How Many People Are Exposed to Suicide? Not Six

Julie Cerel, PhD ![ORCID], Margaret M. Brown, DrPH, Myfanwy Maple, PhD, Michael Singleton, PhD, Judy van de Venne, PhD, Melinda Moore, PhD, and Chris Flaherty, PhD

It has long been stated that six people are left behind following every suicide. Despite a lack of empirical evidence, this has been extensively cited for over 30 years. Using data from a random-digit dial survey, a more accurate number of people exposed to each suicide is calculated. A sample of 1,736 adults included 812 lifetime suicide-exposed respondents who reported age and number of exposures. Each suicide resulted in 135 people exposed (knew the person). Each suicide affects a large circle of people, who may be in need of clinician services or support following exposure.

In the wake of the over 44,000 suicides each year in the United States, it is often repeated that six survivors are left behind for each suicide death (Drapeau & McIntosh, 2017). This estimate, created by Shneidman (1972), has been widely promulgated since the early 1970s, but was never based on empirical evidence. Even if this very conservative estimate were to be correct, 1 in 64 Americans (1.5% of the population) would be considered significantly impacted by a suicide (McIntosh, 2015).

Recent evidence shows that over and above the impact of bereavement by other causes, exposure to the suicide of a relative increases risk for depression, admission to psychiatric care, and suicide death (Pitman, Osborn, King, & Erlangsen, 2014). Further, clear risks have been shown in nonkin who have been exposed to a suicide attempt and/or death (Maple, Cerel, Sanford, Pearce, & Jordan, 2017). There has been a call to change the nomenclature of suicide bereavement to recognize that exposure to suicide is on a continuum with some people exposed, some affected, and some bereaved (Cerel, McIntosh, Neimeyer, Maple, & Marshall, 2014). The continuum defines individuals exposed to

Julie Cerel, College of Social Work, University of Kentucky, Lexington, KY, USA; Margaret M. Brown, University of Kentucky, Lexington, KY, USA; Myfanwy Maple, School of Health, University of New England, Armidale, NSW, Australia; Michael Singleton, Kentucky Injury Prevention Research Center, University of Kentucky, Lexington, KY, USA; Judy van de Venne, Department of Psychology, Eastern Kentucky University, Richmond, KY, USA; Melinda Moore, Department of Psychology, Eastern Kentucky University, Richmond, KY, USA; Chris Flaherty, College of Social Work, University of Kentucky, Lexington, KY, USA.

suicide as "anyone who knows or identifies with someone who dies by suicide," and stresses no longer merely just focus on kin or those who were exposed to the trauma of the death itself (Cerel et al., 2014, p. 4).

Various studies have estimated different percentages of the population exposed to suicide. In 2002, Crosby and Sacks reported that 7% of U.S. adults in 1994 knew someone who died by suicide in the past year, including 1.1% who reported losing a relative and 5.4% who reported exposure to the suicide death of a friend or acquaintance. Based on the 7% estimate plus vital statistics data on the number of suicide deaths in the United States in 1993, they further estimated that, on average, there were 425 U.S. adults exposed per suicide. In a more recent small survey, Cerel, Maple, Aldrich, and van de Venne (2013) reported that 40% of their random-digit dial study of residents of one U.S. state reported lifetime exposure to suicide, with almost 20% reporting that the suicide had a significant impact on their life. In a recent meta-analysis, Andriessen, Rahman, Draper, Dudley, and Mitchell (2017) determined that lifetime prevalence of exposure in the community was 21.83% (CI: 16.32–27.90). Another recent examination of participants in the military suicide research consortium studies revealed that more than half (57.3%) reported lifetime suicide exposure (SE), mostly to the deaths of friends (Hom, Stanley, Gutierrez, & Joiner, 2017). Despite these findings, the historical assumption of six survivors for every suicide has remained entrenched, hampering efforts to illuminate the public health importance of identifying, supporting, and developing treatments for those exposed to suicide who are in need of support.

Utilizing random-digit dial data from a single U.S. state sample of 1,736 adults, we reported that almost half of participants (48.3%) reported lifetime exposure to suicide (Cerel et al., 2016). Suicide-exposed individuals were more likely than nonsuicide exposed to report suicide ideation (9.0% vs. 5.3%). A close or very close relationship was reported by 36.2% of the sample. When a measure of perceptions of closeness to the decedent was added to models, the magnitude of the associations with poor psychiatric outcomes was increased. Perceptions of closeness to the decedent almost doubled the odds of depression and anxiety and almost quadrupled the odds of posttraumatic stress disorder (PTSD) in those exposed to suicide.

