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The Social Side of Accidental Death *

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Abstract

Mortality from unintentional injuries, or accidents, represents major and understudied causes of death in the United States. Epidemiological studies show social factors, such as socioeconomic and marital status, relate with accidental death. But social theories posit a central role for social statuses on mortality risk, stipulating greater relevance for causes of death that have been medically determined to be more preventable than others. These bodies of work are merged to examine deaths from unintentional injuries using 20 years of nationally representative survey data, linked to prospective mortality. Results indicate that socially disadvantaged persons were significantly more likely to die from the most preventable and equally likely to die from the least preventable accidental deaths over the follow-up, compared to their more advantaged counterparts. This study extends our knowledge of the social contributors to a leading cause of death that may have substantial implications on overall disparities in length of life.

Keywords: mortality, unintentional injury, SES, marital status, fundamental cause

1. Introduction

On any given day in the United States alone, approximately 320 individuals lose their lives abruptly and in an often astonishingly unexpected fashion. Most adults have reflected on their own mortality and reasonably have not envisioned their ultimate demise resulting from an automobile accident driving home from work or from taking the wrong dosage of a prescribed medication. But over 120,000 persons in the United States died from accidental causes such as these in 2008, representing the 5th leading cause of all deaths (Miniño et al. 2011). Referred to more commonly by epidemiologists as deaths arising from unintentional injuries, the age adjusted rate of accidental mortality, 38.6 per 100,000, is over three times the rate of suicide, over six times the rate of homicide, and over ten times the rate of deaths arising from human immunodeficiency virus (HIV). In fact, the annual number of deaths from accidents is just short of the number of deaths from acute myocardial infarction, a major contributor to cardiovascular disease deaths (Miniño et al. 2011). The implications of accidental death for society are enormous, resulting in billions of dollars in direct costs and millions of life years lost (Rice, MacKenzie and Associates 1989). Despite their relevance, accidents remain a relatively neglected area of research especially among researchers studying the social determinants of health and mortality (Kposowa and Adams 1998; Pampel 2001).

In this paper, we combine the fields of injury prevention and risk and the social determinants of health by focusing on both socioeconomic status (SES) *and* marital status across a range of accidental deaths. We review the existing evidence and move beyond previous works, examining the independent associations of SES and marital status and assessing relationships by the preventability of the accidental death. The findings lend support to social theories of health and mortality as they relate to fatal unintentional injuries.

1.1 Social Factors and Mortality

Decades of research have established that mortality is itself a social process. SES and social relationships have much to do with how long and how well persons live (Berkman and Syme 1979; Kitagawa and Hauser 1973; Link and Phelan 1995). SES provides a number of benefits that encourage healthy living and longer life including more autonomy over life circumstances and ready access to knowledge that promotes healthy living (Mirowsky and Ross 2003). Consequently, research has documented that more disadvantaged SES groups are generally more likely to die, via accident or otherwise, than more advantaged groups (Cubbin, LeClere and Smith 2000b; Steenland et al. 2003).

Similarly, social relationships serve as mechanisms to inhibit poor health and extend life through enhanced social integration, cohesion, and social support (Berkman and Glass 2000; Berkman, Leo-Summers and Horwitz 1992; House 1981; Rogers 1996). These connections to longevity have received less attention in the realm of accidental death (Cubbin, LeClere and Smith 2000b). However, crucial social relationships could certainly lower the probability that one dies from an accident. Accidents are often related to taking health risks (Leistikow, Martin and Samuels 2000; Runyan et al. 1992; Shah et al. 2007), and socially supportive relationships, such as marriage, inhibit risk and lengthen life (Berkman 1995; Rogers et al. 2010; Waite 1995). Further, possessing relationships that more often than not provide positive support (Turner and Marino 1994) can increase the likelihood of assistance and ready delivery of resources that save lives in times of desperation.

Link and Phelan (1995) laid a groundwork for understanding social conditions as “fundamental causes” of health and length of life. In developing their theory, the authors note that social factors, such as SES *and* social support derived from important relationships, are

central to health and mortality because they influence access to resources that can help prevent and overcome disease processes (Link and Phelan 1995). That is, higher SES and strong social relationships relate with better health prospects through greater social connectivity, more control of life circumstances, knowledge of and access to medical technologies, and healthier lifestyles (Glied and Lleras-Muney 2008; Mirowsky and Ross 2003; Rogers 1995; Umberson 1987). Systematic investigations of the fundamental role of social factors on mortality risk have primarily focused on SES (Phelan and Link 2005; Phelan et al. 2004). However, a similar set of arguments follows for those who maintain solid social relationships, such as those found in family settings, which hold substantial potential for social support. Though these close knit relationships can be a source of stress and strain (Amato 2000; Seeman 2000; Williams, Sassler and Nicholson 2008), married persons often provide each other with opportunities for social integration (Kosteniuk and Dickinson 2003) that lead to longer and healthier lives. And as Turner and Marino (1994) contend and others have found support for (Liang et al. 2005; Waite and Gallagher 2000), marriage more often than not reflects the existence of a positive relationship that involves essential resources that can be leveraged toward better health.

1.2 SES, Marital Status, and Accidental Death

Much of what we know about the sociodemographic and socioeconomic correlates of accident mortality come from epidemiological studies that combine all causes of accidental mortality (a diverse group) together or investigate a single cause of accidental death. This work identifies heightened risk of death from accidental causes for young children and older persons (Istre et al. 2001), and for men (Cubbin, LeClere and Smith 2000b; Steenland et al. 2003). For race and ethnicity, blacks typically display higher rates of death via all injuries (Cubbin, LeClere and

Smith 2000b; Steenland et al. 2003) especially accidents involving fires (Istre et al. 2001) and in occupation specific accidents (Loomis and Richardson 1998). Findings also indicate heightened risks in rural areas (Allareddy et al. 2007; Paulozzi and Xi 2008) and in parts of the South and West (National Safety Council 2007). Importantly, much of this work treats accidental deaths as ancillary or as an ‘other’ external cause of mortality and often includes intentional injury deaths via suicide and homicide in the estimation of effects (Cubbin, LeClere and Smith 2000a). Deaths via unintentional injuries, however, encompass unique conditions that call into question studies that cannot separate them from each other or from other external causes.

