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Public beliefs about the preventability of unintentional injury deaths

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Abstract

This report is based upon the results of a national random digit dialed telephone survey in which 943 adults were queried. Subjects reported the proportion of deaths due to motor vehicle crashes, falls, fires/burns, drowning and poisoning that they felt were preventable. On average, respondents believed that 56% of 'fatal accidents' were preventable; as were 62% of motor vehicle crash deaths, 53% of fall deaths, 67% of drownings, 62% of fire/burn fatalities and 70% of accidental poisonings. Logistic regression models predicting preventability beliefs differed according to the type of injury event in question, but socio-economic status and perceived alcohol involvement were positive predictors of beliefs related to all of the injuries under study. The ramifications of these findings and future research directions are discussed. Published by Elsevier Science Ltd.

Keywords: Injury; Preventability beliefs; Motor vehicle; Falls; Fires; Drowning; Poisoning

1. Introduction

Injuries kill more Americans between the ages of 1 and 45 than any other cause (Centers for Disease Control, 1998). Injury control professionals are often perplexed as to why more attention is not paid to this important problem. No major voluntary organization, such as an American Cancer Society or American Heart Association, exists to coordinate efforts to support injury research and education. The Federal government devotes five times as many research dollars to cardiovascular disease as it does to injury, which garners one-tenth of what we invest in cancer research (National Research Council, 1985). This despite the fact that injuries claim more years of productive life than heart disease and cancer combined.

One explanation for this state of affairs that is widely circulated among the injury control community is that people believe that injuries cannot be prevented. In 1989, the National Committee for Injury Prevention and Control issued a report which pronounced that, "… the vast majority of legislators, governors, commissioners, physicians, nurses, lawyers, and the general public continue to view injuries as acts of fate" (National Committee for Injury Prevention and Control, 1989). Similarly, in its 1999 follow-up report, the Institute of Medicine named as a priority the need to "broaden public understanding of the feasibility … of efforts to prevent … injuries" (Bonnie et al., 1999). Such statements have typically been made, however, without reference to empirical research. The present study was designed to shed light on whether professional concerns about public preventability beliefs are well founded.

Specifically, it will assess whether members of the lay public believe that deaths due to motor vehicle crashes, falls, drownings, fires/burns and poisonings are preventable. Homicides and suicides were not addressed in this investigation. Our background summary will also be limited to unintentional injury, although it will include non-fatal events since no national studies of exclusively fatal injuries were identified. Finally, studies which explored the preventability of one particular injury, after it occurred, were not included.

There is clearly support in the literature for studying beliefs in relation to health behaviors. The Health Belief Model posits that the likelihood of taking a preventive

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action is a function of — among other constructs — the perceived benefits of taking the action (Janz and Becker, 1984). Foss (1985) found that parents who believed child safety seats were very effective were significantly more likely to use them. Peterson and colleagues (1990) found that parents who believed that childhood injuries can be prevented were more likely to teach their children about safety. In another study by this research group, it was found that parents were more likely to 'interact preventively' with their child after a minor injury if they attributed the injury to the child rather than fate (Peterson et al., 1995). Investigators in New Zealand found that boys who disagreed with a statement attributing bicycle crashes to chance were significantly less likely to ride their bikes at night (Langley and Williams, 1992). Gielen et al. (1994) found that children living in suburban Maryland who endorsed statements indicating that they believed there was a need to wear a bicycle helmet were significantly more likely to have worn a helmet on their most recent bicycle ride. Included among items designed to assess such beliefs was the statement, 'Whether or not I get hurt in a bike accident is just a matter of luck.' Wilde et al. (as cited in Wilde and Ackersviller, 1981) reported that people 'drive [more] carefully' if they believe that car accidents are caused by human behavior rather than fate, luck or chance. Colón (1992) found that belief in an immutable destiny was a significant predictor of low (self-reported) seat belt use.

Another reason for studying injury-related preventability beliefs is because they have been linked to support for safety legislation (Hingson et al., 1988; Schenck et al., 1985; Hu et al., 1993). And a legislator's likelihood of voting for such legislation has been shown to be directly related to their perceptions of how much their constituents support it (Jason and Rose, 1984; Lowenstein et al., 1993).

