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THE 55 MPH HIGHWAY SPEED LIMIT REVISITED:

A CASE-CONTROL STUDY

By

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DEDICATION

To Jill, and our two cubs, Max and Miles, for all their patience, love, understanding and support. From your Grover-bear.

And, in memory of our dear friend, Mrs. May Houghton, Isleham, United Kingdom.

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GROVER K. YAMANE, BA, MD

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THE 55 MPH HIGHWAY SPEED LIMIT REVISITED:

A CASE-CONTROL STUDY

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Motor vehicle accidents are a significant public health problem in the US. Several host, agent, and environmental factors influence the risk of crash death. Over the past several years, maximum highway speed limits have been raised in several states. Most studies have concluded that the increased limits have increased motor vehicles deaths.

In this study, a case-control design was used to estimate the strength of association between motor vehicle driver deaths and maximum state highway speed limits in excess of 55 mph during each year in the period, 1991 to 1993. To date, no other study has used this method. Cases were obtained from the Fatal Accident Reporting System, and were grouped into three general categories of accidents: accidents not involving collisions or impacts; accidents involving collisions with other moving motor vehicles; and accidents involving collisions with stationary objects. Four separate control groups were obtained from deaths recorded in the Multiple Cause of Death Files. Decedents in the four control groups were those who died from unintentional poisoning with solids or liquids; non-Hodgkins lymphoma;

accidental drowning; or diabetes mellitus. The exposure factor was residence in a state at the time of death, according to maximum highway speed limit. Exposed cases were decedents who died in a state with a 60 or 65 mph maximum speed limit (42 states). Non-exposed cases were decedents who died in a state with a 55 mph maximum speed limit (nine states).

Controlled for age and sex, odds ratios for persons in high speed states were consistently and strongly elevated for driver deaths in non-collision accidents (adjusted OR's = 5.6—7.1, $p < 0.00000001$). Also, most of the odds ratios for the other types of accidents were significantly elevated.

The study is limited by the inability to control for other geographic- or regional-related factors. Also, the two independent extant datasets did not allow for a comparison of the case and control groups beyond a few demographic factors. However, this study shows an overall association between driver deaths and states with high speed limits. Legislation concerning speed limits should consider this association, as the risks and benefits of higher speed limits are weighed.

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INTRODUCTION

Automobile crashes are a significant source of excess death and injury in the United States. In 1996, there were 41,907 fatalities and 3,511,000 injuries due to automobile crashes. More than 6.8 million crashes were reported to law enforcement agencies that year.[1] Automobile crashes have ranked in the top ten causes of death for many years, and are the top cause of death for persons aged 6 to 27 years.[2] The adverse economic impact of automobile crashes is likewise enormous. The U.S. Department of Transportation has estimated that crashes cost the public more than $150.5 billion in 1994.[3]

Given the magnitude of the problem, even small changes in the risk of crash death can yield large absolute effects—positive or negative—over the long term. For example, a factor that produces a relatively modest 1% rise in deaths and injuries will result in an annual increase of about 400 of the former, and 35,000 of the later. Over several years, the cumulative mortality and morbidity can be tremendous.

Recently, several states have increased speed limits on their Interstate and non-Interstate highway systems. Proponents, especially from the Western states, have advocated higher limits to facilitate travel over long distances in rural areas.[4] Some state law enforcement agencies have viewed liberal speed limits as an opportunity to transfer precious resources devoted to speed law enforcement towards other enforcement or traffic safety activities.[5]

But, considering the urgency of the problem, there have been relatively few public health studies on automobile crashes, especially those related to highway speed limit laws. Liberalized speed laws may increase the incidence of crash deaths, and exacerbate this public health problem both in the short- and long-term. Understanding the epidemiology of automobile crash deaths and speed limits may help guide public policy decisions and legislation on traffic laws.

Despite the decreased motor vehicle-associated mortality seen during the era of the 55 mph limit,[2] and concerns that higher speed driving might exacerbate crash risks, several states were eager to increase their public highway speed limits in recent years. Several states now have speed limits in excess of 65 mph; indeed, the State of Montana has altogether rescinded daytime speed limits for passenger vehicles on public highways.

There is a relatively small amount of literature on the topics of automobile crash causation and prevention, given the significance of the problem. Much of the literature is found in the more obscure publications; some of the studies have been done by economists or civil engineers, rather than by medical or public health researchers. Perhaps this lack of involvement is due to a perception in the medical community that automobile crash research and prevention is the domain of law enforcement agencies or traffic engineers. The medical community may regard automobile crash casualties in terms of trauma care, rather than a health problem that can be studied and ameliorated.

The purpose of this study is to determine the strength of the association between motor vehicle accident driver deaths and state highway speed limits, using a case-control design.

First, the literature on factors related to motor vehicle accident risk will be reviewed. Then, odds ratios will be determined using cases and controls obtained from two extant national mortality databases; the exposure factor will be maximum state highway speed limit.

REVIEW OF THE LITERATURE

Factors Related to Crashes

Several factors are related to the risk of automobile crash death. Just as with a disease, these factors may be partitioned into host, agent, and environmental categories.

- **Host Factors**
    - **Driver Age**

Age is very strongly related to the risk of automobile crashes and crash deaths. For many years, much attention has been directed toward the very young and relatively inexperienced segment of the driving population. That younger drivers carry more risk of injury and death is well known, and has been well documented. Over the past several years, injury and death rates have tended to peak for drivers in their late-teen years into their early twenties.[2] In an analysis of the US Department of Transportation Fatal Accident Reporting System (FARS) data for 1990, Williams et al. found that the crash rate, per one million vehicle miles traveled (VMT), was 43 for 16 year old drivers, but only 5 for drivers 25 years or older. The fatality rate, per 100 million VMT, was 17 for 16 year olds, and 3 for drivers 25 years or older. The fatal crash rates, per 100,000 licensed drivers, were, respectively, 73, 60, 63, and 56 for 16, 17, 18, and 19 year olds.[6]

Williams et al. also examined the characteristics of fatal crashes involving the youngest drivers. Several features were more common in the 16 year old group, compared to older drivers: single-vehicle crashes, culpability for causing the crash, speeding, high vehicle occupancy (especially of teenage passengers), and a higher proportion of females.

But, alcohol use was less likely in this very young age group, probably because these drivers were under the legal age for purchasing alcoholic beverages.[6]

A youth-associated risk-taking behavior syndrome has often been presented as a reason for the higher crash rates among young drivers. Compared to older drivers, younger motorists are poorer at estimating their own driving skill and in judging driving risks; they show more dangerous driving behaviors, including speeding, following cars too closely, and not wearing seat belts.[7] But, in 1989, Groeger et al. administered questionnaires to a group of 54 licensed British drivers of various ages to study perception of driving ability and driving risk. Their psychologic study concluded that the higher crash risk of young drivers may be due more to lack of driving experience, rather than to an innate age-related tendency for risk-taking behavior.[8]

To reduce crash risks, several states have established driving restrictions for young, novice drivers. These may take the form of curfews, requirements for adult supervision, higher minimum age of licensure, or restrictions against driving on high-speed roadways. A study by Ferguson et al. of five Eastern states concluded that those states with night-time driving curfews and restrictions on unsupervised driving for young drivers had lower crash rates.[9] A multivariate regression analysis by Levy found that states with increased minimum licensing ages and night-time driving curfews had fewer fatalities among 15 to 17 year olds.[10]

The very oldest drivers also have a high risk of crash deaths. The crash rate, per 100,000 VMT begins to increase above 60 years of age.[11] An analysis of FARS data for

1990 showed that the rate of fatal crashes, per 100 million VMT, was 9.2 for drivers aged 16-19 years; 1.8, for drivers aged 40-44 years; but, 11.5, for drivers aged 75 years or older.[12] Indeed, per miles traveled, a 75 year old female has a greater risk of being involved in a fatal crash than a 16 year old male. The "U-shaped" nature of the fatality rates is not evident if the rates are based on population, rather than on distance traveled, since older drivers tend to drive much less often than their younger counterparts.[12]

Another analysis of FARS data from 1975 to 1990 suggests that driver fatality rates for middle-aged or elderly drivers at a given age are lower for more recently born birth cohorts.[13] The reasons for these differences among birth cohorts are unknown. And, it remains to be seen how much safer older drivers will be over the next several years as the elderly population continues to increase in the U.S. It is also unknown at this time if there is a similar trend for the newest generations of drivers.

- **Driver Experience**

Inexperience or lack of skill at driving could have confounded the relationships seen between fatal crash risks and young age groups. Cooper et al. in 1995 examined the crash risks for novice Canadian drivers from a wide age range. Beginners from age 16 to 55 years had higher crash rates, and were more often found culpable for their crashes, compared to more experienced drivers of similar age.[14] The possibility of confounders for the relationship between late age of licensure and crash risk was not addressed in the study. However, it may be that age is to some extent a surrogate for driving experience.