Research on accidental deaths often fall within the purview of injury prevention, which aims to reduce the number and severity of incidents (Barss et al. 1998). The field of injury control and prevention has widely adopted the Haddon Matrix as the central framework to conceptualize the etiology and epidemiology of injuries (Haddon Jr. 1980). This paradigm emphasizes the role of the human (e.g. driver), the agent/equipment (e.g. car), and the environment (e.g. road) in preventing injury occurrence before the event, reducing the impact severity during the event, and minimizing the consequences after the event. Although initially modeled for motor vehicle injuries, the Haddon Matrix can be applied to other forms of unintentional injuries as well (Runyan 1998). Conceivably, individual SES and marital status are important to the elements of the Haddon Matrix. For example, in the case of residential fires caused by cigarettes, higher SES can determine the presence of working fire detectors and lower flammability of the home, and being married can curb the amount of cigarette smoking in the first place and help with escape after the incident.

Injury prevention literature has established SES as an important element of injuries incidence and accident mortality (Barss et al. 1998; Cubbin and Smith 2002; Hosking et al. 2011;

Kposowa and Breault 2009). Accidental deaths disproportionately burden persons of lower SES because they experience greater exposure to hazardous environments, lack high-quality and safe equipment to protect themselves, and suffer greater consequences resulting from injury (Burrows et al. 2012). Additionally, lower SES prevents individuals from accessing important safety information and adopting preventative behaviors (Cubbin and Smith 2002).

Recent work on Canadian mortality by Burrows and colleagues (2012) provides an expansion on the body of work linking SES to accidental death, showing the influence of several markers of SES on specific causes of accidental death. Focusing on the reported effect of low education, the authors find increased risks for motor vehicle accidents among men only, and for poisoning and drowning for both men and women. Fully adjusted models showed no relationship with education for accidental death by falls, suffocation, or fire (Burrows et al. 2012).

Similar to overall mortality, researchers have reported an increased risk of potentially fatal injuries among the unmarried (Cubbin, LeClere and Smith 2000a; Kelly and Miles-Doan 1997; Rogers 1995), for those with lower levels of social connection (Eng et al. 2002), and for those who lack immediate support systems to assist them in times of need (Marshall et al. 1998; Wyatt, Beard and Busuttil 1999). Some evidence suggests the risk of accident mortality across unmarried categories is consistent (Rogers 1995; Spoerri, Egger and von Elm 2011) with divorced, widowed, and never married persons showing similar heightened risks. However, other researchers have found that for motor vehicle accidents, divorced and separated persons exhibit higher risk than never married persons and widowers (Cubbin, LeClere and Smith 2000a; Cubbin, LeClere and Smith 2000b; Kposowa and Adams 1998).

Marital status should influence accidental death through varying levels of social support and through health behaviors (Cheung 1998). For instance, studies of widowers show increased

risk of accidental death following the death of a spouse from over 20 percent (Elwert and Christakis 2008) to upwards of 90 percent (Martikainen and Valkonen 1996). These authors attribute the high accident mortality risk of recent widows to the sudden loss of social support and social integration, as well as increased alcohol intake following the spousal death. Unmarried persons are more likely to exhibit unhealthy behaviors which relate with a host of accidental deaths (Kool et al. 2008), such as cigarette smoking (Leistikow, Martin and Samuels 2000; Wen et al. 2005) and excessive alcohol consumption (Allareddy et al. 2007).

While more recent accident mortality analyses have begun focusing on SES as a primary contributor to risk (Burrows et al. 2012; Cubbin, LeClere and Smith 2000b; Cubbin and Smith 2002), marital status, with few exceptions in the epidemiological literature (see, for example Whitlock et al. 2004), has been included in analyses of accidental death mainly as a confounding factor. Important exceptions include Ben-Shlomo et al. (1993), who use the Whitehall study to find elevated risks of death from accidents and violence (a category that combines all accidents and deaths from violence including homicide for example) among unmarried men. Only the risk of never married men remains significant after accounting for age and SES. Kposowa and Adams (1998) find that divorced individuals are more likely than married persons to die from automobile accidents and suggest that stress and negative health behaviors associated with relationship dissolution contribute importantly to risk. More recently, Kposowa and Breault (2009) found increased risk from motor vehicle death for divorced men, compared to married men, even after accounting for SES differences.

In all, the associations of SES and marital status with accidental death are often specific to mortality from one cause or are generalized across all accidents and other external causes of death. While SES has received more attention than marital status in the accidental death

literature, no studies to date have tested the roles of SES *and* marital status in differentiating mortality risk. To address that issue requires classification of accidental deaths into categories which reflect the degree to which resources afforded by advantaged social status (i.e. higher education, married) can be leveraged toward evading death.

1.3 Mortality Preventability

If vital social relationships and socioeconomic resources prolong life, then they should be more important in situations where death can reasonably be avoided and less valuable in situations that more closely resemble random events. Recently, Phelan and colleagues (2004) extend the fundamental cause perspective by creating a preventability of death ranking system and propose and find support for the notion that more preventable causes of death should be more strongly related to SES than less preventable causes. Their preventability ranking system uses a combination of two criteria (see 2004:272). First, the preventability of the cause itself is considered based on factors such as vaccination availability and lifestyle. Second, they evaluate the preventability of death upon onset of disease based on the availability and means of treatment. For example, death from multiple sclerosis is nearly impossible to prevent, while tuberculosis is one of most preventable causes of death.

Though not a focus of their analyses, the preventability rankings produced by Phelan and colleagues (see Appendix A of Phelan et al. 2004) show that accidental deaths display variability in their preventability; a claim supported in the injury prevention literature (Barss et al. 1998). Accidental deaths by poisoning and fire represent the most preventable, air and water transport accidents represent the least preventable,¹ and motor vehicle deaths, falls, and drowning lie in between the least and most preventable forms of accidental death (Phelan et al. 2004).

1.4 Objectives

Previous works have found support for SES and marital status as contributors to accidental mortality. More advantaged SES groups may hold advantages by harnessing what Phelan and colleagues (2004:267) call “serviceable resources”, such as money and knowledge that can be used to drive safer cars and refrain from excessive alcohol use. Marital status as a mechanism that impacts accidental death is grounded in two primary arguments: 1) discouragement of risk and 2) availability of immediate support. Married persons are generally happier, healthier, and less likely to engage in risky behaviors that may associate with accidental death. And they are also more likely to have immediate support systems in place that can provide advice and assistance in situations that can be life threatening (Rogers 1995).

Thus, this paper has two main objectives. First, we establish the effects of marital status and SES on specific causes of accidental death after accounting for other important and established indicators of risk. Second, we provide an empirical test of the fundamental cause perspective by examining relationships between marital status and SES on more and less preventable forms of accidental death. The theory predicts that marital status and SES should be more relevant for more preventable than for less preventable unintentional injuries leading to death (Link and Phelan 1995; Phelan et al. 2004).