Although rarely cited by proponents calling for changes in public beliefs, studies which measure preventability beliefs related to unintentional injuries have been published. Only one was national, however, and it focused on the prevention of childhood injuries. That survey of parents, sponsored by the National SAFEKIDS Campaign, found that 87% of respondents agreed with the statement 'most accidents are avoidable' (Eichelberger et al., 1990).

A Canadian study which also dealt with childhood injuries reported that 82% of urban, and 91% of rural, parents agreed with the statement, 'Most accidents are avoidable, parents can prevent most accidental injuries involving children' (Hu et al., 1996). In Sweden, when 1843 heads of households were asked which of four categories of preschool injury causes was most important, only 14% said 'fate or bad luck' (Sundelin et al., 1996). In a Scottish study of low-income parents, 61% of respondents disagreed with the statement, 'There's nothing you can do to stop accidents. They just happen..' (Roberts et al., 1995). When parents were queried while visiting an emergency department in Florida — predominantly for causes that were unrelated to trauma — only 15% agreed with the statement, 'Injuries just happen' (Mulligan-Smith et al., 1998). The largest proportion of respondents (46%) instead endorsed, 'Most injuries can be prevented.' In another investigation from the UK, when mothers were asked, 'Do you think that children's accidents are mostly just bad luck or mostly could be prevented,' 89% of respondents replied, 'Mostly could be prevented' (Colver et al., 1982).

When looking at the perceived preventability of specific types of injuries, Peterson et al. 1990 found that respondents felt a majority of childhood injuries could be prevented, with poisonings and near-drownings being perceived as the most preventable. A large ($n = 1659$) Australian study found that 'child drowning' was perceived as relatively more preventable, and 'road injuries' less preventable, when compared to burns and scalds (Smith et al., 1999). Interpretation of this finding is complicated, however, by the mixed age referents used by investigators. Still, a number of other studies (Colón, 1992; Kulik and Mahler, 1987; Moore and Rosenthal, 1992; Peterson et al., 1990) have found that motor vehicle crash deaths are perceived as relatively less preventable.

The present study was designed to provide national data on lay beliefs related to a broad spectrum of fatal, unintentional injuries.

2. Methods

2.1. Sampling

The sampling frame for this study consisted of blocks of United States telephone numbers which were purchased from a commercial sample supplies (GENESYS Sampling Systems). At the investigator's direction, GENESYS used list-assisted sampling to generate an equal probability sample of telephone numbers designed to be representative of households in the United States. This means they worked from banks of 100 randomly generated telephone numbers, which were known to include at least one published number. (Please note that this method, selected for its increased efficiency over pure random digit dialing, does not exclude unpublished telephone numbers from the study sample.) After 'cleaning' — of non-working and yellow-page listed numbers — our final sample size of telephone numbers to be attempted was 6761.

2.2. Instrument

Prior to instrument development, two focus groups were held to determine how lay individuals thought and talked about the issues under study. When a draft instrument had been developed, it was refined using cognitive interviews (Willis, 1994) and pilot testing. The resulting instrument contained questions about general injury knowledge and home safety, in addition to the items described in this report.

The dependent variables in this study — preventability beliefs — were measured by responses to the following questions. The first question was preceded by the preface, 'I want to explain that when I say 'accident,' I don't mean just car accidents. I want you to consider car accidents, but also falls, drownings, fires, burns and accidental poisoning.'

> How preventable do you think that fatal accidents are? If 0% means no fatal accidents are preventable, and 100% means that all fatal accidents are preventable, what number from zero to 100 would you choose?
>
> What percentage of deaths due to [motor vehicle crashes, falls, drownings, fires/burns and accidental poisonings] do you think could be prevented? Please tell me a number from zero to 100%. (Asked as five separate, non-contiguous questions.)