Thus, the current re-examination of our data sought to calculate how many people are likely exposed to each suicide death in the United States, extrapolated from a single-state random-digit dial survey asking about lifetime exposure to suicide.

METHODS

Survey Design

A random-digit dial survey of adults in the Commonwealth of Kentucky was conducted during July 2012–June 2013. This study was approved by the University of Kentucky internal review board and determined in compliance with Department of Defense (DoD) human protections policies by the DoD Human Research Protection Office. A dual-frame sample of landline and cell phone numbers, weighted to reflect the true distribution of landline only, cell only, and dual-use households in Kentucky, were called to achieve a final sample of 1,736 participants.

Due to funding sources and the desire to answer study questions about veterans' exposure to suicide (see Cerel et al., 2015), veterans were deliberately oversampled. As described elsewhere, the Council of American Survey Research Organizations response rate for the study was 35.9% (Cerel, Maple, van de Venne, Moore, Flaherty & Brown, 2016). Overall, calls averaged 12.7 ± 5.9 minutes. Following oral consent, the respondent was interviewed utilizing the following measures (see Cerel et al., 2015).

Measures

Exposure to Suicide. Participants were queried as to whether they knew anyone

who died by suicide ("Do you know anyone who has died by suicide?"). Those who reported exposure to a suicide death were then asked the number of exposures they had experienced in their lifetime, facilitating identification of total number of SEs among participants. For multiple suicides, the closest relationship was used to describe the impact and closeness. Therefore, those variables were not available for each exposure an individual reported and could not be utilized in calculations in this study.

Demographics. Self-reported demographic data included age, race, sex, marital status, and rural/urban residence status based on county of residence, status as a parent, and veteran status.

Population and Sample. The population of interest included all adults (18 years of age and older) living in the Commonwealth of Kentucky at the time of the telephone survey. Of the 1,736 participants, 34 were excluded from analysis for missing responses to the exposure to suicide question or the age question, leaving 1,702 participants contributing to the final analysis.

Statistical Methods

Similarly to Crosby and Sacks (2002), we recognized that our sampling strategy to sample veterans oversampled men. Thus, the data required weighting to be representative of the state population. Weights included both phone-specific weights as described earlier and a poststratification weight to ensure that military veteran, age, race, and sex were scaled up to fully represent similar individuals in the sample compared to the population of adults in the Commonwealth. Thus, this sample contained the same percentage of veterans as the Commonwealth and did not utilize the oversample of veteran status. SPSS Statistics 23.0 for Windows (IBM Corp., Armonk, NY, USA) and SAS 9.4 for Windows (SAS Institute Inc., Cary, NC, USA) software were utilized for the specialized survey data analysis.

We produced a weighted estimate of the total number of lifetime SE for Kentucky adults in 2012 from the survey sample, and a weighted estimate of total person-years at risk of SE for Kentucky adults in 2012 based on the sum of respondent ages at the time of the survey. We estimated the mean cumulative incidence rate of SE among Kentucky adults in 2012 by dividing weighted total lifetime SE by weighted total person-years at risk of exposure. We multiplied this incidence rate by the number of U.S. resident adults in 2012 (obtained from U.S. Census Bureau, 2015) to estimate the total number of SE in 2012 among U.S. adults, which we denote by SE_{US}. We also obtained the number of suicide deaths among U.S. residents in 2012, which we denote by SU_{US}, from the CDC WISQARS database (Centers for Disease Control and Prevention, 2015). Finally, we estimated the number of exposures per suicide among U.S. adults in 2012 as $EPS_{US} = SE_{US}/SU_{US}$.

RESULTS

Final analysis consisted of 1,702 participants, of whom 46.7% (795 individuals) reported exposure to suicide during their lifetime and had nonmissing age and age at exposure variables. Participants reported 2,286 lifetime exposures over 98,399 person-years. The mean lifetime SE incidence rate for Kentucky adults in 2012 therefore was calculated to be 0.0232 exposures per person-year. Using the exposure rate 0.0232 to multiply exposure incidence to the U.S. adult (over 18) population of 235,185,953 (U.S. Census Bureau, 2015) yielded an estimated 5,463,841 SE for U.S. adults in 2012. Dividing by the 40,600 suicide deaths reported in 2012 in the United States (Centers for Disease Control and Prevention, 2015) results in an estimate of 135 U.S. adults exposed per suicide death that occurred in 2012 in the United States. Extrapolating these state-based findings to the total 2012 U.S. population of 235 million adults by 40,600 suicides (Centers for Disease Control and Prevention, 2015) leads to approximately 5.5 million people in

the United States exposed to suicides in their social networks annually.