- **Gender**

Gender is another factor that is strongly related to the risk of crashes and crash deaths. Crash and fatality rates per capita are higher for males.[2] However, when rates are based on 100 million VMT, females tend to have a higher incidence of injuries and police reported crashes. Per miles traveled, males still have a 55% greater risk of fatal crashes, whereas females have a 26% greater risk of crashes yielding injuries, and a 16% greater overall risk of crashes.[12] The fewer miles traveled by, and, consequently, less driving experience of, females may account for this discrepancy in injuries and crashes.[12]

When duration of time before a crash occurs is considered as a measure of risk, decreased risk is associated in both sexes with marriage and higher income; in males with more miles of driving experience; and, in females with more years of driving experience. Shorter durations to crashes were associated with a history of moving violations in males, and a history of previous crashes in females.[15]

The causes of these gender differences, especially in fatalities, are elusive. But, male and female drivers may appreciate driving risks differently. DeJoy, in 1992, administered a driving risk questionnaire to young male and young female drivers from a college population. He found that males had more optimistic views of their own driving skills, and perceived certain dangerous driving conditions as less risky.[16] Males may thus have a tendency to place themselves in high risk driving situations.

- **Ethnicity**

There are striking differences in motor vehicle-related fatality rates among ethnic groups. The death rate, per 100,000 population, is 42 for Native Americans; 20 for Whites; 17 for Blacks; and 11 for Asians.[17] There are no known studies that explore the reasons behind these differences.

- **Alcohol Intoxication**

Alcohol intoxication is related to automobile crashes and deaths. This is believed to be a factor in 50% of all fatal crashes and 60% of all fatal single-vehicle crashes.[2, 11] In non-fatal crashes, the frequency of alcohol intoxication correlates with the severity of the crash: 5% of drivers in property damage-only crashes have blood alcohol levels equal to or greater than 0.10%, compared to 9-13% of drivers in injury-producing crashes. Alcohol can impair driving skills and judgment, and may decrease tissue tolerance to the effects of trauma.[11] Over the past decade, the proportion of drivers involved in fatal crashes who were intoxicated has decreased by about 21%.[3]

- **Attitudes and Psychological Factors**

It is reasonable to expect that driving behavior is influenced by personal attitudes about driving safety and risk. However, a Norwegian study on driving attitudes found no relationship between unsafe attitudes and actual behavior. In this study, 15,000 licensed Norwegian drivers were given the same questionnaire about driving safety two years apart. The researcher found that drivers who had "correct" attitudes towards driving safety had fewer accidents per mile traveled than those with "incorrect" attitudes. However, when adjusted for age, the difference in accident risk was not apparent. He concluded that increased age and driving experience were more important for decreased accident risk, than were attitudes toward driving safety.[18] It is unclear if these findings—a discordance between beliefs and behaviors over the short-term—is generalizable to other nations or cultures.

An interesting case control study on Australian army conscripts from the Viet Nam war era was performed in 1990. The researcher studied the presence of certain psychological and sociological factors in those who died from automobile crashes. He found that soldiers who died from crashes had higher odds of having lower army IQ scores, poorer educational levels, lower pre-service occupational status, a past history of juvenile infractions, and a history of going AWOL while on duty.[19]

- **Speed Variability and Adaptation**

On a roadway, increased variation in speed among vehicles, or decreased uniformity of traffic flow, may increase the risk of crashes. Higher speed limits on a particular highway may worsen speed variability, and, hence, increase the risk of crashes.[2]

As highway speed limits increase, average speeds on the non-Interstate, secondary roads may increase as well. Drivers may "adapt" or become accustomed to faster driving on highways, and subsequently, may drive faster on secondary roads that are posted with lower limits.[2, 4] The effects of changes in highway speed limits may thus spill over, and be felt beyond the major highways into the remainder of a state's roadways.

- **Environmental Factors**
  - **Location**

The location of driving is strongly related to the risk of automobile crashes. The risk of death is much higher in rural areas, compared to urban areas.[2, 17] Muelleman et al., in 1993, studied death certificate data for Nebraska from a five year period. The researchers found that the age-adjusted death rate from automobile crashes was 93% higher in counties with less than 10,000 people, than in more populated areas.[20] In 1996, Meulleman et al. studied FARS data for four different population density areas in four states. They found that occupant fatality rates were inversely related to population density. Fatal crashes in the less populated areas tended to involve more trucks, more frequent alcohol use, non-collision crashes, crashes on gravel surfaces, more frequent occupant ejection, and delayed medical care.[21]

  - **Accessibility of Trauma Care**

Delayed access to, or decreased availability of, trauma care services has been offered as an explanation for the increased fatality rates in rural areas. Maio et al. studied crash-related deaths in rural and non-rural areas in Michigan. They found that rural crashes tended to involve a greater level of vehicle damage, a higher rate of unbelted drivers, and more drivers aged 50 years or more. They concluded it was difficult to isolate medical resources as a factor; but, they state that about half of rural crash deaths may be accounted for by crash characteristics and older age.[22] Chen et al. in 1995 studied rural and urban area fatalities in Michigan. They examined the severity of traumatic injuries using standard indexes or trauma scores, and calculated "preventable death rates." They concluded that fatally injured persons in rural areas sustained worse levels of trauma, and that ultimately the quality or quantity of rural medical care did not affect the outcome.[23]

- **Agent Factors**
  - **Engineering and Technology**

Robertson, in 1996, analyzed crash data from 1975 to 1991 using regression analysis. He concluded that increased crashworthiness of cars contributed to lower crash death rates during this period.[24]

Usage of safety belts and airbags reduces the risk of injury or death from automobile crashes.[2] In 1996, the U.S. Department of Transportation estimated that 10,414 lives were saved by seat belts, 686 lives were saved by air bags, and 365 lives were saved by child car seats. Since 1982, seat belts saved an estimated 85,396 lives.[3]

Automobile Crash Analyses

Automobile crashes are rather complex phenomena. Many factors may come into play during a single crash. Some factors may be more important in certain locations, or at certain times. And, some factors, such as road geometry or weather conditions,[25, 26] may change in importance from day to day, or from hour to hour. Of the factors associated with automobile crashes, perhaps only age, gender, and ethnicity are immutable. Thus, examining specific factors may be difficult.

In the literature, several techniques for studying automobile crashes have been discussed and debated. On the whole, these study methods involve various linear regression, modeling, or correlational techniques,[26-28] rather than the more traditional epidemiologic analytic designs.

Even the methods for measuring fatality rates are controversial. As with most causes of death, automobile crash fatality rates are often compared on a per capita basis. If different groups have significantly different proportions of automobile drivers or passengers, however, comparisons can be misleading. Rates based on licensed drivers may be more meaningful. However, comparisons could be misleading, if different groups of licensed drivers drove significantly different amounts, and hence, were exposed to road hazards differentially. The method of induced exposure attempts to account for differing amounts of driving and, hence, exposure. Groups are compared on the basis of the proportion of their drivers held responsible for causing a two-car crash. A higher proportion indicates higher risk.[12] However, determination of culpability can be a subjective decision on the part of law enforcement authorities; and, the method does not address the issue of shared responsibility for a crash. Another method of comparison is based on vehicle miles traveled. However, calculation of mileage for specific groups or segments of drivers may be difficult to perform.[12] It may be extremely difficult or impossible to determine individual miles traveled.

Increased Highway Speed Limits

In late 1973, certain Middle Eastern countries imposed an oil embargo against the U.S. for supporting Israel during the Yom Kippur war. The following year, Congress established a National Maximum Speed Limit (NMSL) of 55 mph, to conserve national petroleum supplies. The NMSL was raised to 65 mph in 1987. It was rescinded altogether in 1995. Several states now allow highway speed limits much higher than the previous level of 65 mph. One state, Montana, permits motorists on public highways during the day to travel as fast as they deem prudent, based on road conditions.

New Highway Speed Limits and Mortality

Since the NMSL was raised in 1987 several studies have suggested that automobile crash fatality rates have increased. By and large, they have involved linear regression, correlational, or descriptive designs.