Independent variables included age, gender, income, education, race, Hispanic origin, religiosity, political persuasion, risk-taking proclivity, population density, geographic region, personal history of serious injury, relationship to a fatally injured person, perceived alcohol involvement, perceived age of victim, and countermeasure knowledge. Religiosity was measured by responses to, 'The next few questions have to do with how you would describe yourself. Would you say that your are religious, somewhat religious or not religious?' Political persuasion was measured by, 'Politically speaking, would you say that you are very conservative, somewhat conservative, moderate, somewhat liberal, or very liberal?' Risk-taking proclivity was based upon subject responses to, 'How often would you say that you like to do things that other people consider dangerous? Would you say always, often, rarely or never?' Population density was determined by subject responses to, 'Which of the following best describes the area in which you live; urban, suburban, rural?' Geographic region was determined through telephone numbers, not self-reports.

Personal history of serious injury was based upon whether respondents said yes when asked, 'Have you ever had to stay overnight in a hospital as a result of being in a motor vehicle crash, a fall, a near-drowning, a fire or burns, or accidental poisoning?' Subjects who had been hospitalized were queried as to the type(s) of accidents which caused their injuries. Relationship to fatally injured person was determined by responses to, 'Has anyone you loved ever died as a result of a motor vehicle crash, a fall, drowning, a fire or burns, or accidental poisoning?' Again, positive responders were then asked to specify the type of event that caused the death.

Perceived alcohol involvement was based upon subject responses to, 'What percent of [drivers/adults] who die [in motor vehicle crashes/from falls/from drownings/from fires/burns/accidental poisonings] do you think are legally drunk?' Perceived age of victim was determined by subject responses to a question which asked, 'Would you say that children up to the age of 12, teenagers aged 13–19, young adults in their 20's and 30's or people over the age of 65 are at highest risk of dying from [motor vehicle crashes/falls/drowning/fires/burns/accidental poisoning]? Countermeasure knowledge was considered to be present if subjects provided any response when asked, "If the United States wanted to reduce the number of people who die [in/due to] [motor vehicle crashes/falls/drowning/fires/burns/ accidental poisoning], what do you think is the most effective thing they could do?' For the preceding three items, separate questions were actually asked for each injury mechanism. The alcohol and countermeasure knowledge items were not posed sequentially, rather the survey instrument was separated into sections which dealt with each type of injury event.

2.3. Procedures

The data reported in this paper were collected from August 19 to October 3, 1996. Prior to engaging in data collection, telephone interviewers attended a training session and had to demonstrate competent survey administration. Data were collected using Computer-Assisted Telephone Interviewing (CATI). The system was programmed so that each number in the sample was attempted at least six times; with one attempt being made before 17:00 h on a weekday, one attempt made between 17:00 and 21:00 h on a weekday, one attempt being made on the weekend, and no phone number being closed out within a 1-week period.

The interview began with screening questions to be sure that the random number had been dialed correctly, and a private residence (versus business or institution) had been reached. Next an adult resident of the household was randomly selected using the most recent birthday method (Groves and Lyberg, 1988). If that person was not home, he or she was called back at another time. When the randomly selected subject was contacted, informed consent was obtained, and the interview commenced. Quality control procedures included on-site supervision, CATI-programmed prompts, and interview monitoring.

2.4. Analyses

These data were analyzed using SPSS® for Windows software. Bivariate methods of analyses applied included chi-square tests of independence, Analyses of Variance, Student's t-tests, Kruskal–Wallis and Mann–Whitney U tests, Pearson and Spearman's rho correlation coefficients and Wilcoxon matched pairs signed rank sum tests. Response categories were collapsed, when necessary, to achieve sufficient cell sizes for chi-square tests.

Table 1
Comparison of study sample and US population[a]

Variable	Sample proportion (%)	US census proportion (%)
Age ($n=863$)		
18–39	44	45
40–64	39	37
65 and over	17	17
Gender ($n=943$)		
Female	63	52
Male	37	48
Household income ($n=821$)		
<$10 000	5	14
10 000–14 999	10	9
15 000–24 999	16	17
25 000–34 999	22	14
35 000–49 999	21	16
50 000–74 999	15	17
75 000 and over	11	14
Education ($n=939$)		
Not a high school grad	10	19
High school grad	34	34
Some college	28	27
College grad	15	14
Advanced degree	12	7
Race ($n=886$)		
White/Caucasian	85	84
Black/African–American	11	12
Asian/Pacific Islander	2	4
Native American/Alaskan Native	2	1
Hispanic origin ($n=934$)		
Yes	6	9
No	95	91
Geographic region ($n=943$)		
Northeast	17	20
Midwest	26	24
South	39	35
West	18	21

[a] This information first appeared in the BMJ Publishing Group's journal Injury Prevention, 1999 (5) 21.