DISCUSSION

Based on our findings, it is clear that for each death by suicide many more are exposed than the previously repeated six individuals. For each suicide, our data estimate that 135 people are exposed to the death, resulting in 5.5 million U.S. residents exposed to suicide in a given 12-month period.

The current study was drawn from a single U.S. state with the fifteenth highest suicide rate in the United States. Thus, the generalizability to the U.S. population might be overstated. The suicide deaths which resulted in exposure to suicide reported by our respondents could have occurred outside of the state and the absolute number of deaths in the nation (40,000) is substantially more than the absolute number in the state (724). Calculating the estimated number of exposures per suicide using only Kentucky data would ignore this fact. Therefore, the calculation was based on national data, as the national suicide rate (12.9) is lower than the rate in Kentucky (16.5). In addition, suicides that took place outside the United States would not be accounted for in the population estimates of potential exposures. There are a number of conceivable reasons why our estimate is lower than the one reported in 2002 by Crosby and Sacks. First, the question in this study asked about lifetime exposure to suicide death, while Crosby and Sacks asked about exposure over the past 12 months only. Therefore, recall bias might have eliminated reporting of more distal exposures in our sample. Also, relatively little is known about geographic and cultural differences, or temporal changes, in the stigma surrounding suicide. In areas where such stigma is greater one might expect SE to be lower due to the cause of death not being disclosed as a suicide or a lack of willingness to describe it this way to researchers. Similarly, if there had been some reduction in suicide

stigma over time, a study assessing lifetime exposure would be expected to produce a lower estimate than one asking only about past-year exposure as people would be unaware of hidden suicides in their extended social networks. This is best exemplified by a family in which eight people had died by suicide in the last three generations, but it was never spoken of until a recent death caused some family members to start asking questions and uncover the genuine cause of death of their relatives.

Some additional limitations of this study include assumptions that the risk of exposure to suicide is constant from year to year, individuals who responded to the phone survey are representative of the general U.S. population, and that network sizes are normally distributed. It is clear that suicides often occur in clusters or at specific developmental periods rather than being evenly distributed throughout the lifespan. In addition, many people who die by suicide have experienced a long trajectory of severe mental illness and a history of social isolation, and might have a smaller social network than individuals who end their lives under different circumstances. We were unable to prove any of the assumptions based on the current study methodology, yet chose to make the calculations with an understanding that those assumptions were made.

Our results are restricted by these limitations, yet for the first time we are able to calculate a statistically sound estimate of lifetime exposure to suicide in the United States. There is still a need to replicate this study nationally and internationally so that the effects of each suicide can be better appreciated.

It would have been most helpful for the field to stratify these findings by closeness to the decedent as this has been shown to be associated with risk for psychopathology (Cerel et al., 2016). The suicides reported by participants range from those closest to them to only very distant social contacts. However, due to the analytic strategy of utilizing all suicide exposures reported

by respondents but only asking about the closeness to the individual closest to the respondent, we were unable to calculate the number of people exposed at each level of closeness. This is an area that requires future research to more deeply explore those among the exposed group who are most deeply affected, and who will require intervention to support them postexposure.

This study successfully identifies the difference in the long-standing proposition of six people exposed per suicide versus the empirically assessed value of 135 people exposed to suicide. Some might argue that the six people per suicide was meant to include only those whose lives were forever changed by the suicide and this new calculation is a different type of number than the six. We agree that 135 is not the number of people who are definitely bereaved by each suicide. Exposure is important because we simply do not know the scale and magnitude of those affected by suicide, and the prevalence of those in society who may be in need of both suicide prevention and postsuicide support and services, postvention. Given the identified magnitude of difference, the old speculations must be cast aside to allow increases in services and resources for the bereaved to mitigate the long-term effects from suicide. These data confirm suicide postvention as a necessary public health priority.