Baum et al. in 1989 examined fatality rates in the 38 states that raised speed limits to 65 mph in 1987. They concluded that fatality rates were higher after the change. Also, they found that the odds of death were higher on rural Interstates compared to other rural roads, and compared to all other roads.[29]

Gallaher et al. in 1989 studied the automobile fatality rate in New Mexico, after that state's rural Interstate speed limit was increased in 1987. They used linear regression methods and data from fatality trends from the previous five years to predict the rate of fatal crashes, had the speed limit not changed. They concluded that fatality rates increased with the 65 mph speed limit.[30]

Garber et al. in 1990 studied FARS data for each state, using multiple regression analysis and time series techniques. They concluded that the 65 mph highway limit had disparate effects, depending upon the state. They concluded that fatalities increased in some states, decreased in others, and stayed the same in the remainder. Overall, they concluded that the median increase in fatalities on rural Interstate highways was 15%.[4]

Wagenaar et al. in 1990 examined fatalities and injuries in Michigan on highways that had 65 mph speed limits, compared to highways with lower limits. Their multiple time series study concluded that fatalities increased by 19.2%; serious injuries, by 39.8%; and moderate injuries, by 19.2%.[31]

Rock in 1995 examined automobile crashes in Illinois on highways with 65 mph and 55 mph limits. He concluded that higher speed limits increased the rate of crashes, injuries, and deaths.[32]

However, Lave et al. in 1994 used regression analysis to study fatalities in the states with 65 mph speed limits. They concluded that overall statewide fatality rates based on mileage decreased with the higher limit. They argued that higher speed limits may allow state highway patrol departments to divert resources from speed limit enforcement to other intramural activities. This change in emphasis, they claimed, may thus promote overall or system-wide road safety.[5]

METHODS AND PROCEDURES

Overview

This study used a case-control design. Case and control subjects were identified from two separate, publicly available computerized mortality databases. The coverage of these databases overlapped during 1991 to 1993; hence, these years were chosen for the study period. Commercial statistical, spreadsheet, and database management programs were used to extract, manipulate, and analyze the data. Cases were divided into three groups, based on how the motor vehicle accident occurred. Four control groups were used, each group representing a different cause of death.

Case Subjects

The cases were obtained from a Fatal Accident Reporting System datafile. The FARS system contains detailed descriptions of each fatal motor vehicle accident in the US by year. To be included in the system, an accident must have involved a motor vehicle on a public roadway, with the death or deaths occurring within one month. Each accident is described in four broad data fields: an overall description of the accident; descriptions of the motor vehicles involved in the accident; descriptions of the drivers; and descriptions of the injured persons. Each broad field has several sub-fields, permitting a large amount of information to be recorded for each accident.

The FARS datafiles used for the study were contained in the Traffic Safety CD-ROM 1996 (Bureau of Transportation Statistics, US Department of Transportation). All of a specific year's accidents are contained in one large ASCII text flat file. Each line of text contains 106 spaces, and represents a single record for either the accident level, vehicle level, driver level, or person level data fields. The information for each sub-field is coded with letters, numbers, or both, and entered within a specific location on its line.

Records for the accident level fields contain coded data in all the 106 spaces. Records for the remaining fields contain asterisks or blank spaces in certain locations on the line. Thus, by examining certain spaces for these symbols or for coded data, it is possible to discern the type of data field represented by each line of text. Each accident is assigned a state and case number, which is included in all of its corresponding records. Thus, it is possible to link together all the appropriate records for an accident, even though the datafile is not truly organized or sub-divided by each accident.

The Minitab Version 11 for Windows 95 statistical program was used to import the datafile for each study year. Using the record description documents included on the FARS CD-ROM to ascertain the locations of the asterisks or blanks characteristic of each data field, it was possible with the software to segregate the records according to the accident and person level fields. Microsoft Access 97 was used to link an accident level record with its appropriate person level record.

Using the code book supplied on the CD-ROM, fatally injured drivers were identified and segregated according to the first harmful event. The first harmful event is the first injury- or property damage-producing event in an accident, as determined by the law enforcement authorities. Table 1 presents the three general categories of accidents used in the study, and the specific events included in each.

Drivers whose ages were unknown, not specified, or less than 15 years were excluded. Minitab was used to obtain simple random samples from the resulting eligible populations. The final study populations were 2000, 4000, and 4000 for the non-collision, collision with motor vehicles in transit, and collision with stationary objects groups. The samples were stratified according to ten year age intervals, starting at 15 years and ending at ≤ 75 years, and according to sex. Federal Information Processing System (FIPS) codes were used to further separate the strata into the exposed (high speed limit state) and non-exposed (slow speed limit state) groups for the data analysis.

The Multiple Cause of Death Files also contain information on persons dying from motor vehicle accidents. However, information on the person type (for example, driver, passenger, or pedestrian) was frequently not specified. Thus, this database was not useful as a source of case subjects.

Control Subjects

Decedents selected as controls were obtained from the Multiple Cause of Death Files CD-ROMs (National Center for Health Statistics, US Department of Health and Human Services) for 1991, 1992, and 1993. The SETS Version 1.22a database program, included on the CD-ROMs, was used to extract the death records according to the underlying cause of death. Persons dying from unintentional poisoning by solids or liquids (ICD-9 Codes E850 to E859, and E860 to E866); non-Hodgkins lymphoma (ICD-9 Code 202.8); accidental non-boating drowning or submersion (ICD-9 Code E910); and diabetes mellitus (ICD-9 Code 250) were selected as controls.

The control groups datafiles were imported into Minitab. Control subjects whose ages were unknown, not specified, or less than 15 years were excluded. Simple random samples were obtained from the resulting eligible populations. The final study populations were 4000, 4000, 2000, and 8000 for the poisoning, non-Hodgkins lymphoma, drowning, and diabetes mellitus groups, respectively. As with the cases, the control samples were stratified according age and sex. FIPS codes were used to further separate the strata into the exposed and non-exposed groups for the data analysis.

Exposure Factor

Between 1991 and 1993, nine states had maximum speed limits of 55 mph: Connecticut, Delaware, the District of Columbia, Hawaii, Maryland, New Jersey, New York, Pennsylvania, and Rhode Island. The remaining states had maximum speed limits of 65 mph, with the exception of Alaska, which had a maximum limit of 60 mph during 1991 and 1992.

The latter group was considered the high speed states, or the exposed group. The former group was considered the slow speed states, or the non-exposed group. A subject was considered exposed or non-exposed, based on the state speed group in which his death occurred.

Data Analysis

For each year during the study period, 1991 to 1993, each case and control group was divided according to exposure or non-exposure. Each of the three case groups was compared with each of the four control groups of the same year, resulting in a total of 12 separate comparisons per study year. Also, all case and control pairs were broken down into two gender and seven age strata.

The stratified data were entered into Epi Info Version 6 for DOS to calculate the crude odds ratios, Mantel-Haenszel weighted odds ratios, Cornfield 95% confidence limits for the weighted odds ratios, and p-values. Since the case and control groups differ with respect to age and sex distributions, the Mantel-Haenszel technique was used to help control for these dissimilarities.

RESULTS

Sample Sizes of the Case and Control Groups

The sample sizes for the case groups are presented in Table 2. The FARS datafile yielded three sets of fatally injured drivers, based on the first harmful event of the accident. These case groups were deaths from non-collision accidents; collisions with motor vehicles in transit; and collisions with stationary objects. During the three year study period, non-collision deaths ranged from 2500 to 2800 per year; collision with motor vehicles in transit deaths, from 10900 to 11600 per year; and collision with stationary object deaths, from 8500 to 9200 per year. Cases for which the age was unknown, not specified, or less than 15 years were excluded from the study. This reduced the pools of cases by less than one percent. The final randomly selected study samples comprised 35% to 81% of their respective eligible populations.

The sample sizes for the control groups are presented in Table 3. The Multiple Cause of Death File yielded four sets of control groups, based on the underlying cause of death. The control groups were deaths from unintentional poisoning from solids or liquids (ICD-9 Codes E850 to E859, and E860 to E866); non-Hodgkins lymphoma (ICD-9 Code 202.8); accidental non-boating drowning and submersion (ICD-9 Code E910); and diabetes mellitus (ICD-9 Code 250). Deaths from poisoning from solids or liquids ranged from 5700 to 7900 per year; deaths from non-Hodgkins lymphoma, from 17500 to 19400 per year; deaths from drowning, from 3600 to 4000 per year; and deaths from diabetes mellitus, from 49000 to 54000 per year. As with the case groups, control subjects for which the age was unknown, not specified, or less than 15 years were excluded. The reduction in the pools of controls was variable: about 30% for the drowning group, and 1% or less for the others. The final randomly selected study samples comprised 20% to 80% of their respective eligible populations.

Characteristics of the Case and Control Groups

The age and sex characteristics of the case groups are presented in Table 4. The median ages of the non-collision and the collision with stationary objects groups were similar: 30 to 32 years. Interestingly, the median ages of the collision with motor vehicles in transit groups were consistently higher, at 38 years. The age distributions for all case groups were skewed to the right. For both the non-collision and the collision with stationary objects groups, males predominated by a 4:1 ratio. The ratio of males to females for the collision with motor vehicles in transit group was about 2.3:1.

The age and sex characteristics of the control groups are presented in Table 5. The median ages for the poisoning, non-Hodgkins lymphoma, drowning, and diabetes mellitus groups were, respectively, 37-38, 71-73, 33-35, and 73. The two accidental death groups, poisoning and drowning, had age distributions that were skewed to the right. The other two control groups had age distributions skewed to the left. For the poisoning and drowning groups, males predominated by 3:1 and more than 5:1, respectively. The sex distribution for non-Hodgkins lymphoma was about equal. Females predominated slightly, at a ratio of 1.3:1 for the diabetes mellitus group.