A screening significance criteria of ≤ 0.25 in bivariate analyses was used to select candidate variables for building multivariate regression models to predict each dependent variable. Due to the highly non-normal distributions of reported preventability beliefs, it was determined that logistic rather than linear regression would be performed. The models were used to predict subject assignment to one of two groups: those who felt that most ($\geq 51\%$) injury deaths are preventable, and those who did not believe that most injury deaths are preventable. Six models were built, one for each of the injury events under study, as well as for the generic category of 'fatal accidents.'

The results of bivariate analyses suggested that collinearity was not a threat to the models. Interaction terms were also entered and determined to be non-significant. Finally, goodness-of-fit was determined using Hosmer-Lemeshow tests. Adjusted odds ratios, with confidence intervals, will be reported for independent variables which did not drop out of the regression models using a $P \leq 0.05$ level of significance criterion. Readers who are interested in additional details may contact the investigator.

3. Results

3.1. Sample

A total of 943 subjects completed our survey instrument. Of the original 6761 telephone numbers transferred from GENESYS, 22% were non-working, 19% were not answered despite six or more attempts, and 59% were confirmed working. Of the working numbers, 29% were deemed ineligible, primarily because they represented businesses rather than residences. Of confirmed eligible households, 5% remained unresolved at the close of data collection. Of the 2695 people who were offered study participation, 65% refused, and 35% agreed to complete an interview.

Normally in a telephone interview, little would be known about refusers. Since the phone numbers used in this sample were purchased from a commercial supplier, however, we were able to compare refusers to participants at the level of their telephone exchanges. This means that we could compare measures of central tendency for the refusers's neighborhoods, if you will, with participants' neighborhoods (i.e. using census data on all of the people who share the first six digits of their telephone numbers). When this analysis was performed, refuser and participant groups differed by $<2\%$ with regard to age, income, education and racial distributions.

Table 1 describes our final study sample (i.e. completed interviewees), and how they compare to the United States as a whole. Please note that the subject

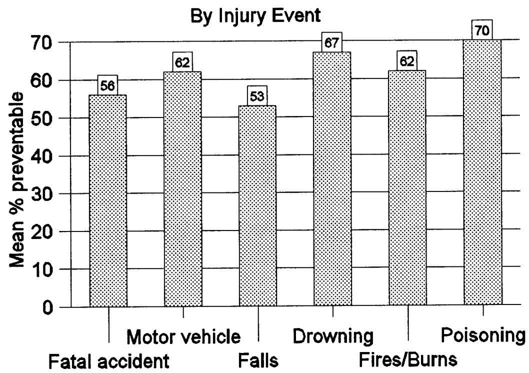

Fig. 1. Mean preventability beliefs.

demographics reported in Table 1 are based upon self-report, not the exchange level data mentioned earlier in this paragraph.

3.2. Univariate analyses

Fig. 1 shows subjects' mean responses when asked to report the percentage of injury fatalities that were preventable. Standard deviations ranged from 21 to 27. For each of the injury events studied, responses offered by individual subjects ranged from zero to 100%.

3.3. Bivariate analyses

Mean preventability beliefs (see Fig. 1) differed from each other significantly ($P < 0.005$ for each pair-wise comparison), with the exception of motor vehicle and fire/burn-related beliefs. All preventability beliefs were, however, significantly correlated with each other ($P \leq 0.000$). Their Spearman rho rank correlations ranged from 0.18 to 0.33. Tests of association between all independent and dependent variables were also conducted. These data are not shown but are available from the author.