2. Methods

2.1 Data

The data come from combining multiple years of the National Health Interview Survey (NHIS), linked to prospective mortality through the Linked Mortality Files (LMF). The Integrated Health Interview Series (IHIS), an initiative through the Minnesota Population Center at the University

of Minnesota, streamlines an otherwise arduous data construction process and provides the complete data set used here (Minnesota Population Center 2010). NHIS years include 1986 through 2004 and LMF cover 1986 through 2006. Designed as a cross-sectional household survey by the National Center for Health Statistics (NCHS), the NHIS annually collects information from approximately 30,000 to 40,000 households, obtaining response rates consistently at or above 90% (NCHS various years).

The NCHS recently completed its fourth mortality follow-up with NHIS respondents (NCHS 2009). NCHS uses a probabilistic mortality matching scheme that assigns weights to multiple factors including social security number, first and last name, and date of birth to create the LMF. The public-use mortality matches are made available for all respondents age 18 and older. Therefore, analyses cannot address accidental deaths among children. NCHS designates some cases as ineligible to be linked to prospective mortality if records include insufficient identifying data, such as name and social security number, to create a mortality record (NCHS 2009). For the years used here, fewer than 3.0% of cases are deemed ineligible in any single year and NCHS (2009) provides weights that adjust for the exclusion of ineligible records. Due to missing data on key variables used in the analysis, an additional 3.4% of cases are dropped. The final data set includes information on 1,302,090 adults aged 18 and above; their records are linked to 4,347 accidental deaths through the end of 2006.

2.2 Variables

The dependent variables include accidental underlying causes of death coded '1' for deaths defined through the World Health Organization's (2007) 10th revision of the *International Statistical Classification of Diseases, Injuries, and Causes of Death* (ICD-10) as death from unintentional injuries and consistent with the available information in the public-use release of

the LMF mortality linkages provided by NCHS. All other respondents are coded '0' if they either survived the follow-up or died from other causes. Results are presented separately for accidental causes which included enough detail in the method of death and that included a sufficient number of deaths for analysis. These specific causes include poisoning, fire or smoke, falls, drowning, motor vehicle, and air and water transport accidents (see Appendix A for the ICD-10 codes that align with the public-use NCHS mortality matches for accidental deaths).² Some causes, such as air and water, drownings, and fire or smoke related include fewer than 200 deaths. However, including these causes separately rather than combining them is justified because of their distinctiveness and because their preventability varies (Phelan et al. 2004).

The NHIS collects a core set of sociodemographic and socioeconomic measures (NCHS various years). Age is included as a continuous variable and an age squared term captures increased risk for both the young and very old (Istre et al. 2001). Gender is coded dichotomously with women as the referent. Race and ethnicity compares the effects of non-Hispanic black, non-Hispanic other, and Hispanic to the referent group, non-Hispanic white. Multivariate models also include a dichotomous measure that captures rural (the referent) or urban living and a set of dummy variables indicate region of the U.S. with persons living in the Northeast serving as the referent.

Separate dummy variables capture educational attainment and work status categories with referents of greater than high school educated and employed, respectively. More education detail is available only for 1997 forward, so the broader measure is used here and provides sufficient enough detail to evaluate its impact on accidental death. Supplementary analyses using the 1997 and later data were conducted and do not alter interpretations provided here (available upon request).

For income, the reference person reports the total income of the household in categories defined by NCHS, and that value is assigned to each individual living in the dwelling. To approximate a continuous measure of income, the midpoint of each category is taken and a median value for the open-ended category is estimated (Parker and Fenwick 1983). The value is then adjusted to account for varying purchasing power among different sized families (see Van der Gaag and Smolensky 1982) and the consumer price index is used to regulate changes in purchasing power over time. To estimate missing income data for approximately 18% of the sample, a number of covariates in the data, including a less detailed measure of income indicating above or at or below \$20,000, were used. Following Gelman and Hill (2007), stochastic variation is incorporated into the predicted values of income to better represent variability in the actual income data. Terciles of income are generated and the analyses include dummy variables to compare the accidental mortality risk of those in the lowest and middle income categories to those in the highest. The consistency of the income measure was evaluated by estimating models with and without the missing income data and found no discernible differences in results.

Marital status is coded to compare the effects of divorce or separation, widowhood, and never married to the reference category of married. Though it is impossible to know how long individuals have been married using the NHIS data, these social relationships existed most likely before any biological mechanism was triggered as a result of an accident, eventually leading to the respondent's death. Few other indicators of social relationships or social support exist across all years of the NHIS used here.³ Information on family size and presence of children in the household were investigated in the multivariate models but produced no influence on results

(available upon request). For parsimony, these measures were eliminated in the models presented here.

2.3 Statistical Analyses

We estimate the risk of accidental death using Cox proportional hazard models (Allison 1984). Duration in quarter year intervals indicate the time to death in our models. Thus, the risk of death is calculated at four points over the course of a year, starting from the quarter and year of each person's interview. Records are censored at the time of death from causes other than accidents or if respondents survive to the end of the follow-up period. The Cox models are particularly useful because they do not impose a distribution of death nor do they require the analyst to choose a particular distributional form for the times of survival specified (Allison 1984). The model declares that the hazard rate for the j th respondent is

$$h(t|x_j) = h_0(t) \exp(x_j\beta_x)$$

where the coefficients β_x are estimated from the data using a partial likelihood approach (Hoffman 2004).

A key assumption of the Cox model is proportional hazards. We tested this assumption by generating Schoenfeld and scaled Schoenfeld residuals in Stata (Cleves, Gould and Gutierrez 2004; StataCorp 2010) and calculating variable-by-variable and global chi-square statistics and associated p-values for our models. Global tests indicate the proportionality assumption is violated but the variable specific tests generally show that the effects of marital status and SES do not vary over the study period. This was especially the case for divorce/separation and education (results of these tests available upon request). Thus, we focus on the effects of those measures in our illustrations of the results. Given these tests and the conclusions of Therneau and Grambsch (2000) that estimates are sturdy despite any possible violation of proportionality when

based on large nationally representative samples, we proceeded with our analyses. We report all results in the form of hazard ratios and use Stata 12 software to incorporate sample weights, make adjustments for the complex sampling frame, and estimate robust standard errors to account for the clustered sampling design of the NHIS (StataCorp 2010).