Tables 6 to 11 present the age group and sex breakdowns of both the case and control groups for the contingency tables and odds ratio calculations.

Odds Ratios for Non-Collision Driver Death

The odds ratios for non-collision driver deaths are presented in Table 12. Over all control groups and the three study years, the adjusted odds ratios for driver death occurring in the exposed (high speed limit) states are elevated. The range is from 2.80 to 7.10. The lower 95% confidence limit ranged from 2.19 to 5.78. P-values were all highly significant.

Odds Ratios for Collision with Motor Vehicles in Transit Driver Death

The odds ratios for collision with motor vehicles in transit driver deaths are presented in Table 13. The adjusted odds ratios for driver death occurring in the exposed states are elevated for all control groups and the three study years. For the poisoning, non-Hodgkins lymphoma, and diabetes mellitus control groups, the adjusted odds ratios ranged from 1.50 to 2.36. The lower 95% confidence limit using these groups ranged from 1.29 to 2.06. The corresponding p-values were highly significant. However, the odds ratios utilizing the drowning control groups did not reach statistical significance at the $p = 0.05$ level.

Odds Ratios for Collision with Stationary Objects Driver Death

The odds ratios for collision with stationary objects driver deaths are presented in Table 14. The adjusted odds ratios for driver death occurring in the exposed states are significantly elevated over all study years for the poisoning and non-Hodgkins lymphoma control groups. For these groups, the adjusted odds ratios ranged from 1.31 to 1.91. The corresponding lower 95% confidence limits ranged from 1.12 to 1.69. The corresponding p-values were all highly significant.

All adjusted odds ratios utilizing the drowning groups, however, were not elevated. For the year 1992, the adjusted odds ratio of 0.85 carried a p-value of about 0.04 The corresponding 95% confidence limit ranged from 0.73 to 0.99. The remaining odds ratios were not statistically significant at the $p = 0.05$ level.

In the diabetes mellitus control group, the adjusted odds ratios were significantly elevated for the years, 1991 and 1992. The corresponding lower 95% confidence limits were 1.30 and 1.41. For 1993, the adjusted odds ratio was slightly elevated at 1.07, but did not reach statistical significance.

Odds Ratios for Each Stratum

Crude odds ratios for each age and sex stratum are presented in Tables 15 to 20. The stratum-specific odds ratios tended to vary widely. There was no discernible pattern with respect to age or year.

DISCUSSION AND CONCLUSION

Strength of Association

The main overall findings were increased risks of driver deaths in the states with maximum highway speed limits of 65 mph.

Adjusted odds ratios were consistently high, and highly statistically significant, over all study years, and with all control groups for non-collision accidents.

For driver deaths involving collisions with other motor vehicles in transit, the adjusted odds ratios were moderately strong and statistically significant with three of the four control groups. The elevated odds ratios for the remaining control group were not significant.

Driver deaths in collisions with stationary objects on the roadway appeared to be associated with the high speed states when compared to the poisoning and non-Hodgkins lymphoma controls. There may have been a slight negative association when compared to the drowning controls. For the diabetes mellitus controls, the association with the high speed states was significant, except for one year.

Significance of the Findings

Although still controversial, most studies have concluded that raising the NMSL to 65 mph in 1987 raised the risk of motor vehicle crash death. Historically, crash death rates decreased during the era of the national 55 mph limit, and increased when the NMSL was raised. Faster driving decreases reaction times, and increases stopping distances. Kinetic energy, which is dissipated through the motor vehicle structure, outside objects, and human tissues during a crash, increases as the square of the velocity of the vehicle. The phenomenon of speed adaptation suggests that increases in highway speeds will be felt over much of a state's roadway system. This study is consistent with most of the literature. However, this is the first to utilize the case-control method.

Lave, in 1994, proposed that the higher speed limit could help decrease overall crash deaths, by allowing law enforcement authorities to shift resources and attention from speed limit control to other intramural safety activities. This assertion is interesting and provocative. However, if such were the case, the association of driver deaths with the high speed states should have been negative.[5]

Alternative Explanations

Alternative explanations for these findings are possible. First, it is not likely that chance produced the high odds ratios, since the p-values tended to be rather small.

Second, certain regional or geographical factors were not considered, but may have biased the observed associations. Most of the slow speed states are clustered in the northeast. The cooler regional climate could have reduced the frequency or duration of driving, thus suppressing the numbers of crash deaths. Likewise, people in cooler climates may engage in water sports less frequently, thus suppressing the number of drowning deaths. This may account for the lower odds ratios with the drowning control groups. Regional economic conditions could modulate the frequency of driving, or affect how drivers maintain or repair their vehicles. Differences in the distribution of vehicle types (cars, trucks, sport vehicles, and motorcycles) and their safety features could affect the risk of dying in a crash. Geographic differences in drunk driving and seat belt usage rates could also affect the risk of crash death. The quality of driving education programs, local road conditions, law enforcement activities, or emergency medical care could have varied between the two regions. The influence of these possible factors is unknown.

Third, regional attitudes and behaviors with respect to road safety could have confounded the observed associations. A "safety-minded" region may have safer drivers, maintain its roads better, and promote safer driving habits and regulations. And, it may be in no hurry to increase its local speed limits. Interestingly, while many states immediately increased their speed limits when Congress raised the NMSL to 65 mph in 1987, the slow speed states opted to hold back for several years. It may be difficult to measure or control for these possible cultural influences.

Methodological Issues

Ideally, a control group in a case-control study should be comparable to the source population of the case subjects. Since there is a correlation between state motor vehicle and other unintentional injury death rates, there may be factors common among those who die in accidents.[17] Hence, unintentional poisoning and accidental drowning deaths may be appropriate sources for control groups. Also, since the physical requirements for motor vehicle operation are minimal, controls from the general population may be considered. Non-Hodgkins lymphoma and diabetes mellitus are two disparate but common general medical conditions that may also be appropriate as sources for controls.

Motor vehicle deaths are unique in that the age distribution is strongly skewed, with a preponderance of victims in the younger age groups. This is in contrast to most other diseases, which cause death in the middle-aged or elderly. The age distributions of the cases and controls (especially the non-Hodgkins lymphoma and diabetes mellitus controls) were dissimilar. The sex distributions were likewise dissimilar. However, stratifying by age and sex, and using the Mantel-Haenszel weighted odds ratio technique should help to mitigate these differences. Since the crude and adjusted odds ratios were on the whole comparable, these differences were likely not significant in this study.

Two independent datasets were used. Both sets yielded information on age, sex, and the state in which the death or accident occurred. However, it was not possible to compare the case and control groups on other variables. FARS contains information drivers' licensing statuses and traffic law conviction histories. This is not contained in the Multiple Cause of Death File. However, the Multiple Cause of Death File contains information on ethnicity and educational level, which is not found in FARS. Neither dataset contains information regarding history of alcohol or drug use, seat belt usage habits, socio-economic status, or frequency of driving. Hence, it was not possible to compare the case and control groups beyond a few demographic variables.

Conclusion

Using a case-control design and extant databases, this study shows an association between driver deaths and high maximum state speed limits, during 1991 to 1993. The association is strongest and most consistent with deaths involving non-collision-type accidents.

Some factors may have influenced these observed associations, however. Legislation concerning speed limits should carefully consider the potential risks of high speed driving, as well as its benefits.

Considering the ubiquity of driving in our society, and the magnitude of the public health problem of motor vehicle crashes, further study is warranted. Intervention trials in which state or local speed limits are lowered may not be practical or politically possible. Prospective or retrospective cohort studies may be possible. Computerized state driver license databases may allow subjects to be identified and tracked longitudinally. Also, military personnel, with their frequent moves and transfers within the US, may be a convenient source of cohorts. However, since motor vehicle fatality rates are low in absolute terms, very large numbers of subjects may be needed over long study periods. Also, coordinating a longitudinal study with several state motor vehicle bureaus will probably present significant logistical challenges. Since motor vehicle fatality datasets are now readily available and accessible by desktop computers, further case-control studies may be performed relatively quickly and cheaply. Basic research on driver behavior, psychology, or driving skills and performance may also help shed light on this public health problem.