3.4. Multivariate analyses

Independent variables which had attained a level of significant of 0.25 or lower in bivariate analyses were entered into regression models in a stepwise fashion. Table 2 displays these candidate variables, by injury event.

Table 3 displays the odds ratios, with 95% confidence intervals, of variables which retained significance at the $P \leq 0.05$ level after controlling for all other variables which remained in the model. None of the chi-square values generated by our Hosmer-Lemeshow tests were

Table 2
Candidate variables for logistic regression models*

VARIABLE	FATAL ACCIDENTS	MOTOR VEHICLE CRASHES	FALLS	DROWNINGS	FIRES/ BURNS	POISONINGS
Age	X	X		X		X
Gender	X		X			
Income	X	X	X	X	X	
Education	X	X	X	X	X	X
Race		X		X		X
Hispanic Origin	X	X	X	X		
Political Persuasion		X		X		X
Risk-taking Proclivity	X		X	X		X
Population Density		X		X	X	
Geographic Region			X	X		X
Personal Injury History	NA	X	X			X
Perceived Alcohol Involvement*	X	X	X	X	X	X
Perceived Age of Victim	NA	X		X	X	X
Counter-measure Knowledge	NA	X	X	X	X	X

* For the category of fatal accidents, a mean perceived alcohol involvement was calculated from subjects' event-specific responses, and entered as a variable into the logistic regression model.

Table 3
Predictors of preventability beliefs: adjusted odds ratios displayed with 95% confidence intervals

Variable	Fatal accidents ($n=837$)	Motor vehicle crashes ($n=903$)	Falls ($n=840$)	Drowning ($n=821$)	Fires/burns ($n=774$)	Poisoning ($n=799$)
Age	0.99 (0.98–1.00)[b]			0.98 (0.98–0.99)[b]		0.99 (0.98–1.00)[b]
Per capita income						
0–$8750					0.73 (0.48–1.10)	
$8751–15 000					0.56 (0.37–0.86)[b]	
$15 001–22 500					0.86 (0.57–1.31)	
$22 500+					1.00	
Education						
<High school	0.44 (0.23–0.83)[b]	0.34 (0.19–0.63)[b]	0.46 (0.24–0.89)[a]	0.34 (0.18–0.66)[b]		0.25 (0.12–0.51)[b]
High school grad	0.50 (0.31–0.80)[b]	0.36 (0.22–0.58)[b]	0.59 (0.37–0.95)[a]	0.49 (0.29–0.81)[b]		0.36 (0.20–0.64)[b]
Some college	0.69 (0.43–1.10)	0.63 (0.39–1.03)	0.92 (0.58–1.48)	0.73 (0.43–1.24)		0.57 (0.31–1.06)
College grad	0.99 (0.58–1.69)	0.98 (0.56–1.71)	1.16 (0.69–1.95)	1.42 (0.77–2.64)		0.70 (0.36–1.37)
Grad degree	1.00	1.00	1.00	1.00		1.00
Risk-taking proclivity						
Always	1.56 (0.63–3.88)		1.86 (0.76–4.59)			
Often	1.43 (0.90–2.26)		1.95 (1.23–3.10)[b]			
Rarely	1.88 (1.36–2.60)[b]		1.21 (0.88–1.68)			
Never	1.00		1.00			
Geographic region						
Northeast				0.83 (0.49–1.41)		
Midwest				0.52 (0.32–0.84)[b]		
South				0.60 (0.38–0.95)[a]		
West				1.00		
Personal injury history						
No		0.58 (0.37–0.92)[a]				
Yes		1.00				
Perceived alcohol involvement	1.01(1.00–1.02)[a]	1.02 (1.01–1.03)[b]	1.02 (1.01–1.03)[b]	1.01 (1.01–1.02)[b]	1.03 (1.02–1.04)[b]	1.02 (1.01–1.03)[b]
Counter measure knowledge						
Yes			1.45 (1.08–1.94)[b]		1.97 (1.23–3.15)[b]	2.81 (1.90–4.16)[b]
No						

[a] $P \leq 0.05$.
[b] $P \leq 0.01$.

significant, indicating that our final models fit the observed data at least reasonably well.