CONCLUSION

Although previous clinical wisdom prompted discussion of the impact of suicide on multiple individuals on the spectrum of suicide exposure, it seems that estimates of the scope of this impact have been grossly understated or underappreciated. As we are able to present data-based analyses of the number of people exposed to each suicide, it is now time to begin to use these empirically supported calculations rather than repeating the misleading number "six individuals left behind" that has historically been reported after a suicide death. In so doing, we can now focus our postvention efforts on a broader group of people who may require support to reduce harm from exposure to suicide. Identifying these individuals may constitute an interdisciplinary approach, including public health surveillance, as well as routine screening in school systems, universities, primary care offices, emergency departments, and hospitals. Developing competencies around assessment of the impact of suicide exposure and its treatment will be forthcoming, but, given the burden of suicide and the potential for intervention through thoughtful postvention, perhaps suicide may be elevated in the public health conversation to reduce the impact of suicide death on those exposed.

REFERENCES

ANDRIESSEN, K., RAHMAN, B., DRAPER, B., DUDLEY, M., & MITCHELL, P. B. (2017). Prevalence of exposure to suicide: A meta-analysis of population-based studies. *Journal of Psychiatric Research*, *88*, 113–120.

Centers for Disease Control and Prevention. (2015). *Web-based Injury Statistics Query and Reporting System (WISQARS) fatal injury reports*. Retrieved from http://www.cdc.gov/injury/wisqars/fatal_injury_reports.html

CEREL, J., MAPLE, M., ALDRICH, R., & VAN DE VENNE, J. (2013). Exposure to suicide and identification as survivor. *Crisis*, *34*, 413–419. https://doi.org/10.1027/0227-5910/a000220.

CEREL, J., MAPLE, M., VAN DE VENNE, J., MOORE, M. M., FLAHERTY, C., & BROWN, M. (2016). Suicide exposure in the community: Prevalence and correlates in one US state. *Public Health Reports*, *131*(1), 100–107.

CEREL, J., MCINTOSH, J., NEIMEYER, R., MAPLE, M., & MARSHALL, D. (2014). The continuum of "survivorship": Definitional issues in the aftermath of suicide. *Suicide and Life-Threatening Behavior*, *44*, 591–600. https://doi.org/10.1111/sltb.12093.

CEREL, J., VAN DE VENNE, J., MOORE, M., MAPLE, M., FLAHERTY, C., & BROWN, M. (2015). Veteran exposure to suicide: Prevalence and correlates. *Journal of Affective Disorders*, *179*, 82–87. https://doi.org/10.1016/j.jad.2015.03.017.

CROSBY, A. E., & SACKS, J. S. (2002). Exposure to suicide: Incidence and association

with suicidal ideation and behavior, United States, 1994. *Suicide and Life-Threatening Behavior*, *32*, 321–328.

Drapeau, C. W., & McIntosh, J. L. (for the American Association of Suicidology). (2017). *U.S.A. suicide 2016: Official final data*. Washington, DC: American Association of Suicidology. Retrieved December 24, 2017, from http://www.suicidology.org.

Hom, M. A., Stanley, I. H., Gutierrez, P. M., & Joiner, T. E. (2017). Exploring the association between exposure to suicide and suicide risk among military service members and veterans. *Journal of Affective Disorders*, *207*, 327–335.

Maple, M., Cerel, J., Sanford, R., Pearce, T., & Jordan, J. (2016). Is exposure to suicide beyond kin associated with risk for suicidal behavior? A systematic review of the evidence *Suicide and Life-Threatening Behavior*, *47*, 461–474. https://doi.org/10.1111/sltb.12308

McIntosh, J. L. (2015). *U.S.A. suicide: 2013 official final data*. Retrieved from http://mypage.iu.edu/~jmcintos/2013datapgsv1.0.pdf

Pitman, A., Osborn, D., King, M., & Erlangsen, A. (2014). Effects of suicide bereavement on mental health and suicide risk. *The Lancet Psychiatry*, *1*, 86–94.

Shneidman, E. (1972). Foreword. In A. Cain (Ed.), *Survivors of suicide* (pp. ix–xi). Springfield, IL: Charles C. Thomas.

U.S. Census Bureau. (2015). *State and County QuickFacts*. Data derived from Population Estimates, American Community Survey, Census of Population and Housing, State and County Housing Unit Estimates, County Business Patterns, Nonemployer Statistics, Economic Census, Survey of Business Owners, Building Permits. Retrieved from http://quickfacts.census.gov/qfd/states/21/21111.html