Table 1. Categories of Accidents Used for the Three Case Groups

Non-Collision Group
Included the following first harmful events:

Overturn
Immersion
Other non-collision
Irregular pavement

Collision with Motor Vehicles in Transit Group
Included the following first harmful events:

Striking a vehicle in transit on the same roadway
Leaving a roadway and striking a vehicle in transit on another roadway

Collision with Stationary Objects Group
Included the following first harmful events:

Parked motor vehicle
Boulder
Other non-fixed object
Building
Impact attenuator
Bridge pier
Bridge parapet
Bridge rail
Guardrail
Concrete barrier
Other L-barrier
Highway sign post
Overhead sign
Light support
Utility pole
Other post/ pole
Culvert
Ditch
Embankment-earth
Embankment-rock
Embankment-unknown
Fence
Wall
Fire hydrant
Shrubbery
Tree
Other fixed object
Traffic equipment
Traffic sign support

First Harmful Events Not Used in the Study

Fire/ explosion
Gas inhalation
Falling from a motor vehicle
Injured inside a motor vehicle
Striking a pedestrian
Striking a pedalcycle
Striking a train
Striking an animal
Other non-motor vehicle event
Hit by a thrown or falling object

Table 2. Sample Sizes of the Case Groups				
Accident Category		**1993**	**1992**	**1991**
Non-Collision Deaths				
	Raw N	2550	2506	2790
	Eligible Sample N*	2533	2484	2771
	% of Raw N	99.3%	99.1%	99.3%
	Study N	2000	2000	2000
	% of Eligible Sample N	79.0%	80.5%	72.2%
Collision with Motor Vehicles in Transit Deaths				
	Raw N	11576	10910	11439
	Eligible Sample N*	11533	10877	11398
	% of Raw N	99.6%	99.7%	99.6%
	Study N	4000	4000	4000
	% of Eligible Sample N	34.7%	36.8%	35.1%
Collision with Stationary Objects Deaths				
	Raw N	8500	8686	9194
	Eligible Sample N*	8473	8663	9168
	% of Raw N	99.7%	99.7%	99.7%
	Study N	4000	4000	4000
	% of Eligible Sample N	47.2%	46.2%	43.6%

*Size after removing subjects <15 years old, or with unknown age.

Table 3. Sample Sizes of the Control Groups				
Underlying Cause of Death		**1993**	**1992**	**1991**
Poisoning by Solids or Liquids Deaths				
	Raw N	7888	6462	5718
	Eligible Sample N*	7806	6398	5620
	% of Raw N	99.0%	99.0%	98.3%
	Study N	4000	4000	4000
	% of Eligible Sample N	51.2%	62.5%	71.2%
Non-Hodgkins Lymphoma Deaths				
	Raw N	19409	18309	17515
	Eligible Sample N*	18832	18262	17472
	% of Raw N	97.0%	99.7%	99.8%
	Study N	4000	4000	4000
	% of Eligible Sample N	21.2%	21.9%	22.9%
Drowning (Non-Boating) Deaths				
	Raw N	3872	3586	4040
	Eligible Sample N*	2805	2543	2897
	% of Raw N	72.4%	70.9%	71.7%
	Study N	2000	2000	2000
	% of Eligible Sample N	71.3%	78.6%	69.0%
Diabetes Mellitus Deaths				
	Raw N	53943	50113	48993
	Eligible Sample N*	53894	50077	48948
	% of Raw N	99.9%	99.9%	99.9%
	Study N	8000	8000	8000
	% of Eligible Sample N	14.8%	16.0%	16.3%

*Size after removing subjects <15 years old, or with unknown age.

Table 4. Age and Sex Characteristics of the Cases				
Accident Category		**1993**	**1992**	**1991**
Non-Collision Deaths				
	N	2000	2000	2000
	Age Range	15-99	15-99	15-87
	Median Age	32	31	30
	Mean Age ± SD	34.9 ± 15.4	34.6 ± 15.2	33.9 ± 14.6
	Males	1614 (80.7%)	1548 (77.4%)	1603 (80.2%)
	Females	386 (19.3%)	452 (22.6%)	397 (19.8%)
Collision with Motor				
Vehicles in Transit Deaths				
	N	4000	4000	4000
	Age Range	15-99	15-99	15-93
	Median Age	38	38	38
	Mean Age ± SD	43.3 ± 20.7	43.3 ± 20.5	43.1 ± 20.6
	Males	2759 (69.0%)	2807 (70.2%)	2784 (69.6%)
	Females	1241 (31.0%)	1193 (29.8%)	1216 (30.4%)
Collision with Stationary				
Objects Deaths				
	N	4000	4000	4000
	Age Range	15-99	15-99	15-99
	Median Age	32	31	31
	Mean Age ± SD	36.7 ± 17.5	36.5 ± 17.6	35.7 ± 17.1
	Males	3215 (80.4%)	3244 (81.1%)	3269 (81.7%)
	Females	785 (19.6%)	756 (18.9%)	731 (18.3%)

Table 5. Age and Sex Characteristics of the Controls				
Underlying Cause of Death		**1993**	**1992**	**1991**
Poisoning by Solids				
or Liquids Deaths				
	N	4000	4000	4000
	Age Range	15-103	15-120	15-103
	Median Age	38	38	37
	Mean Age ± SD	40.4 ± 13.2	40.7 ± 14.7	41.0 ± 15.8
	Males	3089 (77.2%)	3024 (75.6%)	2890 (72.2%)
	Females	911 (22.8%)	976 (24.4%)	1110 (27.8%)
Non-Hodgkins Lymphoma				
Deaths				
	N	4000	4000	4000
	Age Range	15-106	16-106	15-104
	Median Age	72	72	71
	Mean Age ± SD	68.8 ± 14.8	69.1 ± 14.9	68.4 ± 15.0
	Males	2068 (51.7%)	2079 (52.0%)	2126 (53.2%)
	Females	1932 (48.3%)	1921 (48.0%)	1874 (46.9%)
Drowning (Non-Boating)				
Deaths				
	N	2000	2000	2000
	Age Range	15-98	15-99	15-99
	Median Age	35	35	33
	Mean Age ± SD	39.9 ± 19.8	40.4 ± 20.2	38.5 ± 19.1
	Males	1668 (83.4%)	1671 (83.5%)	1718 (85.9%)
	Females	332 (16.6%)	329 (16.5%)	282 (14.1%)
Diabetes Mellitus Deaths				
	N	8000	8000	8000
	Age Range	15-107	16-104	15-102
	Median Age	73	73	73
	Mean Age ± SD	71.8 ± 13.5	71.6 ± 13.9	71.6 ± 13.6
	Males	3510 (43.9%)	3455 (43.2%)	3506 (43.8%)
	Females	4490 (56.1%)	4545 (56.8%)	4494 (56.2%)

Table 6. 1993 Cases, by Age Group, Sex, and Exposure								
	Age							
	15-24	25-34	35-44	45-54	55-64	65-74	75+	
Non-Collision Cases, N = 2000								
Males								**By Sex Only**
Exposed	454	407	311	163	87	67	36	1525
Non-Exposed	26	33	15	7	5	2	1	89
Females								
Exposed	129	97	74	41	14	11	10	376
Non-Exposed	3	2	3	1	1	0	0	10
By Age Only								
Exposed	583	504	385	204	101	78	46	
Non-Exposed	29	35	18	8	6	2	1	
Collision with Motor Vehicles in Transit Cases, N = 4000								
Males								**By Sex Only**
Exposed	555	530	382	253	184	204	277	2385
Non-Exposed	77	83	58	37	40	30	49	374
Females								
Exposed	240	194	179	161	107	104	115	
Non-Exposed	30	28	19	19	8	16	21	
By Age Only								
Exposed	795	724	561	414	291	308	392	
Non-Exposed	107	111	77	56	48	46	70	
Collision with Stationary Objects Cases, N = 4000								
Males								**By Sex Only**
Exposed	846	683	481	275	168	126	114	2693
Non-Exposed	160	134	86	47	30	36	29	522
Females								
Exposed	192	165	132	55	43	45	39	671
Non-Exposed	20	33	20	8	8	13	12	114
By Age Only								
Exposed	1038	848	613	330	211	171	153	
Non-Exposed	180	167	106	55	38	49	41	

Table 7. 1992 Cases, by Age Group, Sex, and Exposure								
				Age				
	15-24	**25-34**	**35-44**	**45-54**	**55-64**	**65-74**	**75+**	
Non-Collision Cases, N = 2000								
Males								**By Sex Only**
Exposed	445	389	276	166	93	60	28	1457
Non-Exposed	26	33	16	8	3	3	2	91
Females								
Exposed	163	106	73	45	21	20	4	432
Non-Exposed	9	5	2	4	0	0	0	20
By Age Only								
Exposed	608	495	349	211	114	80	32	
Non-Exposed	35	38	18	12	3	3	2	
Collision with Motor Vehicles in Transit Cases, N = 4000								
Males								**By Sex Only**
Exposed	547	542	364	270	210	232	260	2425
Non-Exposed	81	97	56	43	31	37	37	382
Females								
Exposed	220	209	153	112	101	111	116	1022
Non-Exposed	29	35	26	23	16	27	15	171
By Age Only								
Exposed	767	751	517	382	311	343	376	
Non-Exposed	110	132	82	66	47	64	52	
Collision with Stationary Objects Cases, N = 4000								
Males								**By Sex Only**
Exposed	875	722	480	230	154	138	115	2714
Non-Exposed	160	152	80	46	43	28	21	530
Females								
Exposed	176	148	112	61	44	47	45	633
Non-Exposed	34	25	13	15	10	16	10	123
By Age Only								
Exposed	1051	870	592	291	198	185	160	
Non-Exposed	194	177	93	61	53	44	31	

