chi^2(3) =$

14.70, $p < .01$). The canonical correlation (.19) indicated that 3.61% of the variation in group membership is explained by demographic and stressor variables combined. Using demographic variables and life stressors, 63.0% percent of the cases were correctly classified. Improvement in classification was evaluated using McNemar's X^2 test for change (Tabachnick & Fidell, 1989) which indicated that the addition of the stressors to the demographic factors did not reliably improve classification. Next, psychiatric diagnosis was added to the model. Wilks' Lambda ($X^2 (5) = 67.93$, $p < .001$) indicated that there was significant separation between the two groups when including five variables in the equation. When using three classes of predictors, 75.8% of the cases were correctly classified. McNemar's X^2 test for change (Tabachnik & Fidell, 1989) indicated reliable improvement in classification with addition of psychiatric diagnoses to the demographic and stress predictors. The canonical correlation (.40) indicates that 15.6% of the variation in group membership is explained by the combination of demographics, recent stressors, and psychiatric disorders. After including history of suicide attempt, Wilks' Lambda ($X^2 (6) = 70.99$, $p < .001$) indicated that there was significant separation between the two groups when including all six variables in the equation. The canonical correlation (.40) indicated that 15.6% of the variation in group membership is explained by the combination of demographic characteristics, stressor variables, psychiatric diagnosis, and history of suicide attempt. When using four classes of predictors, 75.3% of the cases were correctly classified.

The final model had high regression coefficients on factors that distinguished suicide completers from control subjects (depressive diagnosis at the time of death, $\beta = 1.04$ and substance abuse diagnosis at the time of death, $\beta = 0.43$). A structure matrix of correlations between predictors and the discriminant function was calculated to examine the best predictors for distinguishing between suicide completers and control subjects. Loadings less than .50 were not interpreted, as recommended by Tabachnik and Fidell (2007). Results suggest that the best predictor for distinguishing between suicide completers and non-suicide completers is depressive diagnosis at the time of death. Suicide completers were more likely to have a depressive diagnosis at time of death (69.6%) as compared to non-suicidal death (19.1%).

Comparison subjects (Figure 1) and suicide completers (Figure 2) were analyzed separately to examine the presence of suicide risk factors in each sample. The two groups were examined separately in order to allow a closer inspection of the prevalence of different risk factors in each group. Results are presented in a visual model, showing the differences between suicide completers and nonsuicidal controls in a visual way. Results from the chi-square analyses determined suicide risk variables included. Only predictors that reached significance in the chi-square analyses were used in these analyses. Risk was considered present in the *demographic* domain if the participant had two demographic risk factors: Caucasian and unmarried (divorced, separated, or widowed). We required two demographic predictors in an attempt to control the risk of false positive prediction errors. Thus, one demographic variable used alone would result in a greatly inflated risk estimate. Risk was considered present in the *stressful life events* domain if the participant experienced an interpersonal stressor during the six months prior to their death. Risk was considered present in the *psychiatric diagnosis* domain if the participant met criteria for a depressive disorder or a substance use disorder at the time of their death. Because of the proximal relationship between psychiatric diagnosis and suicide risk, we required only one of the psychiatric diagnoses to indicate an elevated degree of risk.

Slightly over half (53.4%) of the suicide completers had risk factors present in two or more domains at the time of their death, while about one-fifth (19.8%) of control participants had risk factors present in two or more domains at the time of their death. Many (46.8%) of the control participants displayed none of the risk factors at the time of their death while few

(10.2%) suicide completers displayed none of the risk factors at the time of their death. As seen in Figures 1 and 2, demographic risk was observed in 19.0% of controls and 32.8% of suicide completers. Recent interpersonal conflict was seen in 16.3% of controls and 35.8% of suicide completers. Finally, depression or substance abuse was diagnosed in 40.0% of controls and 94.4% of suicide completers.

Discussion

The present study used psychological autopsy procedures to assess 148 suicide completers as compared to 257 deceased individuals who died suddenly of causes unrelated to suicide. Suicide completers were more likely than comparison subjects to be divorced, separated or widowed. Findings are consistent with extensive research that has demonstrated the close link between suicide risk and marital status (Kposowa, 2000; Luoma & Pearson, 2002; Smith, Mercy, & Conn, 1988). The support and intimacy that is often provided through a marital relationship may play an important role in protecting individuals from periods of extreme emotional distress and help to reduce their risk of a suicidal crisis. In addition, suicide completers were more likely than comparison subjects to be Caucasian. The present sample included deceased individuals from the Midwestern United States. Thus, results may not generalize to other regions.