Age emerged as a significant predictor of believing that a majority of fatal accidents, drowning and poisoning deaths could be prevented. In each of these instances, the odds of believing in the preventability of most fatalities decreased a small but significant amount for each year of increased subject age. To understand the magnitude of this effect over a lifetime, we reran these models with age as a categorical variable. In that analysis, subjects between the ages of 18 and 39 were almost twice as likely as subjects aged 65 or older to believe that most fatal accidents could be prevented. With regard to drowning and poisoning, both subjects aged 18 to 39, and subjects aged 40–64 were approximately twice as likely as people aged 65 or older to believe that a majority of accidental fatalities could be prevented, and this effect was more pronounced in the youngest age group.

Socio-economic status was represented as a significant predictor in every final model. Subjects with less education, or in the case of fire/burns lower income, were less likely to believe that injury fatalities could be prevented.

Self-reported risk-taking had inconsistent effects across accident types. Subjects who said they rarely liked to do things that other people considered to be dangerous were approximately twice as likely as people who reported never doing such things to believe that fatal accidents could be prevented. Subjects who claimed they liked doing dangerous things often were approximately twice as likely to believe that most fatal falls could be prevented as were subjects who claimed they never liked engaging in such activities.

Subjects who had been hospitalized as a result of a motor vehicle crash were significantly more likely to believe that deaths related to such accidents could be prevented. Respondents who could name a means of preventing deaths due to falls, fires/burns and poisoning were more likely to believe that most related fatalities could be prevented. Subjects who lived in the West were about twice as likely as those who lived in the South or Midwest to believe that most drowning deaths could be prevented. Finally, regardless of the injury event under discussion, the likelihood of preventability beliefs increased as subjects' perceptions of the prevalence of victim intoxication increased.

4. Discussion

Most of our respondents apparently believe that most fatal injuries could be prevented. Another report from this survey indicated that 83% of lay subjects associated preventability with the word 'accident' (Girasek, 1999). These findings may be welcomed by injury control professionals who feared that fatalistic perceptions on the part of the public were impeding the field's progress. Of course, such developments leave open the question of why injury control has not garnered more support.

Among the types of injury under study here, falls and the generic category 'fatal accident' were perceived as less preventable. With regard to the latter, it may be that lacking a specific dangerous event to envision, respondents were hesitant to take a strong stance on preventability. Of the five leading causes of injury death in America, falls are probably the least preventable, in terms of existing countermeasures that are known to be effective. Public recognition of this fact may suggest that there would be support for increased public funding into prevention research for this, the seconding leading cause of death among unintentional injuries in the US.

It is noteworthy that public perceptions of injury preventability vary somewhat by injury type, and that each type of injury belief was predicted by a unique final model. This may indicate that references to specific types of injuries may be more meaningful than referring to 'injury' prevention when educating the public about this problem.

For three of the injury events under study, the odds of believing that most deaths could be prevented were higher for subjects of younger ages. This association has been previously reported for childhood drownings (Smith et al., 1999). It may be due, in part, to a cohort effect. For more of older people's lives, the science of injury control was underdeveloped and injuries were objectively less preventable. European studies have found that older people are more likely to attribute their health (including auto accident involvement) to luck than are younger people (Giscard, 1967; Davison et al., 1992). Davison and colleagues could not decide whether this finding was due to younger subjects having a more 'modern outlook,' or to older subjects having 'seen more of life.' In the United States, it has been observed that younger people are more likely to exhibit optimistic bias with regard to motor vehicle crash risk (Kreuter and Strecher, 1995).

There are also a number of possible explanations for the finding that people from lower socio-economic strata were less likely to believe that fatal injuries are preventable. First of all, people who are more educated have more access to information and products that reduce injury risk. Their beliefs may mirror their reality: that they tend to live in environments which are, objectively, more safe than do people who have fewer resources. There is even evidence that uninsured trauma patients experience higher mortality rates because of the quality of care they receive after they are injured (Haas and Goldman, 1994). While disadvantaged communities do experience higher rates of fatal injury, this cross sectional study cannot shed light on whether their beliefs contribute to risky behavior or whether their beliefs are a by-product of their risk status.

