Differences in U.S. Suicide Rates by Educational Attainment, 2005-2014

Julie A. Phillips
Professor
Institute for Health, Health Care Policy and Aging Research / Department of Sociology
Rutgers University
112 Paterson Street
New Brunswick, NJ 08901
jphillips@sociology.rutgers.edu

Katherine Hempstead
Senior Advisor
Robert Wood Johnson Foundation
Route 1 and College Road East
P.O. Box 2316
Princeton, NJ 08543-2316
khempstead@rwjf.org

WORD COUNT: 2,964

Abstract

Objective. To document the association between education and suicide risk, in light of rising suicide rates and socioeconomic differentials in mortality in the United States.

Methods. We investigate differentials and trends in U.S. suicide rates by education from 2005-2014 using National Center for Health Statistics and Census data. We use CDC surveillance data from 2013 to examine differences in the circumstances and characteristics of suicide deaths by education.

Results. Between 2005 and 2014, men and women aged 25 and over with at least a college degree exhibited the lowest suicide rates; those with a high school degree displayed the highest rates. Men with a high school education were twice as likely to die by suicide compared to those with a college degree in 2014. The education gradient in suicide mortality generally remained constant over the period. Interpersonal/relationship problems and substance abuse were more common circumstances for less educated decedents. Mental health issues and job problems were more prevalent among college-educated decedents.

Conclusions. Our findings highlight the importance of social determinants in suicide risk, with important prevention implications.

Introduction

Age-adjusted suicide rates rose by 24% between 2000 and 2014 in the United States, with the increase especially pronounced among those aged 45-64. For men in this age category, rates rose by 43% over the period and for women, by 63% although death by suicide remains far more common among men.[1] A widely publicized article recently documented that this substantial increase in suicide, alongside rising death rates from drug and alcohol poisonings, has been large enough to produce a marked upturn in all-cause mortality among white middle-aged Americans.[2]

As has been noted, the current epidemic of rising suicide and drug abuse has affected some groups more than others – namely, those who are less educated. For example, Phillips et al. found that the increases in suicide rates for those aged 40-60 years during the initial period of increase (2000–2005) were confined to those who lacked a college degree.[3] Case and Deaton reported that by 2013, suicide rates for those aged 45-54 years had risen for all educational groups, but the increases were substantially larger for the less educated.[2] They found that in 1999, suicide rates for those aged 45-54 with a high school degree or less were 1.7 times greater than those with a college degree, but that differential had increased to 2.4 by 2013. These trends have contributed to widening socioeconomic disparities in mortality.[4]

Following the famous Whitehall study of British civil servants[5], a flurry of research investigated the relationship between socioeconomic status and morbidity and mortality, revealing the importance of education in shaping health status, health related behaviors and psycho-social factors. These studies have documented the recent widening of the educational gradient in mortality in Western countries, emphasizing not only differences in the prevalence of risk behaviors such as tobacco and alcohol use but also differential returns to risk factors, suggesting there may be important differences in both access to and ability to benefit from health

care and medical information.[6-8] The nature of educational differences in suicide, however, is poorly understood. Hence, the goal of this study is to: (1) examine the differential and annual trends in suicide rates by educational attainment between 2005 and 2014, a period when U.S. suicide rates rose significantly and that encompasses the Great Recession; and (2) describe the ways in which the circumstances and other characteristics of suicide differ by educational attainment.

Data and Methods

To investigate trends in suicide by educational attainment, we construct annual suicide rates by educational attainment for all persons aged 25 and over from 2005 to 2014. We do not examine suicide rates among individuals younger than 25 since many have not completed their formal education by that age. We obtain information on the number of suicide deaths by level of education from the National Center for Health Statistics (NCHS). Data on educational attainment are missing for 3.6% and 3.2% of male and female suicide decedents, respectively; these deaths are excluded from the rates. Following common standards, we measure education according to major milestones: less than high school, high school degree, some college, and college degree or more. Data on the total population aged 25 and older by year and education level are gathered from the American Community Survey (ACS). Because the increases in suicide have been especially pronounced among the middle-aged, we also examine trends in annual suicide rates by education level for those aged 35-54. We compute suicide rates by gender since levels and trends in suicide may be different for men and women.