At the time of their death, suicide completers were more likely than the comparison subjects to meet criteria for a depressive disorder or a substance abuse disorder. This finding is closely aligned with prior research on suicide completion (Isometsa, 2001). Many studies have found a high risk for suicidal ideation and suicidal behaviors among patients with a depressive disorder (Chen et al., 2006; Khan et al., 2008). Furthermore, alcohol abuse and drug use are known to increase the probability of suicide (Beck & Steer, 1989). Psychiatric diagnosis plays a central role in understanding the risk of suicide completion. In the present study, more than 95 percent of suicide completers met criteria for a psychiatric diagnosis at the time of their death. Depressive disorders, including Major Depressive Disorder (51%), Dysthymic Disorder (9%), Adjustment Disorder with depressed mood (10%), and Depressive Disorder not otherwise specified (5%) were the most common diagnoses represented among the suicide completers. However, based on the present findings, it is important to realize that psychiatric diagnosis alone does not sufficiently predict suicide completion. Nonetheless, when combining psychiatric diagnosis with demographic characteristics and stressful life events, depressive diagnosis remained the most important risk factor for suicide. It seems likely that for many individuals, depression may reflect the culmination of various factors, including divorce or separation from a loved one, loss of employment, or advanced age and a subsequent decline of physical health. It will be important for researchers to continue to explore the process that develops over time that may underlie the gradual expansion of suicide risk in vulnerable individuals.

Suicide completers were not significantly more likely than controls to have a psychotic disorder or an anxiety disorder. The low base rate psychotic disorders may have impacted the significance of the findings. However, both anxiety disorders and psychosis are infrequent in most studies of suicide completion (Lesage et al., 1994; Moskos et al., 2005). In contrast to most other psychiatric autopsy studies of suicide completers, the present study evaluated suicide completers from the general population, instead of psychiatric patients who had been discharged from inpatient psychiatric treatment. When studies conduct a follow-up assessment of discharged psychiatric patients, the prevalence of all forms of mental illness becomes inflated. Furthermore, many studies of suicide risk conduct a follow-up of depressed (Coryell et al., 2002; Sinclair et al., 2005) or suicidal psychiatric inpatients (Beck & Steer, 1989; Johnsson et al., 1996), which will inflate the risk of depression in suicide completers. Anxiety disorders do not appear to be linked strongly to suicide risk. In

contrast to research on completed suicide, anxiety disorders have been found common among suicide attempters (Shah & Bhandarkar, 2009) and anxiety disorders may be more common among suicide attempters than suicide completers (Beautrais, 2001). Severe anxiety and feelings of panic may be common in individuals who make serious suicide attempts (Hall, Platt, & Hall, 1999) but not a significant predictor in completed suicide (Dumais et al., 2005). The entire sample of deceased individuals experienced a similar, but low frequency of anxiety disorders, including post-traumatic stress disorder, generalized anxiety disorder, panic disorder, and obsessive-compulsive disorder.

As compared to the comparison group, suicide completers were more likely to experience interpersonal difficulties during the six months prior to their death. Interpersonal conflict is an important risk factor for completed suicide. Conflict with parents and significant others in the few days preceding death is common among suicide completers (Brent, Perper, Moritz, & Baugher, 1993; Phillips et al., 2002). Interpersonal difficulties are inevitable life stressors. In the current sample, conflict with a spouse, child, or friend was common among suicide completers as well as comparison subjects. However, 35.8 percent of the suicide completers experienced a recent interpersonal conflict, as compared to only 16.5 percent of the natural death comparison group. Relationship problems may serve as a trigger that persuades individuals who are ambivalent about life toward committing suicide.