3. Results

Table 1 provides weighted means and proportions for the covariates in the full sample, for all of the accidental deaths, and separately by the specific types of accidental deaths and by their preventability. There are noticeable variations across variables when comparing the full sample to those who died from accidental causes. Compared to the full sample, accidental death victims are older, male, white, poorer, less likely to be employed, less educated, and less likely to be married.

The patterns vary considerably across the different causes of accidental death, however. For example, roughly 43% of the most preventable accidental deaths (poison and fire/smoke related) were married while greater than 54% of victims of less preventable accidents (falls, drowning, and motor vehicle) and two-thirds of air and water accident victims were married. Age varies dramatically across accident victims and these differences likely drive many of the descriptive SES differences across accidental deaths. Victims of the least preventable accidents, air and water, look very different than the other accident victims. Unlike the other specific causes, more air and water transport accident victims are married and not disadvantaged in terms of income, employment, or education. To examine the effects of the covariates in a multivariate setting we turn to Table 2.

(Table 1 about here)

Table 2 provides hazard ratios (HR) from Cox models first for all the accidental deaths together and then separately by each of the types of accidental death. The multivariate analyses proceed by first establishing the main effects of marital status (Model 1) and SES (Model 2) on accident mortality controlling for sociodemographic and geographic indicators that associate with risk. A full model (Model 3) is then included to examine independent marital status and SES effects on accidental death risk over the follow-up period. The table includes effects for all accidents and then moves from left to right according to the preventability of the cause-specific accidental death.

Model 1 for all accidents shows that marital status is strongly related to unintentional injury mortality risk. Compared to married persons, divorced or separated, widowed, and never married adults all experienced substantially higher risk of death. Divorced or separated persons were 76%, widowers were 41%, and never married persons were 35% more likely than married adults to die via accident over the follow-up period. In addition, a non-linear relationship exists between age and accidental death and men are over two times ($HR = 2.12$) as likely to die from accidents as women. Race/ethnicity does not associate with mortality risk in Model 1 but those persons living in urban areas experienced a 25% lower risk of accidental death ($HR = 0.75$). Finally, there are important regional differences in accidental death. Compared to those living in the Northeast, persons in the other three regions of the U.S. experienced greater risk of accidental death. The effects of the control variables generally hold across models with the exception of race, which shows in the full model (Model 3) that blacks and Hispanics experience lower risk to accidental mortality compared to whites.

Model 2 for all accidents shows that, as expected, socioeconomic resources associate strongly with death (Cubbin, LeClere and Smith 2000b). Those with compromised income,

employment status, and educational attainment all experienced higher risk of accidental death over the follow-up period. The effects of both marital status and the SES indicators go largely unchanged in Model 3. For example, the effect of divorce or separation is only slightly reduced moving from Model 1 to Model 3 (HR 1.76 to 1.68) and the effect of less than high school education goes unchanged. To aid with the interpretation of the magnitude of these effects we estimated discrete time logistic regression full models (all results available upon request) and calculated age-specific death rates (m_x) using the coefficients from those models (see Rogers et al. 2005:267 for a similar approach). For adults age 20 to 30 the death rate from accidents for divorced or separated adults was .003 compared to .001 for married adults. For less than high school educated adults age 20 to 30 the death rate was .004 compared to .001 for their more than high school educated counterparts.

(Table 2 about here)

Looking across the different types of accidental deaths in Table 2 reveals that marital status, and particularly divorced or separated status, relates strongly to most accidental deaths. Divorced or separated adults are 2.7 times more likely to die from poisoning, twice as likely to die from smoke/fire related accidents, 1.5 times more likely to die from falls, twice as likely to die from drowning, and 1.4 times more likely to die from motor vehicle accidents than their married counterparts, after accounting for all other covariates. In addition, widows experienced higher risk of fire/smoke, falls, and drowning deaths and never married persons experienced greater mortality risk for poisoning and falls. Air and water accidents are the only type of mortality that deviates from these patterns. In fact, with the exception of heightened risk for men and lower risk for those in urban areas, deaths from air and water accidents appear to be removed almost entirely from the characteristics of individuals (Li et al. 2001).

Men, compared to women, were at greater risk of death from all types of accidents and important variation exists across the accident types for the other control variables. For example, age expressed non-linear relationships with poisoning and motor vehicle deaths and was unrelated to fire and smoke related deaths and falls. Compared to non-Hispanic whites, non-Hispanic blacks experienced over twice the risk of death from fire or smoke but were 49% less likely to die from falls after accounting for all covariates. Persons in urban areas are generally at the same or reduced risk of death compared to persons in rural areas with the exception of poison related deaths where they experienced nearly 50% greater mortality risk. Finally, persons in the southern U.S. experienced higher risk of poisoning, drowning, and motor vehicle deaths compared to those in the Northeast.

Models 2 and 3 in Table 2 show also that disadvantaged SES in one form or another generally heightened accident-specific mortality risk over the follow-up with the exception, once again, for air and water accidents. Educational attainment relates strongly to deaths from poisoning, fire/smoke, and motor vehicle accidents but shows no relationship for deaths from falls or drowning. In fact, the only SES indicator placing persons at higher risk from falls or drowning is being out of the labor force. Low income persons experienced greater risk of poisoning and motor vehicle accidents as well.

Overall, Table 2 shows that unmarried and socioeconomically disadvantaged persons had higher risks across most causes of accidental death. Additional models (not shown) stratified by gender revealed no marital status differences between men and women and that less education predicted accidental mortality more strongly for men. In other words, though men are much more likely to die via accidental death than women, the effects of marital status on accidental death do not significantly differ across gender. There were also no differences in the effects of marital

status in models stratified by three broad age groups, 18 to 39, 40 to 59, and 60 and older. Younger persons generally showed stronger effects by work status and education in these unreported models (all results available upon request).

Table 3 explicitly evaluates the fundamental cause perspective on accidental death by providing Cox HRs for the most preventable to the least preventable accidental causes using the rankings from Phelan and colleagues (note that the estimates for the least preventable causes in Table 3 replicate the information for Air and Water in Table 2). Focusing on the effects of marital status provides support for the fundamental cause perspective. Indeed, compared to married persons, persons who were divorced or separated experienced 2.63 times the risk of death from the most preventable causes of death (fire/smoke and poisoning), a greater risk than the less preventable ($HR = 1.50$, $p \leq 0.01$) and least preventable causes ($HR = 0.52$, n.s.). A similar trend exists for widowed and never married respondents. To illustrate these effects, Figure 1 provides the point estimates and 95% confidence intervals by mortality preventability for divorced or separated respondents.