To learn more about circumstances surrounding suicide deaths by education level, we use the National Violent Death Reporting System (NVDRS). The NVDRS is an incident-based

violent death surveillance system established by the Centers for Disease Control (CDC) to assist states and local communities in violence prevention efforts.[9] The system links information on violent deaths from multiple sources, including medical examiner and coroner reports, toxicology reports, law enforcement records, supplemental homicide reports and death certificates. By 2013, 18 states participated in the program, but information on educational attainment is incomplete for a number of these states. Only half (9) of the states had fairly complete information on education, with 95% or more of suicide deaths including reports on education. Thus, we restrict our analysis of NVDRS data to the 5,172 suicides that occurred in 2013 in Kentucky, New Jersey, New Mexico, Ohio, Oklahoma, Oregon, South Carolina, Utah and Wisconsin.

A major strength of the NVDRS is the existence of comprehensive circumstance information on all violent fatalities. Participating states are trained by the CDC to identify the presence of a set of defined circumstances through careful examination of detailed information from the various sources listed above. These circumstance variables record the presence or absence of factors such as substance abuse problems, mental health issues, relationship difficulties and a number of other circumstances. Following prior work[10], we classify the circumstances into three conceptual groups: personal circumstances, which relate to the decedent's mental and physical health, interpersonal circumstances, which capture circumstances pertaining to the decedent's relationships to other people, and external circumstances, which relate to problems the decedent may have had with outside factors such as employment and the legal system. These circumstances are not mutually exclusive, as multiple circumstances can be reported by an abstractor for a given incident.

We also consider characteristics which measure the extent to which a suicide was planned: whether the decedent left a note, expressed an intention to die by suicide or had a history of suicide attempts. Finally, we examine whether the manner of death (firearm; poisoning; suffocation; other) varied in any significant way by educational level.

We begin by describing national patterns and trends in suicide by educational attainment. We then drill down to describe characteristics of those suicides, considering the circumstances related to risk factors, degree of planning, and mechanism used. We examined the possibility that these characteristics may have changed over time (from 2005 to 2013) by education and report any notable patterns.

Results

National Trends. Over the study period, men and women aged 25 and over who possess a college degree or higher consistently exhibited the lowest rates of suicide while those with a high school degree displayed the highest rates. The differential is substantial for men; a college degree halves the risk of death by suicide relative to those who have a high school degree only in 2014. However, education does not have a linear association with suicide, as both men and women who did not complete high school display lower rates of suicide than those with a high school diploma, and in the case of women ages 25 and older, lower rates than those with some college education as well. Cross-national research also reports more inconsistent educational differences for women.[11] For all educational groups and both genders, suicide rates are higher in 2014 than they are in 2005. Among men, the suicide rate for those with a high school degree increased by 6.63 per 100,000, from 32.2 in 2005 to 38.8 in 2014 (20.1% increase); for those

with a college degree, the increase was 3.76 per 100,000 (13.9 in 2005 to 17.6 in 2014 or a 27% increase). The education gradient in suicide, however, did not change over the period.

[Figures 1a and 1b about here]

Overall patterns are similar among those ages 35-54 years. Among middle-aged women, a college degree confers significant protection against suicide, with rates lower on the order of 2-3 per 100,000 relative to the next group. In 2005, women with some college had lower suicide rates than those without a high school diploma, but in 2008-2009 (the years of the Great Recession), that shifted so that those with some college actually exhibited higher suicide rates than those without a high school degree. The patterns suggest some shift in trends associated with the Great Recession. For example, in the period before 2010, suicide rates were rising for middle-aged men across the board; since 2010, however, rates for college educated men plateaued and declined for those without a high school degree but they continued to rise for the other educational groups. Among middle-aged women, suicide rates increased for all educational groups since 2010, but more for those with just a high school education so that the education gradient grew slightly for this demographic group over the study period.

[Figures 2a and 2b about here]

Characteristics of suicides, by educational attainment. Table 1 displays the characteristics of suicide decedents aged 25 and older by education and gender, using 2013 data from the NVDRS.[1] Given the national patterns in suicide by education, we distinguish only between those with at least a college degree and those without a degree and find important differences in the circumstances surrounding suicide deaths according to education level. Although the overall prevalence of personal circumstances was not different by education, we

[1] Results are similar for suicide decedents aged 35-54 and are available upon request.

observe significant differences in specific personal circumstances. Less educated male and female suicide decedents were less likely to have had a mental health problem, such as clinical depression, and to have sought treatment for mental health concerns than their more educated counterparts. In the case of men, those without a college degree who had a mental health problem were less likely to receive treatment for that problem, which may reflect differences in access to health care and/or care-seeking behavior. Yet less educated suicide decedents were *more* likely to have substance abuse circumstances than those with a college degree.