Table 8. 1991 Cases, by Age Group, Sex, and Exposure								
				Age				
	15-24	25-34	35-44	45-54	55-64	65-74	75+	
Non-Collision Cases, N = 2000								
Males								**By Sex Only**
Exposed	467	453	288	153	80	55	26	1522
Non-Exposed	26	22	16	13	1	1	2	81
Females								
Exposed	136	98	77	26	15	12	9	373
Non-Exposed	9	9	4	1	0	0	1	24
By Age Only								
Exposed	603	551	365	179	95	67	35	
Non-Exposed	35	31	20	14	1	1	3	
Collision with Motor Vehicles in Transit Cases, N = 4000								
Males								**By Sex Only**
Exposed	582	563	365	214	211	226	268	2429
Non-Exposed	87	82	51	32	23	40	40	355
Females								
Exposed	210	217	188	128	97	111	115	1066
Non-Exposed	32	29	18	14	20	14	23	150
By Age Only								
Exposed	792	780	553	342	308	337	383	
Non-Exposed	119	111	69	46	43	54	63	
Collision with Stationary Objects Cases, N = 4000								
Males								**By Sex Only**
Exposed	875	756	468	261	165	127	106	2758
Non-Exposed	163	157	75	43	28	20	25	511
Females								
Exposed	200	162	97	48	41	35	31	614
Non-Exposed	36	23	11	12	14	10	11	117
By Age Only								
Exposed	1075	918	565	309	206	162	137	
Non-Exposed	199	180	86	55	42	30	36	

Table 9. 1993 Control Groups, by Age Group, Sex, and Exposure								
				Age				
	15-24	25-34	35-44	45-54	55-64	65-74	75+	
Poisoning by Solids or Liquids Controls, N = 4000								
Males								**By Sex Only**
Exposed	112	634	987	299	100	57	48	2237
Non-Exposed	58	247	397	114	20	8	8	852
Females								
Exposed	32	161	242	100	49	41	70	695
Non-Exposed	14	62	82	21	11	6	20	216
By Age Only								
Exposed	144	795	1229	399	149	98	118	
Non-Exposed	72	309	479	135	31	14	28	
Non-Hodgkins Lymphoma Controls, N = 4000								
Males								**By Sex Only**
Exposed	12	57	101	149	292	445	571	1627
Non-Exposed	3	16	37	54	65	123	143	441
Females								
Exposed	7	26	48	103	199	414	739	1536
Non-Exposed	0	7	11	19	51	131	177	396
By Age Only								
Exposed	19	83	149	252	491	859	1310	
Non-Exposed	3	23	48	73	116	254	320	
Drowning (Non-Boating) Controls, N = 2000								
Males								**By Sex Only**
Exposed	419	361	256	140	74	87	82	1419
Non-Exposed	58	46	46	27	42	17	13	249
Females								
Exposed	40	50	46	22	29	44	55	286
Non-Exposed	10	9	6	2	4	8	7	46
By Age Only								
Exposed	459	411	302	162	103	131	137	
Non-Exposed	68	55	52	29	46	25	20	
Diabetes Mellitus Controls, N = 8000								
Males								**By Sex Only**
Exposed	10	34	128	228	468	841	1117	2826
Non-Exposed	0	5	27	40	125	220	267	684
Females								
Exposed	5	37	90	191	453	958	1810	3544
Non-Exposed	2	5	16	41	115	252	515	946
By Age Only								
Exposed	15	71	218	419	921	1799	2927	
Non-Exposed	2	10	43	81	240	472	782	

Table 10. 1992 Control Groups, by Age Group, Sex, and Exposure								
				Age				
	15-24	25-34	35-44	45-54	55-64	65-74	75+	
Poisoning by Solids or Liquids Controls, N = 4000								
Males								**By Sex Only**
Exposed	174	633	900	274	81	80	65	2207
Non-Exposed	41	261	370	101	18	12	14	817
Females								
Exposed	55	196	206	111	41	57	95	761
Non-Exposed	18	63	68	17	8	9	32	215
By Age Only								
Exposed	229	829	1106	385	122	137	160	
Non-Exposed	59	324	438	118	26	21	46	
Non-Hodgkins Lymphoma Controls, N = 4000								
Males								**By Sex Only**
Exposed	14	51	102	138	272	459	569	1605
Non-Exposed	2	18	44	53	74	127	156	474
Females								
Exposed	6	23	44	80	171	424	754	1502
Non-Exposed	6	9	20	22	59	118	185	419
By Age Only								
Exposed	20	74	146	218	443	883	1323	
Non-Exposed	8	27	64	75	133	245	341	
Drowning (Non-Boating) Controls, N = 2000								
Males								**By Sex Only**
Exposed	432	315	260	153	101	88	90	1439
Non-Exposed	48	55	57	20	19	21	12	232
Females								
Exposed	46	46	45	22	28	25	61	273
Non-Exposed	5	11	5	2	7	12	14	56
By Age Only								
Exposed	478	361	305	175	129	113	151	
Non-Exposed	53	66	62	22	26	33	26	
Diabetes Mellitus Controls, N = 8000								
Males								**By Sex Only**
Exposed	16	53	111	258	474	755	1052	2719
Non-Exposed	3	16	45	52	115	205	300	736
Females								
Exposed	7	27	86	161	462	935	1905	3583
Non-Exposed	0	10	28	40	121	267	496	962
By Age Only								
Exposed	23	80	197	419	936	1690	2957	
Non-Exposed	3	26	73	92	236	472	796	

Table 11. 1991 Control Groups, by Age Group, Sex, and Exposure								
	Age							
	15-24	25-34	35-44	45-54	55-64	65-74	75+	
Poisoning by Solids or Liquids Controls, N = 4000								
Males								**By Sex Only**
Exposed	185	719	764	200	105	74	69	2116
Non-Exposed	65	270	321	71	22	10	15	774
Females								
Exposed	41	196	210	108	82	66	134	837
Non-Exposed	20	74	90	24	12	18	35	273
By Age Only								
Exposed	226	915	974	308	187	140	203	
Non-Exposed	85	344	411	95	34	28	50	
Non-Hodgkins Lymphoma Controls, N = 4000								
Males								**By Sex Only**
Exposed	20	43	121	165	298	464	563	1674
Non-Exposed	4	22	45	47	76	127	131	452
Females								
Exposed	9	20	37	93	201	409	677	1446
Non-Exposed	3	7	18	21	50	115	214	428
By Age Only								
Exposed	29	63	158	258	499	873	1240	
Non-Exposed	7	29	63	68	126	242	345	
Drowning (Non-Boating) Controls, N = 2000								
Males								**By Sex Only**
Exposed	440	385	237	116	118	96	75	1467
Non-Exposed	68	75	42	27	17	14	8	251
Females								
Exposed	48	44	38	28	31	17	41	247
Non-Exposed	6	8	0	4	5	7	5	35
By Age Only								
Exposed	488	429	275	144	149	113	116	
Non-Exposed	74	83	42	31	22	21	13	
Diabetes Mellitus Controls, N = 8000								
Males								**By Sex Only**
Exposed	14	39	116	220	427	818	1122	2756
Non-Exposed	2	18	29	63	138	209	291	750
Females								
Exposed	3	36	93	187	461	930	1784	3494
Non-Exposed	1	8	19	37	137	265	533	1000
By Age Only								
Exposed	17	75	209	407	888	1748	2906	
Non-Exposed	3	26	48	100	275	474	824	

Table 12. Non-Collision Death Odds Ratios, by Control Group and Year					
Year	Crude OR	[1]MH OR	95% Confidence Interval	[2]MH χ^2	p-value
Control Group: Poisoning by Solids or Liquids					
1993	6.99	7.10	5.78--9.21	358.44	<0.00000001
1992	5.92	5.63	4.44--6.87	289.39	<0.00000001
1991	6.40	6.57	5.25--8.21	345.51	<0.00000001
Control Group: Non-Hodgkins Lymphoma					
1993	5.08	6.36	4.39--8.13	148.70	<0.00000001
1992	4.89	6.91	4.99--8.95	189.31	<0.00000001
1991	5.09	6.39	4.71--8.58	166.58	<0.00000001
Control Group: Drowning (Non-Boating)					
1993	3.32	3.25	2.57--4.23	100.90	<0.00000001
1992	2.86	2.80	2.19--3.54	76.44	<0.00000001
1991	3.01	3.14	2.43--3.95	92.30	<0.00000001
Control Group: Diabetes Mellitus					
1993	4.91	4.92	3.19--6.11	90.44	<0.00000001
1992	4.59	5.57	3.94--7.05	141.37	<0.00000001
1991	5.05	5.37	3.83--7.10	124.48	<0.00000001