The finding that educational attainment seems to be a powerful predictor of preventability beliefs is consistent with results which have been previously reported (Mulligan-Smith et al., 1998; Smith et al., 1999). It is noteworthy, however, that for fire deaths income rather than education predicted preventability beliefs. To be specific, subjects in the second poorest quartile of respondents were half as likely to believe that most fire deaths could be prevented. One might speculate that the intensive educational and smoke detector give-away programs which have been targeted to low income communities may be correcting for the effect of educational level on preventability beliefs. Perhaps families living on \$9000–15000 per year are less likely to qualify for such community services.

Our findings do not support Smith and colleagues' (1999) conclusion that men are more likely to believe that 'serious road injuries' are highly preventable. This may be due to their trichotomous, versus our dichotomous, conceptualization of preventability. The strongest predictor identified by this Australian group of researchers was 'ethnicity,' as measured by 'language usually spoken at home.' Self-identifying as Hispanic was not a significant predictor of preventability beliefs in our sample, but our resources did not allow us to include non-English speaking individuals in this study.

While our findings with regard to reported risk-taking proclivity seem at first to be inconsistent, they begin to make sense if our division between response categories is considered to be somewhat arbitrary. For example, both subjects who rarely and subjects who often did dangerous things were more likely to believe types of injury could be prevented than did subjects who never did such things. Since there was no neutral choice for respondents to choose here, people who felt they had a 'normal' tendency towards risk-taking proclivity were forced to choose between 'rarely' and 'often' (as opposed to 'always' and 'never'). A total of 61% of subjects selected one of these middle designations. It may be that subjects who report 'never' doing things that others consider dangerous are truly different from this middle group of people. Their belief that many injury deaths cannot be prevented may cause them to retreat from situations which they perceive as risky. If this interpretation is valid, it raises questions about how preventability beliefs are linked to risk-taking, and the levels of belief that we might want to inculcate.

It is interesting that subjects who had been seriously injured in a motor vehicle crash were more likely to believe related deaths were preventable. This could be due to the fact that such respondents had a particular incident upon which to base their preventability estimate. Perhaps their recollection, or dealings with law enforcement and/or insurance investigators, indicated that their accident could have been prevented. It has also been suggested that it is easier for people who have been traumatized to 'go on' if they believe that they can prevent similar occurrences from being repeated (Janoff-Bulman, 1979; Abbey, 1987). It is also possible that believing crash deaths are preventable is associated with driving less cautiously, thus increasing risk for hospitalization. Again, this study's cross sectional nature does not allow us to speculate about the direction of the observed associations. A considerably larger sample would be necessary to accurately determine whether this finding holds up across the other (more rare) types of injury events. For a very informative discussion of how personal experience may influence preventability beliefs, as well as preventive behaviors, readers are referred to Weinstein (1989).

It is not surprising that people who could name countermeasures for a given type of fatal injury were, in three instances, more likely to believe that such deaths could be prevented. Prior to controlling for related factors like education, this variable was associated with all preventability beliefs. Injury prevention education may explain why people in the West were more likely than those in the South and Midwest to believe that drownings were preventable. Arizona, California and Alaska have been the sites of aggressive campaigns on drowning prevention.

The fact that most respondents thought alcohol involvement corresponded directly with injury preventability may strike readers as logical and encouraging. It corresponds with the results of an investigation led by Lehto et al. (1994) which concluded that alcohol use was perceived as increasing injury risk and being under the user's control. At least one veteran injury control practitioner has noted, however, that alcohol's involvement in injury causation complicates rather than facilitates prevention efforts (personal communication, Baker, 1997). Another cause for concern would be if people used their awareness of alcohol's contribution to fatal injuries to distance themselves, psychologically, from at-risk status and the need to take precautions.

