



Gender and age differences in suicide mortality in the context of violent death: Findings from a multi-state population-based surveillance system

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Abstract

Objective: Males are more likely than females to die by all forms of violent death, including suicide. The primary purpose of the present study was to explore whether the gender difference in suicide rates is largely accounted for by males' general greater tendency to experience violent deaths. The current study examined gender and age differences in suicides and other violent deaths, using data from a population-based surveillance system.

Method: Pearson's chi-square tests and logistic regression analyses were conducted with data for 32,107 decedents in the 2003–2005 National Violent Death Reporting System (NVDRS). Decedents were categorized by gender, age, and death by suicide versus other violent means.

Results: When suicides were examined in the greater context of violent death, the total proportion of violent deaths due to suicide did not differ across gender. When deaths were examined by age group, after controlling for ethnicity, marital status, and U.S. location in which the death occurred, males in early to mid childhood were significantly more likely than same-aged females to die by suicide relative to all other violent deaths. The portion of deaths due to suicide was for the most part equal across both genders in late childhood, young adulthood, and mid-adulthood. Older males were more likely than older females to die by suicide relative to other violent deaths.

Conclusion: Our findings suggest that the risk of dying by suicide relative to other violent deaths may be more pronounced at certain developmental stages for each gender. This knowledge may be valuable in tailoring prevention strategies.

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1. Gender and age differences in suicide mortality in the context of violent death

Violent deaths, such as suicide, homicide, motor vehicle accidents, and accidental firearm discharges, are among the top 10 causes of death for all age groups in the United States [1]. These deaths represent an important area of study as they are behaviorally driven, and thus, to some extent, preventable [2]. Suicide is the most common form of violent death, comprising almost half of all violent deaths in the United States [3]. It is known that whereas females attempt suicide more often than males, males are more likely to die by suicide [3–5]. More broadly, males are also more likely to die of violent deaths

[6,7]. It is unknown, however, if this gender difference in completed suicide is due simply to males' greater propensity to experience more violent deaths in general.

1.1. Gender and violent deaths

The increased rate of male suicides may be due to an overall tendency to die by more violent methods than females. Indeed, although males are three to four times *less* likely than females to engage in suicidal behavior, males who do engage in suicidal behavior are three to four times *more* likely than females to actually die in a suicidal act [3–5]. This is due in part to males adopting more lethal, and thus often more violent, means than females. Females are more likely than males to self-poison, a method which tends to be slow-acting, and is fatal in only a small percentage of cases [3,8–10]. In contrast, males more commonly utilize hanging and firearms, which have the highest case fatality ratios out of all means of suicide in the United States [3,8–10].

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Additionally, males have a greater tendency than females to engage in behaviors that are not only related to death by suicide but also violent death in general. First, males are more likely to engage in generally aggressive behavior [11,12], to carry weapons which could facilitate aggressive behavior [13,14] and to require emergency medical care from injuries due to aggressive behaviors [15]. Aggressive behavior is associated with greater propensity for both violent death in general [7] and suicide in particular [16,17]. Second, males tend to engage in more risk-taking behavior [18,19], including reckless driving [20–22]. Risk-taking behavior, like aggressive behavior, is also associated with both violence-related deaths in general [23] and suicide deaths more specifically [24]. Third, males tend to be more impulsive [25]. Impulsivity predicts both aggressive [26,27] and risk taking behavior [28]. Again, like aggressive and risk-taking behaviors, impulsive behavior is associated with violent deaths in general [29] and suicide in particular [16,30,31]. Collectively, these findings suggest that the gender disparity in suicide rates may in large part be due to the greater rate of violent deaths for men in general.

1.2. Age as a moderator

It is also worth noting that suicide and violence-related fatalities share similar developmental tendencies with the underlying processes outlined above. That is, rates of both suicide in particular and violent deaths in general increase substantially in mid-to-late adolescence and early adulthood, continue to increase in mid-adulthood, and later decline in late adulthood [1]. This mortality trend may be due to developmental changes in processes that underlie risk for both suicide and violent death. Indeed, several of these risk factors, which also separate men and women, including aggression, risk-taking, and impulsivity, tend to peak during mid-to-late adolescence as well, beginning to decline in early to mid-adulthood [11,31–35]. It has been suggested that these risk factors decline as cognitive control processes begin to solidify and emotional regulation increases with the maturation of the prefrontal cortex during adolescence and early adulthood [36]. These patterns suggest that developmental considerations may be important in the etiology of violent deaths in general and suicide in particular. Thus, a secondary aim of this study is to examine age as a moderator of gender differences in suicide.

1.3. Current study

Previous research on gender and age differences in suicide has focused largely on risk factors and means of suicide. To our knowledge, however, no research to date has examined gender and age differences in suicide in the context of violent death. Thus, a question that naturally follows is to what degree are the well-documented gender differences in suicide rates a function of males' general greater propensity to experience more violent deaths. The National Violent Death Reporting System (NVDRS) is

uniquely suited for research in this area. It is a population-based surveillance system managed by the Centers for Disease Control and Prevention that collects data regarding violent deaths in the United States, most notably including the characteristics and circumstances surrounding each death [37]. The primary purpose of the present study was to explore whether the gender difference in suicide rates is largely accounted for by males' general greater tendency to experience violent deaths. Specifically, we assessed whether gender served to differentiate suicides from other violent deaths in the NVDRS. We hypothesized that the portion of violent deaths due to suicide does not differ across genders. We also considered age as a moderator in our analysis of gender as a factor differentiating suicide from other violent deaths. We hypothesized that the tendency to die violently may be more pronounced at certain developmental stages.

2. Method

2.1. Data source

The data on violent deaths used in the current study were obtained from the 2003–2005 NVDRS database ($n = 32,107$). The NVDRS is an incident-based surveillance system that provides detailed information for participating states about different types of violent deaths. Data from 2003 were comprised of seven states (Alaska, Maryland, Massachusetts, New Jersey, Oregon, South Carolina, and Virginia). Six more states were added to the NVDRS in 2004 (Colorado, Georgia, North Carolina, Oklahoma, Rhode Island, and Wisconsin), and four additional states were added in 2005 (California, Kentucky, New Mexico, and Utah) to the database, for a total of 17 states. With the exception of California, for which data were only collected from three counties (Los Angeles, Riverside, San Francisco, and Santa Clara), data for each state were collected state-wide.

The NVDRS collected details about each decedent, including manner and mechanism of death, demographic characteristics, and the context in which the death took place [37,38]. The NVDRS linked data from multiple information sources, including death certificates, hospital records, coroner or medical examiner's reports, toxicology laboratories, crime laboratories, and law enforcement records [39]. Data were assembled and coded monthly by trained abstractors at designated locations (e.g. state health departments or subcontracted entities, such as a medical examiner's office) throughout each state. Abstractors adhered to the NVDRS coding manual when reviewing source documents to ensure coding consistency and accuracy [40]. Additional information regarding the NVDRS has been described elsewhere [37,40].

2.2. Measures

2.2.1. Demographic characteristics

Demographic characteristics were derived from the death certificate, and included gender, age, and marital status at the

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