[1]Mantel-Haenszel Weighted Odds Ratio

[2]Mantel-Haenszel Weighted χ^2 Value

Table 13. Collision with Motor Vehicles in Transit Death Odds Ratios, by Control Group and Year					
Year	Crude OR	[1]MH OR	95% Confidence Interval	[2]MH χ^2	p-value
Control Group: Poisoning by Solids or Liquids					
1993	2.46	2.36	2.06--2.66	174.29	<0.00000001
1992	2.17	1.97	1.72--2.20	114.11	<0.00000001
1991	2.45	2.36	2.06--2.65	182.89	<0.00000001
Control Group: Non-Hodgkins Lymphoma					
1993	1.79	1.73	1.50--2.03	52.55	<0.00000001
1992	1.79	1.93	1.69--2.28	81.81	<0.00000001
1991	1.95	1.94	1.71--2.33	80.38	<0.00000001
Control Group: Drowning (Non-Boating)					
1993	1.17	1.16	0.99--1.37	3.36	0.0667303
1992	1.05	1.07	0.91--1.25	0.63	0.42755741
1991	1.15	1.13	0.96--1.33	2.17	0.14106287
Control Group: Diabetes Mellitus					
1993	1.73	1.50	1.29--1.72	29.77	0.00000005
1992	1.68	1.68	1.47--1.95	55.36	<0.00000001
1991	1.94	1.84	1.60--2.15	71.25	<0.00000001
[1]Mantel-Haenszel Weighted Odds Ratio					
[2]Mantel-Haenszel Weighted χ^2 Value					

Table 14. Collision with Stationary Objects Death Odds Ratios, by Control Group and Year					
Year	Crude OR	[1]MH OR	95% Confidence Interval	[2]MH χ^2	p-value
Control Group: Poisoning by Solids or Liquids					
1993	1.93	1.91	1.69--2.16	112.99	<0.00000001
1992	1.78	1.72	1.51--1.92	78.81	<0.00000001
1991	1.90	1.87	1.66--2.11	108.19	<0.00000001
Control Group: Non-Hodgkins Lymphoma					
1993	1.40	1.31	1.12--1.57	10.81	0.00100729
1992	1.47	1.54	1.33--1.85	29.39	0.00000006
1991	1.51	1.53	1.32--1.87	26.98	0.00000021
Control Group: Drowning (Non-Boating)					
1993	0.92	0.89	0.76--1.04	2.20	0.13764378
1992	0.86	0.85	0.73--0.99	4.40	0.03590188
1991	0.90	0.89	0.76--1.03	2.34	0.12602829
Control Group: Diabetes Mellitus					
1993	1.35	1.07	0.91--1.25	0.55	0.46000202
1992	1.38	1.30	1.12--1.54	11.71	0.00062170
1991	1.50	1.41	1.21--1.69	17.95	0.00002271
[1]Mantel-Haenszel Weighted Odds Ratio					
[2]Mantel-Haenszel Weighted χ^2 Value					

Table 15. Non-Collision Death Odds Ratios for Males by Age Group, Control Group, and Year								
		Age						
Year		15-24	25-34	35-44	45-54	55-64	65-74	75+
Poisoning by Solids or Liquids Controls								
1993	OR	9.04	4.80	8.34	8.88	3.48	4.70	6.00
	CI	5.30-15.50	3.22-7.19	4.79-14.75	3.89-21.31	1.17-11.09	0.87-33.51	0.70-133.64
	p-value	<0.0000001	<0.0000001	<0.0000001	<0.0000001	0.0119667	0.0383175	0.0644209
1992	OR	4.03	4.86	7.09	7.65	6.89	3.00	3.02
	CI	2.32-7.02	3.26-7.27	4.13-12.36	3.50-17.43	1.82-30.58	0.74-14.07	0.59-20.62
	p-value	<0.0000001	<0.0000001	<0.0000001	<0.0000001	0.0006965	0.0867300	0.2258660
1991	OR	6.31	7.73	7.56	4.18	16.76	7.43	2.83
	CI	3.79-10.57	4.84-12.47	4.40-13.20	2.15-8.24	2.32-340.94	0.93-159.73	0.56-19.25
	p-value	<0.0000001	<0.0000001	<0.0000001	0.0000023	0.0003089	0.0498689	0.2312284
Non-Hodgkins Lymphoma Controls								
1993	OR	4.37	3.46	7.60	8.44	3.87	9.26	9.02
	CI	0.91-18.15	1.70-7.00	3.84-15.17	3.56-20.98	1.44-11.29	2.19-55.41	1.31-178.41
	p-value	0.0178708	0.0001039	<0.0000001	<0.0000001	0.0026011	0.0002118	0.0090487
1992	OR	2.45	4.16	7.44	7.97	8.43	5.53	3.84
	CI	0-12.22	2.08-8.29	3.87-14.45	3.50-18.81	2.49-34.33	1.64-22.47	0.88-23.56
	p-value	0.2329086	0.0000040	<0.0000001	<0.0000001	0.0000299	0.0014391	0.0500620
1991	OR	3.59	10.53	6.69	3.35	20.40	15.05	3.02
	CI	0.96-12.26	5.13-21.68	3.51-12.90	1.68-6.80	3.01-401.08	2.22-295.71	0.69-18.67
	p-value	0.0433590	<0.0000001	<0.0000001	0.0001531	0.0000327	0.0004040	0.1163633
Drowning (Non-Boating) Controls								
1993	OR	2.42	1.57	3.73	4.49	9.88	6.55	5.71
	CI	1.46-4.03	0.96-2.58	1.96-7.15	1.80-11.71	3.50-30.03	1.38-42.54	0.73-121.19
	p-value	0.0002281	0.0572876	0.0000070	0.0002405	0.0000001	0.0056065	0.0657130
1992	OR	1.90	2.06	3.78	2.71	5.83	4.77	1.87
	CI	1.13-3.22	1.27-3.33	2.05-7.05	1.09-6.93	1.56-25.65	1.27-21.09	0.36-12.88
	p-value	0.0099230	0.0016405	0.0000021	0.0172594	0.0021512	0.0081723	0.7358480
1991	OR	2.78	4.01	3.19	2.74	11.53	8.02	1.39
	CI	1.70-4.57	2.39-6.78	1.69-6.09	1.29-5.89	1.57-236.93	1.06-167.81	0.25-10.14
	p-value	0.0000109	<0.0000001	0.0000797	0.0039138	0.0034562	0.0200815	1.0000000
Diabetes Mellitus Controls								
1993	OR	0.00	1.81	4.37	4.09	4.65	8.76	8.61
	CI	0-9.77	0.58-5.29	2.15-8.96	1.70-10.26	1.77-13.28	2.09-52.09	1.26-169.65
	p-value	1.0000000	0.2210205	0.0000033	0.0003688	0.0003702	0.0003022	0.0109055
1992	OR	3.21	3.56	6.99	4.18	7.52	5.43	3.99
	CI	0.69-12.79	1.74-7.23	3.66-13.52	1.86-9.79	2.25-30.27	1.62-21.90	0.92-24.37
	p-value	0.0951325	0.0000786	<0.0000001	0.0000959	0.0000795	0.0015252	0.0418556
1991	OR	2.57	9.50	4.50	3.37	25.85	14.05	3.37
	CI	0-12.83	4.44-20.34	2.26-9.04	1.73-6.68	3.85-505.11	2.09-275.04	0.77-20.66
	p-value	0.2178154	<0.0000001	0.0000012	0.0000828	0.0000020	0.0006218	0.0799002