Interpersonal issues, which include relationship problems with intimate partners and other family members as well as arguments, were more often identified as circumstances in suicides for those without a college degree. For example, 32.2% of male decedents without a degree were experiencing intimate partner problems before their death, compared to just 23.3% of those with a college degree. The circumstance related to argument may also be linked somewhat to impulsivity and planning, as it measures whether or not an argument or conflict was thought to have led to the death. Job problems were relatively more common for college educated men and women, along with financial difficulties for women.

[Table 1 about here]

Decedents differed somewhat by educational status in characteristics related to suicidal planning. Those with less education were more likely to have previously disclosed their suicidal intent to others, while decedents with more education were more likely to have left a note. Decedents with less education were somewhat more likely to have a history of prior attempts, but the differences are not significant. There are minimal differences in method of suicide. Men without a college degree were more likely to die by firearm than those with a degree. More educated men were more likely to use some other means (e.g. jumping or vehicular impact).

More educated women were more likely to use suffocation as a means (p=0.08) than those without a degree.

The results reflect well-known gender differences in the circumstances surrounding suicide. Personal circumstances, in particular mental health issues, were more common for women. Relationship difficulties, especially intimate partner problems, were more likely among men, as were external circumstances such as job problems, financial difficulties, and criminal justice encounters. Women were more likely to have had a prior suicide attempt and to leave a note. Firearms were the most frequently used suicide method for men, regardless of education; for women, poisoning was the most common method.

We examined trends over time in these characteristics to determine any shifts in patterns but found no evidence of any substantial changes over the period.

Discussion

Our findings reveal an important education differential in suicide mortality. Both men and women with a college degree exhibit the lowest rates of suicide, a pattern that held constant over the past decade. While numerous studies document the pathways through which education affects overall mortality[12], less is understood about the association between education and suicide in particular. To the extent that education engenders self-efficacy, strengthens various forms of human, social and cultural capital, and is linked to greater access to and use of mental health services, higher levels will improve well-being and in turn reduce suicidal behavior.

Yet the association between education and suicide risk is not linear or straightforward. Men and women with a high school diploma consistently display the highest rates of suicide, greater than those without a high school degree. For all women aged 25 and older, those with

some college education also exhibit higher suicide rates than those without a high school diploma. We can only speculate as to reasons for this pattern. It may be explained in part by the fact that the population with no high school degree includes a disproportionate share of foreign born residents, for whom low educational attainment is less of a marker. A possible disjuncture between norms and expectations (in Durkheim's[13] terms, anomie) offers another possible explanation. Those with a high school diploma, especially those who were born before the 1970s, were socialized to expect that degree to bring certain economic opportunities. Working-class middle aged individuals today were often raised by parents who lacked a college degree yet were able to achieve a solid middle class standard of living. Fundamental changes in the U.S. economy (a decline in manufacturing jobs and rising inequality) have left many working class Americans vulnerable, as revealed in part by surveys showing that a substantial proportion report that they are worse off than their parents and worse than they expected to be in their present life stage.[14] Indeed, the anger and sense of powerlessness exhibited by many working class white men as a result of their perceived loss of socioeconomic status, is front and center in the 2016 U.S. presidential race.

Our analysis of differences in suicide circumstances by education reveals four important distinctions in the types of precipitating stressors experienced. First, interpersonal problems (problems with intimate partners or family members) were far more likely to have been present in suicide deaths among those without a college degree. Prior work documents the important predictive effect of socioeconomic status on the quality and stability of relationships, with more disadvantaged couples experiencing greater financial strain producing family stress and reporting less satisfaction with their relationship.[15] The association is likely causal – disadvantage produces stress and marital difficulties ensue – and also due to selection – individual experiences

from childhood and adolescence can affect both educational attainment and family relationships.[16]

The second distinction relates to substance abuse, which is an important risk factor for suicide and far more prevalent among less educated decedents. Those with less education may be more likely to have experienced adverse childhood experiences (e.g. abuse and neglect) and to face diminished opportunities leading to substance abuse [17,18], and the literature on education and mortality points to the differential use of alcohol and tobacco as one of the most important drivers of the educational gradient. Consistent with these findings, our analysis shows that substance abuse was a more significant issue among the less educated with regard to suicide completion.

The third difference relates to mental health. Although we document lower levels of mental health problems among those with less education, it may be that these conditions are under-measured and under-treated among those with less education, who may have reduced access to health care and different care seeking behaviors. One piece of evidence consistent with this notion is that, conditional on the identification of a mental health problem, male decedents with less education were less likely to have received mental health treatment.