Similar effects exist across the socioeconomic variables in Table 3. Low income, unemployment, and a less than high school education are most strongly associated with the more preventable causes of accidental death. Education has been shown to relate more strongly to health and mortality than other measures of SES (Hummer and Lariscy 2011) and consistent with the fundamental cause perspective, low education shows a strong relationship by mortality preventability. To illustrate, Figure 2 uses point estimates and 95% confidence intervals for the effect of less than high school education by the most to the least preventable accidental deaths.

(Table 3, Figure 1, and Figure 2 about here)

The least preventable causes of accidental deaths, air and water transport accidents, also provide support for the fundamental cause perspective. Men are much more likely to die from these causes but they display virtually no associations with social characteristics such as education and marital status. Once again, to help with interpretation of the magnitude of these effects we estimated discrete time logistic regression models and calculated death rates from the coefficients (full results available upon request). For married and more than high school educated adults age 20 to 30, the death rate for the most preventable accidents was .00005 compared to .0001 for their divorced or separated and less than high school educated counterparts.

One pitfall of the public use mortality linkages is the absence of covariates at follow up to check for the effects of changes in variables such as marital status from interview to time of death. We checked on the robustness of the findings in two ways: First, we re-estimated the models with a restricted 5 year mortality follow-up and second, we estimated models for an early period (1986-1994 with mortality follow-up through 1996) and a late period (1995-2004 with mortality follow-up through 2006). For the 5 year restricted follow-up the estimates were largely unchanged from the results presented in Tables 2 and 3 and we found no evidence of significant differences for the models estimated on early versus late periods (all results available upon request).

4. Discussion

Research in health and mortality across the social and biomedical sciences has established strong links between social conditions, ill health, and mortality. Associations between SES and accidental death have been documented in the epidemiological literature (Cubbin and Smith 2002) and investigations of SES as a fundamental cause of mortality have harnessed growing support (Miech et al. 2011; Phelan and Link 2005; Phelan et al. 2004) for the theory. Social

support is also leveraged toward better health and social scientists have long connected the benefits of social relationships, particularly those relating to the family, to health (Durkheim [1897] 1951). The current analysis extends that inquiry to deaths arising from unintentional injuries.

Our findings show that accidents are indeed influenced by social status, extending knowledge of the social determinants of accidental death in several ways. First, for our large, contemporary, random sample of U.S. adults both SES *and* marital status are important factors relating to deaths from unintentional injuries. These SES and marital status effects hold after the inclusion of a host of other important risk factors. Perhaps most illuminating, we find that the influence of social factors varies across three levels of preventability. Social disadvantages arising from lower education and divorce or separation associate most strongly with the most preventable forms of accidental death (Link and Phelan 1995; Phelan et al. 2004). According to tenets of social theory, this elevates SES and marital status from important contributors to essential features of accident mortality risk. Those who were divorced or separated were 2.6 times more likely to die from the most preventable, 1.5 times more likely to die from less preventable, and equally likely to die from the least preventable forms of accidental death, compared to their married counterparts. Similarly, the least educated respondents were 2.4 times more likely to die from the most preventable, 1.5 times more likely to die from less preventable, and equally likely to die from the least preventable types of accidental death, compared to the most educated respondents.

In their seminal piece asserting social factors as fundamental causes of health and mortality, Link and Phelan (1995) stipulate that both SES *and* social support carry with them powerful resources that enduringly impact well-being. In a subsequent test of the theory, Phelan

and colleagues (2004) present results on a dichotomous classification of preventability (low and high) and find that SES is more powerfully related to all causes of death with high preventability. Indicators of SES, and not marital status or other indicators of social support, have been the primary focus of research linking social characteristics and accidental deaths. But prior research has not tested whether the resources inherent in higher SES and in marriage (Link and Phelan 1995) can be leveraged to reduce risk of dying from accidents. We find here that SES *and* marital status independently impact accidental death in ways consistent with the theory.

We suggest that the field of injury prevention focus its lens on the roles of social factors influencing risk. Such efforts might begin by more explicitly operationalizing the human elements within the Haddon matrix paradigm (Haddon Jr. 1980): that information, attitudes, and behaviors are shaped by social characteristics such as marital status. Researchers can, for example, track changes in divorce rates and the delay of marriage over time and explore linkages with the most and least preventable forms of accidental death. Practically, policy makers and health practitioners must understand that divorce does not put persons at equally heightened risk across types of fatal injuries. Indeed, supportive relationships may be uniquely leveraged to avoid death via poisoning and fires. Recognizing this may assist in establishing cause-specific prevention strategies.

These findings importantly add to our understanding of the contributors to a leading cause of death and the combined years of data from the NHIS linked to prospective mortality allow for detailed investigation of the mechanisms that contribute distinctly to different types of accidental mortality. Nevertheless, the data and conclusions that may be drawn have significant limitations. First, marital status is an informative and often used, but incomplete, measure of social support. The measurement of social support has sparked lively debate in the past (Bruhn

and Philips 1984; Cohen, Underwood and Gottlieb 2000) and is best encapsulated by including a combination of social relationships, ties, and overall feelings of connectedness and the ability to rely on support networks in times of need. More detailed measures of social support are unavailable across years of the NHIS. Marital status as it relates to health may be a better indicator of something else, more precisely social integration or connectedness (Gorman and Sivaganesan 2007). Nevertheless, marital status provides information on family structure and represents the presence or absence of an important social relationship. Future research should incorporate more thorough measures of social support grounded in theoretical and empirical tenets and investigate effects across time and across a wide range of mortality types.

Second, the analyses presented here do not include measures of health behaviors, which strongly associate with mortality risk and also with marital status and SES. The person files of the NHIS for the years used here do not include information on health behaviors but starting in 1997 an adult was randomly selected from households and responded to questions such as alcohol intake and cigarette use. Merging these files from 1997-2004 and linking them to mortality through 2006 provides a smaller sample with fewer accidental deaths but a sufficient number to preliminarily address the health behavior question. Accordingly, a model for all accidents was estimated on 462 deaths and showed that heavy drinking (defined as having 5 or more drinks per sitting at least once per month over a 12 month period) and current smoking increased risk by 56 and 57% respectively. More importantly, those with compromised SES (HRs for low income = 1.46, $p \leq 0.01$; not working = 1.55, $p \leq 0.01$; less than high school educated = 1.40, $p \leq 0.01$) and those who were divorced or separated (HR = 1.63, $p \leq 0.01$), widowed (HR = 1.42, $p \leq 0.05$), or never married (HR = 1.35, $p \leq 0.10$) experienced increased risk of death even after controlling for these health behaviors (results available upon request).