Suicide completers were not significantly more likely than comparison subjects to have experienced physical health problems in the six months prior to their death. Although the present findings conflict with prior research, several studies have restricted their sample to either youthful suicide completers (Hawton, Fagg, Platt, & Hawkins, 1993; Lesage et al., 1994; Moskos et al., 2005) or elderly suicide completers (Duberstein et al., 2004; Kilseth, Ekeberg, & Steihaug, 2010). Such a restriction of age range will disrupt some comparisons, especially those analyses that examine medical illness as a potential contributing factor in suicide risk. Many of the comparison subjects died from physical health problems such as heart attack or stroke. Thus, it is expected that these individuals would experience a decline in health prior to death. Although physical health problems may be common among suicide completers, they are not unique to suicide completers. Instead, physical health problems appear to be common among the entire sample of participants who died suddenly. Results suggest that physical health problems are likely to precede sudden deaths from a variety of causes including suicide as well as natural causes. Physical health problems may promote additional stress that elicits a suicidal crisis, and therefore remains an important suicide risk factor. When living subjects are used as a comparison group, there will be an artificial inflation of medical problems in the suicide completers, which is controlled when suicide completers are compared with natural death controls (Pouliot & DeLeo, 2006).

Suicide completers were not significantly more likely than controls to have experienced recent financial stress or occupational problems in the six months prior to their death. Although financial stress and occupational problems were present among the suicide completers, financial problems were also experienced by many people in the comparison group. The percentage of suicide completers experiencing financial stress in the current study was lower than what has been reported in other studies (Duberstein, Conwell, Conner, Eberly, & Caine, 2004). In addition, DeJong et al. (2009) found that in the month preceding their suicidal crisis, suicide completers were significantly more likely than suicide attempters to experience financial stress. It seems likely that the current economy and nationwide recession is affecting most people today. In addition, economic struggles are more likely to affect men more than women (Hawton, Harriss, Hodder, Simkin, & Gunnell, 2001; Qin, Agerbo, & Mortensen, 2003). Despite the current findings, the effect of financial problems and occupational stress on suicide risk remains particularly important in light of the numerous lives touched by job loss and financial hardship during the recent economic

crisis. The long-term impact of these financial and occupational difficulties remains unknown.

Suicide completers were best distinguished from the comparison group of individuals who died suddenly by incorporating three domains of suicide assessment into the final model. Suicide assessment often distinguishes between risk factors and warning signs (Rudd et al., 2006). Risk factors, such as demographic characteristics, are chronic and typically unable to be altered through intervention (Rudd et al., 2006). Demographic factors provide a sociological view of suicide risk. Although they are objective and simple to measure, demographic variables can be assessed without ever meeting the individual, and without ever confronting the “mind” of the suicidal individual. Warning signs (e.g. extreme agitation, substance abuse, communication of intent) are proximal in nature, indicating high risk of suicide, and need for immediate intervention (Rudd et al., 2006). Psychiatric diagnoses capture the pain, personal struggles, and emotional breakdown experienced by suicidal individuals. Assessment of psychiatric illness is useful to suicide prevention, but mental health symptoms are not enough to determine suicide risk (Oquendo, Currier, & Mann, 2006; Robertson et al., 2008). Stressful life events may serve as the trigger that precipitates the suicidal action at a specific point in time. The evaluation of multiple domains in the assessment of suicide is crucial.

The present investigation relied on a psychological autopsy methodology for the study of suicide completers. The present study evaluated a large sample of suicide completers, and unlike most other studies, also included a large comparison sample of individuals who died by natural causes. Many studies that evaluate suicide completers lack any comparison group (Pouliot & DeLeo, 2006). Furthermore, many studies of completed suicide have been limited to suicide completers with a diagnosis of depression at the time of their death (Isometsa et al., 1994; Rihmer et al., 1990), or psychiatric patients who had been previously hospitalized because of severe depression (Sinclair et al., 2005) suicidal ideation (Beck, Brown, & Steer, 1989; Beck, Steer, Kovacs, & Garrison, 1985) or following a suicide attempt (Beck & Steer, 1989; Suokas 2001). Some studies have not followed psychological autopsy procedures, and instead relied on a simple survey of physicians who are asked to describe a recent case (e.g., Fushimi et al., 2006). Very few studies have compared suicide completers to natural death control groups.

Despite the inclusion of a sample of suicide completers, there are several limitations in the current study. The present study relied on a retrospective approach to examining suicide risk. Unfortunately, even when conducted under ideal circumstances, psychological autopsy procedures have several limitations. Family member informants may be struggling to accept the death of their loved one (Beskow, Runeson, & Asgard, 1991), and may display a biased recall of the person and the recent life events (Hawton et al., 1998) selective recall of positive qualities and withholding of negative information about the deceased family member (especially arguments and conflict within the home). Furthermore, the use of the psychological autopsy method lacks the ability to evaluate intra-psychic variables that may be present in the minutes and hours prior to suicide completion.