Finally, job problems, while a less common precipitating circumstance surrounding suicide in general, were more often present in suicide deaths of those with a college degree. Undoubtedly, the employment conditions and prospects for those lacking a college degree are less favorable yet the identity of those with a college degree is likely more closely intertwined with work so that job problems pose a greater threat to well-being and self-worth and are perhaps less expected.[19] The Great Recession of 2007-2009 had widespread adverse effects and suicide

rates for all educational groups rose during that period but abated only for men with a college degree after 2010.

We note several cautions regarding our conclusions. The national suicide rates by educational attainment use broad age groups so changes in education level by cohorts may have some minimal effect on the patterns, particularly for those aged 25 and older. In addition, the measurement of education in the NVDRS is incomplete and the sample of states on which this analysis is based may not be representative of the United States population. Most importantly, the NVDRS circumstance data are limited to completed suicides, so the identification of differences in circumstances does not directly explain differences in suicide rates but rather is suggestive of factors that may increase suicide risk for the less educated relative to those with more education. Future studies that can incorporate additional measures of socioeconomic status, including income and occupation, and measure differentials by nativity status would provide greater insight into the nexus between socioeconomic disadvantage and suicidal behavior.

Nonetheless, our findings are among the first to offer insight into the important connection between education and suicide, during a period when levels of suicide and economic inequality and uncertainty have been rising. The differences in the nature of the circumstances surrounding suicide deaths by education level highlight the greater volatility and fragility in the daily lives of those experiencing socioeconomic disadvantage, with important implications for prevention. Health and social policies may provide important opportunities to address some of these social determinants. For example, the coverage expansion accompanying health reform extended access to behavioral health treatment to millions starting in 2014.[20] Additionally, policies that support low income families, such as paid family leave and increased minimum

wage laws, may play an important role in reducing risk factors for suicide among the less educated.

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Figure 1a. Male Suicide Rate, Ages 25 and Older, United States, 2005-2014