This further suggests advantages in SES and marital status produce resources that reduce risk of accidental death beyond the tendency to reduce risky behaviors. With additional mortality matches it may be possible to better test the effects of health behaviors on the relationship between social conditions and preventability-specific causes of accidental death.

One possible mechanism relating health behaviors to marriage and ultimately accidental death is the social selection into marriage perspective (Verbrugge 1983). This viewpoint contends that differences in mortality between married and unmarried persons are explained by a selection of healthy individuals into marriage. The perspective has found limited support (Wu et al. 2003) and researchers have also found evidence of the protective effects of marriage (Gove, Style and Hughes 1990). In all likelihood, both selective and protective effects of marriage operate in tandem (Murray 2000) and future work using data that can better account for selection effects is warranted.

Third, the results presented here may expose problems in the classification of accidental deaths altogether. That is, many of these deaths could be mis-classified as accidents when they are in fact intentional suicides, a cause strongly related to marital status (Durkheim [1897] 1951). Given widespread and increasing concern regarding the accuracy of forensic evidence used to determine cause of death in suspicious cases (Timmermans 2006), mortality researchers across disciplines must take this concern seriously. However, our results prove robust across multiple causes of accidental death and are consistent with theoretical predictions.

Health and mortality researchers are increasingly aware of the need for a more complete health science that incorporates individual behaviors and structural conditions (Syme 2008) in evaluations of the causes and consequences of ill health and mortality. Such concern is more than warranted in examining deaths from unintentional injuries. Accidents represent a major cause of

preventable and premature mortality and while substantial progress has been made over time in preventing motor vehicle deaths (CDC 1999) other causes have experienced steep increases in recent years (National Safety Council 2007; Miech, Koester and Dorsey-Holliman 2011).

Accidental deaths are also extraordinarily costly to society: billions of dollars in direct costs and millions of life years lost (Rice, MacKenzie and Associates 1989).⁴ Importantly, these deaths display undisputable social patterns. Gaining a better understanding of the underlying conditions that produce those patterns may go a long way in addressing disparities in length of life.

Endnotes

¹ NCHS combines water, air, and space transport accidents. Phelan and colleagues (2004) rank air and space as less preventable than water accidents but their data also show that air and space accidental deaths are two times the number of water accidents. Thus, the combined category of air and water transport accidents is presumed to be less preventable than the other types.

² There are additional accidents available in the public-use mortality files. We present results in this paper on accidental causes that are well specified and contain enough deaths for estimation. However, we did estimate models on accidental deaths from other land transport other than motor vehicles (47 deaths) and from firearms (42 deaths). These models were unstable making interpretation questionable and were thus not presented in the final models (available upon request). NCHS also includes a residual 'other accidental death' category for which the underlying cause is unknown, undetermined, or from a cause so rare that confidentiality prevents its release in public-use files.

³ The 2001 NHIS Sample Adult File (SAF) includes additional measures of social and emotional support. There are not enough linked accidental deaths to the 2001 SAF but supplementary

analyses indicate that divorced or separated adults possess significantly less social and emotional support than their married, widowed, or never married counterparts (available upon request).

⁴ The cost of injury report is dated and provides information for all injury deaths, intentional or otherwise. Over two thirds of injury deaths are from accidents, however, and from inflation alone these estimates are presumed conservative.

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Appendix A. Public-use NHIS-LMF Accidental Causes of Death and Associated ICD-10 Codes.

NCHS cause	ICD-10 code(s)
Poison	X40-X49
Fire / Smoke	X00-X09
Fall	W00-W19
Drown	W65-W74
	V02-V04, V09.0, V09.2, V12-V14, V19.0-V19.2, V19.4-V19.6, V20-V79, V80.3-V80.5, V81.0-V81.1, V82.0-V82.1, V83-V86, V87.0-V87.8, V88.0-V88.8, V89.0, V89.2
Motor Vehicle	
Air and Water Transport	V90-V99, Y85

Source: National Center for Health Statistics (2009)

Table 1. Weighted Means and Proportions by Accidental Causes of Death, 1986-2006 (N = 1,302,090).

			Most Preventable ^a		Less Preventable		Least Preventable	
	Full Sample	All Accidents	Poison	Fire/Smoke	Fall	Drown	Motor Vehicle	Air and Water
Number of Deaths		4,347	677	180	1,077	133	2,159	121
Marital Status								
married	62.20	55.08	43.70	43.58	54.46	57.14	59.15	66.67
divorced or separated	10.78	12.27	19.56	15.64	8.27	15.79	11.79	6.67
widowed	7.19	12.66	2.52	24.58	30.11	6.02	7.20	0.83
never married	19.83	19.99	34.22	16.20	7.16	21.05	21.87	25.83
Household income terciles								
lowest third	33.33	41.73	42.25	58.89	45.68	40.60	39.37	21.49
middle third	33.33	29.58	31.31	24.44	28.60	32.33	29.64	32.23
highest third	33.33	28.69	26.44	16.67	25.72	27.07	30.99	46.28
Employment								
employed	64.31	50.95	53.47	29.44	23.96	63.16	63.08	79.34
unemployed	3.03	4.03	8.86	3.89	1.39	3.76	3.94	2.48
not in the labor force	32.66	45.02	37.67	66.67	74.65	33.08	32.98	18.18
Education								
less than high school	20.95	32.48	32.64	48.33	36.95	22.56	30.71	10.74
high school	36.09	38.10	39.14	34.44	34.73	39.10	39.56	40.50
more than high school	42.96	29.42	28.21	17.22	28.32	38.35	29.74	48.76
Age (mean)	44.54	49.69	37.14	57.37	69.09	43.34	44.27	39.39

Table 1 cont.

			Most Preventable ^a		Less Preventable		Least Preventable	
	Full Sample	All Accidents	Poison	Fire/Smoke	Fall	Drown	Motor Vehicle	Air and Water
Number of Deaths		4,347	677	180	1,077	133	2,159	121
Gender								
female	53.43	39.15	35.30	51.67	50.42	15.79	36.54	14.05
male	46.57	60.85	64.70	48.33	49.58	84.21	63.46	85.95
Race/ethnicity								
non-Hispanic white	70.71	75.39	71.20	62.22	85.70	69.92	72.39	85.95
non-Hispanic black	12.88	12.28	15.95	30.00	6.04	12.03	13.02	8.26
non-Hispanic other	3.63	3.17	2.36	3.89	1.76	8.27	3.89	0.83
Hispanic	12.78	9.16	10.49	3.89	6.50	9.77	10.70	4.96
Place of residence								
urban	81.09	72.37	82.42	67.78	72.98	77.44	69.01	71.90
rural	18.91	27.63	17.58	32.22	27.02	22.56	30.99	28.10
Region								
Northeast	19.81	16.93	17.87	21.67	20.61	13.53	14.50	19.01
Midwest	23.65	23.83	20.97	18.89	27.21	15.04	24.32	18.18
South	34.84	38.46	36.63	47.78	30.55	51.13	41.55	36.36
West	21.70	20.77	24.52	11.67	21.63	20.30	19.64	26.45

Source: IHIS 1986-2006 (Minnesota Population Center 2010)

^a Preventability rankings come from Phelan et al. (2004).