This study is subject to a number of limitations, chief among them being its low response rate. Unfortunately, increasing non-cooperation with telephone studies is a well documented trend in the United States (Council for Marketing and Opinion Research, 1995). Cold call, anonymous random digit dial studies, which involve no prior contact with potential subjects and can offer no incentive are particularly prone to this phenomenon. Our study also required cooperation from both the person who answered the phone, and a randomly selected adult in the household.

Non-coverage, another potential source of bias in a survey, occurs when a group of potential respondents are not part of the original list, or frame, used to enumerate members of the population (Groves, 1989). In the United States, $\sim 6\%$ of households do not subscribe to telephone service (Belinfante, 1997) and therefore could not participate in a telephone survey. List-assisted random digit-dialing (RDD) techniques are thought to leave an additional 2.2% of US households 'uncovered' (Giesbrecht et al., 1996).

The biases introduced by these methodologic limitations coincide with some of the under-representation seen in Table 1. These include low income populations, males, and people with less education (Groves, 1990; Thornberry and Massey, 1988). Males are also less likely to be selected for an RDD survey because they are less likely than females to live in small households.

It is worth noting that non-coverage is not the same as non-coverage error. Even if large portions of the target population are missing from a sampling frame, bias is only produced if the missing do not resemble the covered with regard to the survey statistic of interest (Groves, 1989). A recent study which compared the health characteristics of respondents with and without telephones, for example, found that telephone possession did not appear to 'seriously bias' their prevalence estimates (Ford, 1998).

Nonresponse error is a function of the nonresponse rate and the difference between nonrespondents and respondents to the survey (Groves, 1989). As displayed in Table 1, our study sample was quite similar demographically to the US population. Weighting of these data — to bring demographic proportions more in line with those of the US — was explored but rejected when it resulted in minimal adjustment to frequencies. Of course important differences between the two group's cognitions may still exist.

Concerns may rightfully be raised about the advisability of generalizing the results of this study to the whole US. Since socio-economic status was positively correlated with preventability beliefs in this study, for example, and our sample had a relatively greater proportion of more highly educated people, one may estimate that the country's mean preventability beliefs are slightly lower than those reported here. Fortunately, the characteristic by which this study's sample differed most dramatically from the national census — gender — did not emerge in the final regression models as being significantly associated with our dependent variables.

The importance of understanding preventability beliefs hinges largely upon their assumed link to risk behaviors, but this relationship is far from firmly established. There are even studies which suggest that increased preventability beliefs may result in decreased support for both personal and policy-level safety measures (Weinstein, 1980; Slovic, 1987). Future research might focus on identifying optimal levels of preventability belief.

That task may be complicated, however, by the fact that there is no gold standard for determining a category of injury's actual preventability. The literature does contain estimates, that 75% of motor vehicle crash deaths (Smith, 1985), and 48% of child and adolescent injury deaths (Rivara and Grossman, 1996) were preventable. A number of states have set up teams to determine whether the childhood deaths that occurred in their jurisdictions could have been prevented (Arizona Department of Health Services, 1995, 1996, 1997, 1998; Onwuachi-Saunders et al., 1996, 1999). Their estimates vary by type of injury event, and within injury category by year and state. Federal 'topic experts' have rated motor vehicle crash- and fire-related injuries to be highly preventable, whereas falls and drownings were judged to be only moderately so (ZaZa et al., 2000). When physicians have been assembled to rate the preventability of trauma deaths from a clinical perspective, considerable disagreement has been reported (MacKenzie et al., 1992).

Variation among professionals estimating preventability is to be expected. Our ability to prevent categories of death changes as science advances, and is disseminated. The proportion of injury deaths which could be prevented peaks when research has identified effective interventions that have yet to be adopted. It ebbs after 'easy' saves are made, and we face challenges which require further research. Political will and economic forces influence the pace at which this pendulum swings.

Public beliefs about the preventability of fatal injuries are probably important because they influence behavior, as well as which government interventions the public will support. This investigation represents a snapshot of lay views on a concept that is constantly evolving. Before concerted attempts are made to bring public beliefs in line with those of professionals, we must acknowledge that definitive data on the preventability of injuries are elusive. Perhaps public education should target specific behaviors and proven policy measures, rather than achieving consensus around general notions of preventability.

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