Unlike research on suicide attempters, the individual who died by suicide is no longer available to be interviewed or complete any research questionnaires. Therefore, in most studies on completed suicide, the assessment is limited to either a database of demographic factors alone (e.g., Bille-Brahe, 1993; Shah & Bhandarkar, 2009), detailed records from the medical examiner (e.g., Bennewith et al., 2005), prior medical records from health care providers (e.g., Sinclair et al., 2005), or a psychological autopsy which includes detailed interviews conducted with family members or close friend informants. The informant interviews can be useful and thorough, but usually cannot evaluate intra-psychic variables,

such as hopelessness or low self-esteem. However, prior research has found adequate agreement between family member informants as compared to suicide attempters (DeJong & Overholser, 2009). Also, adequate agreement has been found when family member informants are compared to psychiatric diagnoses that had been recorded in the suicide completer's previous psychiatric records (Deep-Soboslay et al., 2005). Thus reliability studies lend support to the accuracy of information that is typically gathered through psychological autopsy research.

Identification of high-risk groups can play a critical role in the prevention of suicide. The present study was guided by a concise and straight-forward framework. Because of the wide spectrum of possible predictor variables, most suicide experts (e.g., Packman et al., 2004; Wingate et al., 2004) recommend the use of a clear and concise model to guide assessment and prevention efforts. Because suicide risk is influenced by numerous factors, research needs to be capable of integrating different domains of risk factors (Hawton & van Heeringen, 2009; Isometsa, 2001). The proposed model could be adopted by mental health professions from several different fields. As opposed to relying on a long list of risk factors, the current approach to suicide assessment includes three domains in which suicide risk is heightened when risk is present in multiple areas. Furthermore, the current model provides a simple structure that can be used to educate school teachers, guidance counselors, police officers, spiritual leaders, and healthcare professionals. Professionals from many different fields can learn to be attentive to these domains and responsive in critical situations.

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Figure 1.

Figure 2.

Table 1

Comparison of Suicide Completers and natural death controls on Demographic Variables

	Natural Deaths (N=257)	Suicide Completers (N=148)	Comparison Statistic
Age			
Mean	49.06	46.76	t(401) = 1.33
SD	15.71	18.11	
Gender			
% Male	68.1	78.4	$\chi^2 = 4.91^*$
% Female	31.9	21.6	
Ethnicity			
% Caucasian	72.0	86.5	$\chi^2 = 17.20^{**}$
% African-American	27.2	10.8	
% Hispanic	0.4	0.7	
% Asian	0.4	2.0	
Marital Status			
% Single	33.0	30.4	$\chi^2 = 15.34^{**}$
% Married	44.0	32.4	
% Divorced	14.0	18.9	
% Separated	1.2	6.8	
% Widowed	7.8	11.5	
Education			
% Did not finish high school	23.5	17.1	$\chi^2 = 5.52$
% High School Degree/GED	35.3	30.8	
% Some college	22.4	25.4	
% Associate's Degree	3.1	4.1	
% Bachelor's Degree	10.6	14.4	
% Advanced Degree	5.1	8.2	

Note:

*
 $p < .05$,**
 $p < .01$

Table 2

Suicide Completers and natural death controls compared on stressful life events

	Natural Deaths (N=257)	Suicide Completers (N=148)	Chi-Square
Recent Stressors			
(% experiencing stressor)			
Bereavement	3.1	7.4	3.85*
Relational Problems	16.5	35.8	19.44***
Health Problems	31.9	21.6	6.29*
Legal Problems	36.8	63.2	5.99*
Occupational Problems	18.0	20.9	0.51
Financial Problems	9.4	15.5	3.41

Table 3

Comparison of Suicide Completers and controls on psychiatric variables

	Natural Deaths (N=257)	Suicide Completers (N=148)	Chi-Square
Diagnosis (% with diagnosis)			
Depressive Disorder	19.1	69.6	101.75 ***
Bipolar Disorder	1.6	5.4	4.81 *
Psychotic Disorder	7.8	13.5	3.42
Substance Use Disorder	30.5	43.9	7.42 **
Anxiety Disorder	5.9	4.7	0.23
Prior Suicide Attempt (% yes)	27.4	68.9	52.33 ***

Note:

*
 $p < .05$,**
 $p < .01$,***
 $p < .001$