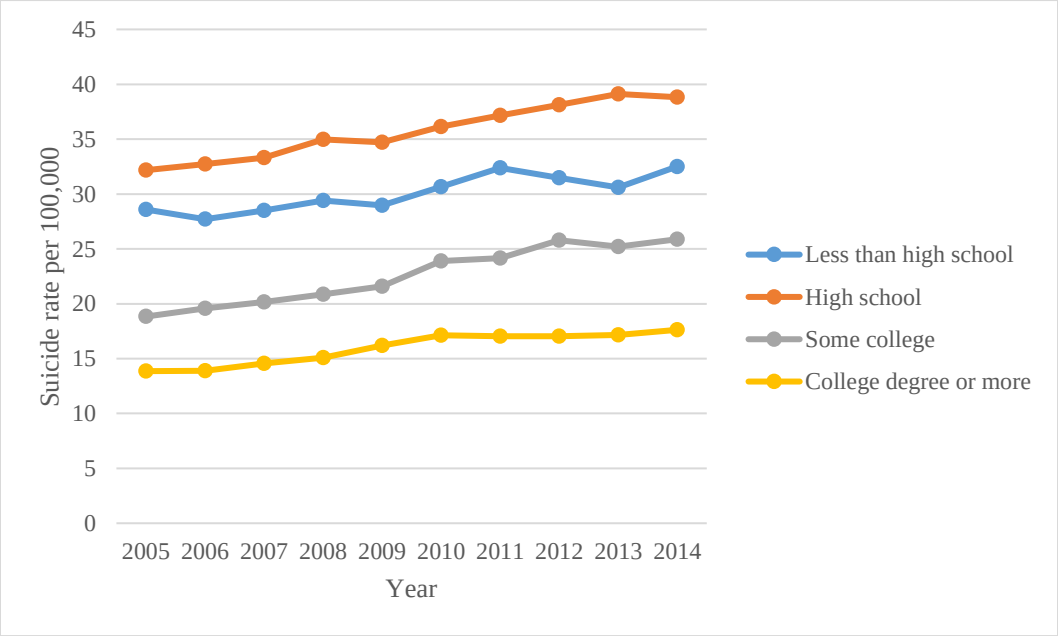

Figure 1b. Female Suicide Rate, Ages 25 and Older, United States, 2005-2014

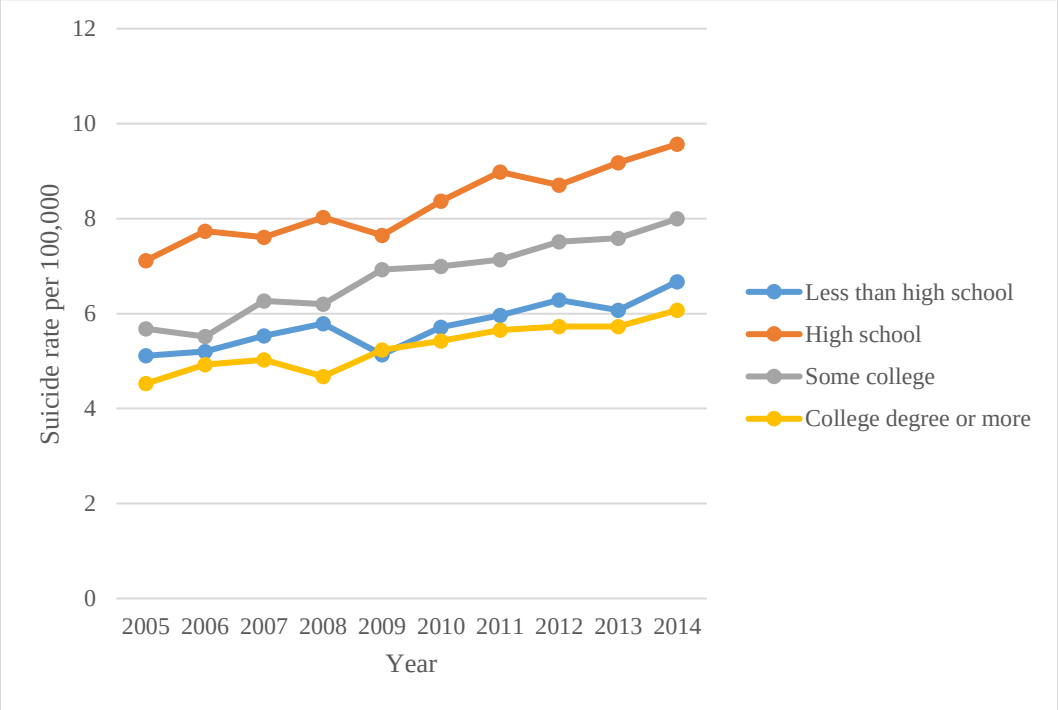

Figure 2a. Male Suicide Rate, Ages 35-54 Years, United States, 2005-2014

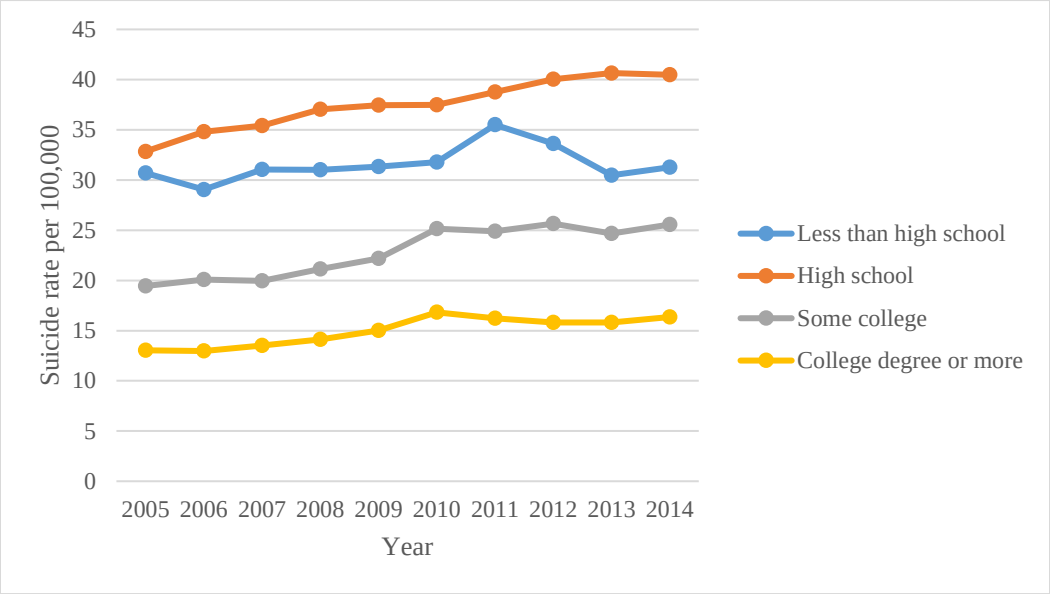

Figure 2b. Female Suicide Rate, Ages 35-54 Years, United States, 2005-2014

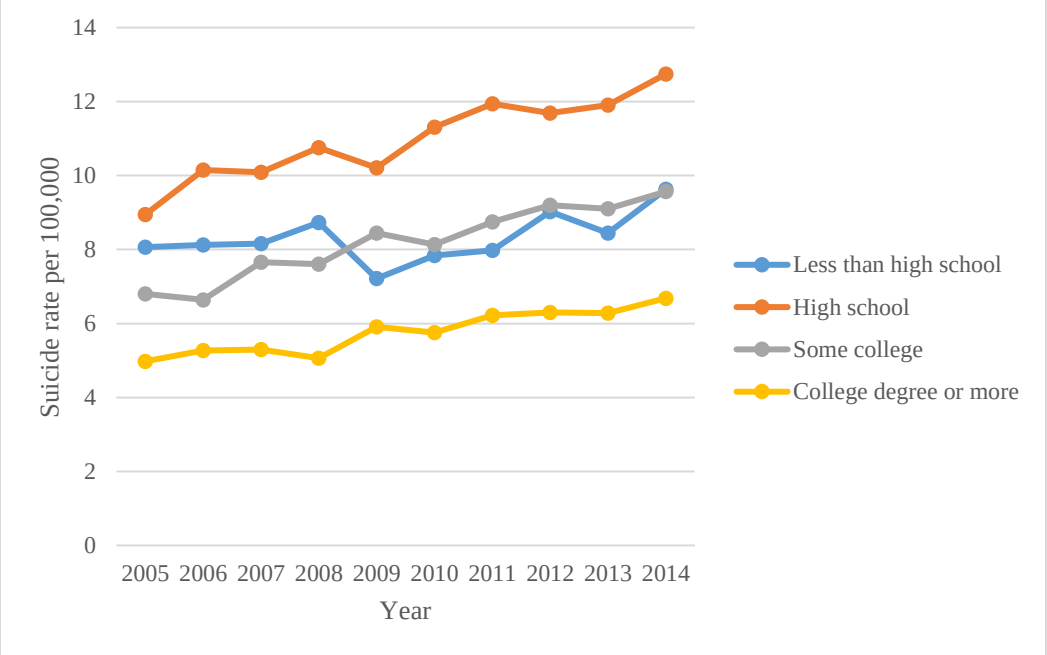

Table 1. Characteristics (%) of Suicide Deaths, by Education and Sex, Ages 25 and older, 2013

	Males				Females			
		College degree				College degree		
	Total	No	Yes		Total	No	Yes	
Circumstances								
Personal	78.8	78.7	79.3		86.6	86.7	86.9	
Physical health problem	23.3	23.1	24.5		22.2	23.0	19.0	
Mental health problem	40.1	39.0	45.4	*	64.0	62.8	69.2	+
Mental health treatment	25.3	23.7	33.6	*	45.2	43.8	51.1	*
Substance abuse problem	14.7	16.1	7.8	*	18.7	20.5	10.9	*
Not receiving treatment for MH problem	37.6	40.2	26.1	*	30.2	31.2	26.1	