Table 2. Cox Hazard Ratios of Accidental Deaths, U.S. Adults.

	<u>All (4,347)^a</u>			<u>Poison (677)</u>		
	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3
Marital Status (married, ref)						
divorced or separated	1.76 **		1.68 **	2.95 **		2.72 **
widowed	1.41 **		1.35 **	1.46		1.31
never married	1.35 **		1.30 **	2.41 **		2.25 **
Socioeconomic Status						
Household income (highest third, ref)						
lowest third		1.29 **	1.24 **		1.53 **	1.40 **
middle third		1.06	1.07		1.33 **	1.35 *
Employment (employed, ref)						
unemployed		1.48 **	1.45 **		2.78 **	2.59 **
not in the labor force		1.27 **	1.28 **		2.79 **	2.68 **
Education (more than high school, ref)						
less than high school		1.57 **	1.57 **		2.38 **	2.39 **
high school		1.31 **	1.32 **		1.48 **	1.50 **
Sociodemographic Controls						
Age	0.93 **	0.94 **	0.95 **	1.08 **	1.12 **	1.15 **
Age ²	1.01 **	1.01 **	1.01 **	0.99 **	0.99 **	0.99 **
Gender (female, ref)						
male	2.12 **	2.12 **	2.22 **	2.13 **	2.64 **	2.54 **
Race/ethnicity (non-Hispanic white, ref)						
non-Hispanic black	0.97	0.90	0.85 **	0.96	0.83	0.71 *
non-Hispanic other	0.90	0.84	0.85	0.58	0.48 **	0.50 *
Hispanic	0.96	0.80 **	0.81 **	0.73 *	0.47 **	0.49 **
Place of residence						
urban (rural, ref)	0.75 **	0.83 **	0.82 **	1.22	1.51 **	1.45 **
Region (Northeast, ref)						
Midwest	1.13 *	1.13 *	1.14 *	1.01	1.02	1.03
South	1.34 **	1.32 **	1.33 **	1.35 *	1.29 *	1.33 *
West	1.20 **	1.25 **	1.24 **	1.40 *	1.46 **	1.46 **
Log likelihood	-53248.16	-53185.64	-53123.92	-8589.65	-8509.94	-8457.33

Table 2 cont.

	<u>Fire/Smoke (180)</u>			<u>Fall (1,077)</u>		
	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3
Marital Status (married, ref)						
divorced or separated	2.19 **		2.04 **	1.52 **		1.51 **
widowed	1.78 *		1.61 *	1.33 **		1.32 **
never married	1.86 *		1.60	1.57 **		1.53 **
Socioeconomic Status						
Household income (highest third, ref)						
lowest third		1.60 *	1.48		1.16	1.11
middle third		1.06	1.06		0.97	0.97
Employment (employed, ref)						
unemployed		1.93	1.87		1.45	1.41
not in the labor force		2.07 **	2.09 **		1.32 **	1.34 **
Education (more than high school, ref)						
less than high school		2.55 **	2.51 **		1.03	1.02
high school		1.66 *	1.68 *		1.11	1.12
Sociodemographic Controls						
Age	1.02	1.03	1.04	1.00	0.98	1.00
Age ²	1.01	1.00	0.99	1.01 **	1.01 **	1.01 **
Gender (female, ref)						
male	1.46 *	1.48 *	1.62 **	1.86 **	1.79 **	1.94 **
Race/ethnicity (non-Hispanic white, ref)						
non-Hispanic black	3.05 **	2.55 **	2.30 **	0.52 **	0.54 **	0.51 **
non-Hispanic other	1.59	1.35	1.37	0.58 *	0.56 *	0.57 *
Hispanic	0.94	0.65	0.65	1.03	1.01	0.99
Place of residence						
urban (rural, ref)	0.57 **	0.69 *	0.67 *	0.93	0.95	0.94
Region (Northeast, ref)						
Midwest	0.77	0.78	0.78	1.14	1.13	1.14
South	1.15	1.11	1.13	0.97	0.96	0.97
West	0.60	0.66	0.66	1.15	1.15	1.16
Log likelihood	-1996.97	-1979.47	-1974.17	-11863.14	-11866.01	-11854.56

Table 2 cont.

	<u>Drown (133)</u>			<u>Motor Vehicle (2,159)</u>		
	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3
Marital Status (married, ref)						
divorced or separated	2.21 **		2.13 **	1.52 **		1.45 **
widowed	2.31		2.35 *	1.21		1.13
never married	0.97		0.91	1.12		1.12
Socioeconomic Status						
Household income (highest third, ref)						
lowest third		1.70 *	1.66		1.26 **	1.23 **
middle third		1.53	1.56		1.03	1.04
Employment (employed, ref)						
unemployed		1.42	1.40		1.15	1.13
not in the labor force		1.66	1.70 *		0.96	0.97
Education (more than high school, ref)						
less than high school		1.00	0.96		1.85 **	1.84 **
high school		1.06	1.03		1.43 **	1.43 **
Sociodemographic Controls						
Age	0.96	1.00	0.99	0.94 **	0.95 **	0.96 **
Age ²	1.01	1.01	1.01	1.01 **	1.01 **	1.01 **
Gender (female, ref)						
male	6.85 **	6.76 **	7.65 **	2.10 **	2.06 **	2.10 **
Race/ethnicity (non-Hispanic white, ref)						
non-Hispanic black	0.83	0.77	0.74	1.07	0.97	0.93
non-Hispanic other	2.53 **	2.23 *	2.30 *	1.11	1.06	1.07
Hispanic	0.86	0.77	0.78	1.10	0.89	0.89
Place of residence						
urban (rural, ref)	0.85	0.91	0.91	0.60 **	0.68 **	0.67 **
Region (Northeast, ref)						
Midwest	0.86	0.88	0.87	1.30 **	1.29 **	1.29 **
South	2.11 *	2.15 **	2.10 *	1.60 **	1.56 **	1.56 **
West	1.11	1.14	1.11	1.24 *	1.29 **	1.28 **
Log likelihood	-1725.95	-1725.19	-1719.44	-26525.87	-26472.15	-26459.51

Table 2 cont.

	<u>Air and Water (121)^b</u>		
	Model 1	Model 2	Model 3
Marital Status (married, ref)			
divorced or separated	0.51		0.52
widowed	--		--
never married	1.22		1.22
Socioeconomic Status			
Household income (highest third, ref)			
lowest third		0.75	0.75
middle third		0.80	0.79
Employment (employed, ref)			
unemployed		0.87	0.87
not in the labor force		1.13	1.11
Education (more than high school, ref)			
less than high school		0.50	0.52
high school		0.96	0.98
Sociodemographic Controls			
Age	1.03	1.01	1.02
Age ²	0.99	0.99	0.99
Gender (female, ref)			
male	7.89 **	8.46 **	8.05 **
Race/ethnicity (non-Hispanic white, ref)			
non-Hispanic black	0.47 *	0.52	0.52
non-Hispanic other	0.12 *	0.13 *	0.12 *
Hispanic	0.36	0.45	0.45
Place of residence			
urban (rural, ref)	0.64	0.60 *	0.60 *
Region (Northeast, ref)			
Midwest	0.63	0.62	0.63
South	1.03	1.03	1.05
West	1.34	1.29	1.32
Log likelihood	-1511.15	-1509.56	-1507.67

Source: IHIS 1986-2006 (Minnesota Population Center 2010)

** p < .01; * p < .05

^a Number of deaths in parenthesis.^b Air and water transport accidents. Because of a small number of deaths, widows are with divorced/separated.

Table 3. Cox Hazard Ratios for Accidental Deaths, by Preventability, U.S. Adults.^a

	<u>Most Preventable (857)^b</u>			<u>Less Preventable (3,369)^c</u>		
	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3
Marital Status (married, ref)						
divorced or separated	2.83 **		2.63 **	1.55 **		1.50 **
widowed	1.99 **		1.83 **	1.32 **		1.27 **
never married	2.23 **		2.05 **	1.18 *		1.16 *
Socioeconomic Status						
Household income (highest third, ref)						
lowest third		1.57 **	1.43 **		1.24 **	1.20 **
middle third		1.28 *	1.29 *		1.03	1.04
Employment (employed, ref)						
unemployed		2.57 **	2.42 **		1.22	1.21
not in the labor force		2.45 **	2.40 **		1.06	1.07
Education (more than high school, ref)						
less than high school		2.37 **	2.36 **		1.46 **	1.45 **
high school		1.46 **	1.49 **		1.31 **	1.31 **
Sociodemographic Controls						
Age (cont)	1.01	1.04 *	1.06 **	0.92 **	0.92 **	0.93 **
Age ²	0.99	0.99 **	0.99 **	1.01 **	1.01 **	1.01 **
Gender (female, ref)						
male	2.00 **	2.27 **	2.31 **	2.07 **	2.02 **	2.12 **
Race/ethnicity (non-Hispanic white, ref)						
non-Hispanic black	1.25 *	1.07	0.93	0.91	0.85 **	0.81 **
non-Hispanic other	0.69	0.58 *	0.59 *	1.02	0.97	0.98
Hispanic	0.77 *	0.50 **	0.52 **	1.06	0.92	0.92
Place of residence						
urban (rural, ref)	1.03	1.26 *	1.21 *	0.71 **	0.76 **	0.75 **
Region (Northeast, ref)						
Midwest	0.96	0.97	0.98	1.19 **	1.19 **	1.20 **
South	1.32 *	1.26 *	1.29 *	1.36 **	1.35 **	1.36 **
West	1.24	1.31 *	1.31 *	1.18 **	1.22 **	1.22 **
Log likelihood	-10717.06	-10628.84	-10572.57	-40791.36	-40762.13	-40736.35

Table 3 cont.

	<u>Least Preventable (121)^d</u>		
	Model 1	Model 2	Model 3
Marital Status (married, ref)			
divorced or separated	0.51		0.52
widowed	--		--
never married	1.22		1.22
Socioeconomic Status			
Household income (highest third, ref)			
lowest third		0.75	0.75
middle third		0.80	0.79
Employment (employed, ref)			
unemployed		0.87	0.87
not in the labor force		1.13	1.11
Education (more than high school, ref)			
less than high school		0.50	0.52
high school		0.96	0.98
Sociodemographic Controls			
Age (cont)	1.03	1.01	1.02
Age ²	0.99	0.99	0.99
Gender (female, ref)			
male	7.89 **	8.46 **	8.05 **
Race/ethnicity (non-Hispanic white, ref)			
non-Hispanic black	0.47 *	0.52	0.52
non-Hispanic other	0.12 *	0.13 *	0.12 *
Hispanic	0.36	0.45	0.45
Place of residence			
urban (rural, ref)	0.64	0.60 *	0.60 *
Region (Northeast, ref)			
Midwest	0.63	0.62	0.63
South	1.03	1.03	1.05
West	1.34	1.29	1.32
Log likelihood	-1511.15	-1509.56	-1507.67

Source: IHIS 1986-2006 (Minnesota Population Center 2010)

** p < .01; * p < .05

^a Preventability rankings come from Phelan et al. (2004). Number of deaths in parenthesis.^b Poisoning and Smoke/Fire related deaths.^c Falls, Drownings, and Motor Vehicle related deaths.^d Transport accidents by air and water. Because of a small number of deaths, widows are included with divorced/separated.

Figure 1. Cox Hazard Ratios and 95% Confidence Intervals for the Effect of Divorce/Separation on Accidental Death, by Preventability.^{a,b}

Source: 1986-2006 IHIS (Minnesota Population Center, 2010).

^a Model controls for sociodemographic, socioeconomic, urban/rural, and region of residence covariates.; ^b Preventability rankings come from Phelan et al. (2004).

Figure 2. Cox Hazard Ratios and 95% Confidence Intervals for the Effect of Less than High School Education on Accidental Death, by Preventability.^{a,b}

Source: 1986-2006 IHIS (Minnesota Population Center, 2010).

^a Model controls for sociodemographic, socioeconomic, urban/rural, and region of residence covariates.; ^b Preventability rankings come from Phelan et al. (2004).

The Social Side of Accidental Death

Highlights

- Accidental deaths are heavily influenced by both socioeconomic *and* marital status.
- Marital status is most relevant for more preventable accidental deaths.
- SES is most relevant for more preventable accidental deaths.