Interpersonal	44.7	46.3	36.5	*	43.3	45.6	32.6	*
Family problem	8.0	8.5	5.5	*	11.5	11.6	10.9	
Argument preceded death	15.1	16.6	7.5	*	15.2	16.8	8.1	*
Intimate partner problem	30.8	32.2	23.3	*	21.9	22.9	17.2	+
External	34.0	34.0	34.0		22.2	21.4	25.8	
Job problems	14.7	14.0	18.5	*	9.7	8.6	14.5	*
Financial problems	13.4	13.3	13.5		9.5	10.2	6.3	+
Planning and Intent								
History of prior attempts	15.2	15.6	13.2		33.7	33.9	32.6	
Left note	34.1	31.6	46.4	*	39.6	38.2	45.7	*
Disclosed intent	24.9	25.7	20.8	*	25.2	26.0	21.3	
Method								
Firearm	59.2	59.9	55.8	*	32..2	33.2	27.6	
Poisoning	11.3	11.1	12.5		36.7	37.2	34.4	
Suffocation	23.4	23.6	22.3		23.1	22.1	27.6	+
Other	6.1	5.5	9.4	*	8.0	7.5	10.4	
Number of suicide deaths	3,987	3,329	658		1,185	964	221	

Source: NVDRS, 2013.

* Difference between those with and without a college degree significant at p<=0.05

+ Difference between those with and without a college degree significant at p<=0.1