Table 16. Non-Collision Death Odds Ratios for Females by Age Group, Control Group, and Year								
		Age						
Year		15-24	25-34	35-44	45-54	55-64	65-74	75+
Poisoning by Solids or Liquids Controls								
1993	OR	18.81	18.68	8.36	8.61	3.14	*	*
	CI	4.66-88.23	4.35-112.94	2.46-34.13	1.16-177.40	0.36-70.66	*	*
	p-value	0.0000004	0.0000001	0.0000359	0.0144037	0.4394899	0.5831209	0.2046881
1992	OR	5.93	6.81	12.05	1.72	*	*	*
	CI	2.35-15.25	2.54-19.87	2.80-72.92	0.51-6.44	*	*	*
	p-value	0.0000090	0.0000065	0.0000219	0.3461196	0.0948697	0.1090266	0.5716205
1991	OR	7.37	4.11	8.25	5.78	*	*	2.35
	CI	2.91-19.11	1.89-9.20	2.80-27.35	0.77-119.83	*	*	0.29-51.17
	p-value	0.0000006	0.0000599	0.0000034	0.0798303	0.2121112	0.1145776	0.6892994
Non-Hodgkins Lymphoma Controls								
1993	OR	0.00	13.06	5.65	7.56	3.59	*	*
	CI	0-52.37	2.27-97.41	1.36-27.07	1.01-156.47	0.48-74.79	*	*
	p-value	0.6867737	0.0001519	0.0050321	0.0242243	0.1933141	0.0629075	0.2231452
1992	OR	18.11	8.30	16.59	3.09	*	*	*
	CI	4.11-82.77	2.25-31.92	3.48-108.15	0.93-11.36	*	*	*
	p-value	0.0000712	0.0004513	0.0000042	0.0410733	0.0052884	0.0113717	1.0000000
1991	OR	5.04	3.81	9.36	5.87	*	*	2.84
	CI	0.90-26.08	1.12-12.98	2.71-35.47	0.77-122.56	*	*	0.37-60.30
	p-value	0.0509394	0.0199011	0.0000157	0.0758388	0.0819316	0.0788978	0.4661952
Drowning (Non-Boating) Controls								
1993	OR	10.75	8.73	3.22	3.73	1.93	*	*
	CI	2.55-52.08	1.66-61.00	0.67-17.21	0.24-110.50	0.17-49.83	*	*
	p-value	0.0001682	0.0025095	0.1560488	0.5484266	1.0000000	0.3309013	0.5826888
1992	OR	1.97	5.07	4.06	1.02	*	*	*
	CI	0.54-6.86	1.51-17.90	0.66-31.68	0.12-7.30	*	*	*
	p-value	0.3200277	0.0019829	0.1148232	1.0000000	0.0376860	0.0046472	1.0000000
1991	OR	1.89	1.98	0.00	3.71	*	*	1.10
	CI	0.56-6.21	0.64-6.08	0-3.30	0.35-93.27	*	*	0.10-27.93
	p-value	0.2416444	0.1818896	0.3048668	0.3624623	0.3047112	0.0703985	1.0000000
Diabetes Mellitus Controls								
1993	OR	17.20	6.55	4.39	8.80	3.55	*	*
	CI	1.56-184.86	1.06-51.31	1.14-19.74	1.24-176.91	0.48-73.18	*	*
	p-value	0.0203324	0.0247277	0.0142167	0.0113677	0.3247817	0.1337417	0.1303084
1992	OR	0.00	7.85	11.88	2.80	*	*	*
	CI	0-17.03	2.22-29.19	2.62-74.77	0.89-9.74	*	*	*
	p-value	1.0000000	0.0003819	0.0000558	0.0530500	0.0118607	0.0116942	0.5870473
1991	OR	5.04	2.42	3.93	5.14	*	*	2.69
	CI	0-65.95	0.78-7.53	1.19-14.32	0.71-104.95	*	*	0.35-56.80
	p-value	0.2448466	0.0954457	0.0109322	0.0916881	0.0292856	0.0797474	0.4707276
*Undefined due to a divide by zero calculation								

Table 17. Collision with Motor Vehicles in Transit Death Odds Ratios for Males by Age Group, Control Group, and Year

		Age						
Year		15-24	25-34	35-44	45-54	55-64	65-74	75+
Poisoning by Solids or Liquids Controls								
1993	OR	3.73	2.49	2.65	2.61	0.92	0.95	0.94
	CI	2.46-5.66	1.87-3.30	1.94-3.62	1.70-4.00	0.49-1.72	0.38-2.33	0.39-2.23
	p-value	<0.0000001	<0.0000001	<0.0000001	0.0000024	0.7815351	0.9125577	0.8850739
1992	OR	1.59	2.30	2.67	2.31	1.51	0.94	1.51
	CI	1.03-2.45	1.76-3.01	1.95-3.67	1.53-3.50	0.76-2.97	0.44-1.98	0.73-3.10
	p-value	0.0264134	<0.0000001	<0.0000001	0.0000227	0.2045778	0.8635021	0.2246157
1991	OR	2.35	2.58	3.01	2.37	1.92	0.76	1.46
	CI	1.61-3.43	1.95-3.41	2.16-4.20	1.46-3.86	0.98-3.77	0.34-1.68	0.72-2.91
	p-value	0.0000024	<0.0000001	<0.0000001	0.0001767	0.0395588	0.4744056	0.2546172
Non-Hodgkins Lymphoma Controls								
1993	OR	1.80	1.79	2.41	2.48	1.02	1.88	1.42
	CI	0.39-7.06	0.94-3.39	1.47-3.95	1.52-4.05	0.65-1.62	1.20-2.97	0.98-2.05
	p-value	0.3633879	0.0541637	0.0001636	0.0000966	0.9149830	0.0037972	0.0539891
1992	OR	0.96	1.97	2.80	2.41	1.84	1.73	1.93
	CI	0-4.56	1.06-3.64	1.74-4.51	1.50-3.88	1.14-2.99	1.14-2.64	1.29-2.89
	p-value	1.0000000	0.0196184	0.0000045	0.0001019	0.0080265	0.0063233	0.0007800
1991	OR	1.34	3.51	2.66	1.90	2.34	1.55	1.56
	CI	0.38-4.27	1.92-6.39	1.66-4.28	1.13-3.21	1.39-3.98	1.03-2.33	1.05-2.33
	p-value	0.5418301	0.0000044	0.0000131	0.0096625	0.0006512	0.0273871	0.0222356
Drowning (Non-Boating) Controls								
1993	OR	1.00	0.81	1.18	1.32	2.61	1.33	0.90
	CI	0.68-1.46	0.54-1.22	0.76-1.83	0.74-2.33	1.52-4.49	0.66-2.65	0.44-1.80
	p-value	0.9902579	0.2923652	0.4293948	0.3118933	0.0001770	0.3872470	0.7445119
1992	OR	0.75	0.98	1.42	0.82	1.27	1.50	0.94
	CI	0.50-1.11	0.67-1.42	0.94-2.17	0.45-1.50	0.66-2.46	0.80-2.80	0.44-1.96
	p-value	0.1361254	0.8927336	0.0829541	0.4938358	0.4415189	0.1780389	0.8539877
1991	OR	1.03	1.34	1.27	1.56	1.32	0.82	0.71
	CI	0.73-1.47	0.94-1.90	0.80-2.01	0.86-2.82	0.64-2.70	0.41-1.65	0.29-1.67
	p-value	0.8480343	0.0918973	0.2888726	0.1194722	0.4108045	0.5611480	0.4093434
Diabetes Mellitus Controls								
1993	OR	0.00	0.94	1.39	1.20	1.23	1.78	1.35
	CI	0-3.88	0.31-2.61	0.82-2.35	0.72-2.00	0.81-1.86	1.16-2.74	0.96-1.91
	p-value	0.6177414	0.8985450	0.1948063	0.4584279	0.3061274	0.0054941	0.0745303
1992	OR	1.27	1.69	2.64	1.27	1.64	1.70	2.00
	CI	0.29-4.75	0.89-3.18	1.65-4.22	0.80-2.01	1.05-2.58	1.15-2.54	1.37-2.95
	p-value	0.7259955	0.0844183	0.0000136	0.2918781	0.0221314	0.0056026	0.0001659
1991	OR	0.96	3.17	1.79	1.92	2.96	1.44	1.74
	CI	0-4.51	1.66-6.03	1.05-3.04	1.17-3.13	1.81-4.89	0.98-2.12	1.20-2.52
	p-value	1.0000000	0.0000937	0.0217106	0.0056827	0.0000029	0.0501783	0.0021448

Table 18. Collision with Motor Vehicles in Transit Death Odds Ratios for Females by Age Group, Control Group, and Year								
				Age				
Year		15-24	25-34	35-44	45-54	55-64	65-74	75+
Poisoning by Solids or Liquids Controls								
1993	OR	3.50	2.67	3.19	1.78	3.00	0.95	1.56
	CI	1.58-7.73	1.59-4.50	1.82-5.66	0.87-3.66	1.04-8.82	0.31-2.83	0.75-3.26
	p-value	0.0004665	0.0000664	0.0000104	0.0883888	0.0216598	0.9223349	0.1953264
1992	OR	2.48	1.92	1.94	0.75	1.23	0.65	2.60
	CI	1.22-5.03	1.19-3.11	1.15-3.30	0.36-1.55	0.44-3.36	0.26-1.57	1.27-5.38
	p-value	0.0056273	0.0047374	0.0082681	0.3965767	0.6577265	0.2987203	0.0042380
1991	OR	3.20	2.83	4.48	2.03	0.71	2.16	1.31
	CI	1.59-6.45	1.72-4.65	2.53-8.01	0.95-4.37	0.31-1.64	0.95-4.96	0.70-2.44
	p-value	0.0002927	0.0000093	<0.0000001	0.0464055	0.3836757	0.0440769	0.3679639
Non-Hodgkins Lymphoma Controls								
1993	OR	0.00	1.87	2.16	1.56	3.43	2.06	1.31
	CI	0-6.66	0.67-5.06	0.89-5.18	0.75-3.26	1.50-8.13	1.14-3.76	0.78-2.22
	p-value	1.0000000	0.1811987	0.0574585	0.1969626	0.0011908	0.0105283	0.2798192
1992	OR	7.59	2.34	2.67	1.34	2.18	1.14	1.90
	CI	2.00-28.94	0.92-5.86	1.29-5.52	0.66-2.70	1.15-4.18	0.70-1.88	1.05-3.47
	p-value	0.0019529	0.0452537	0.0033797	0.3784726	0.0103941	0.5721712	0.0232428
1991	OR	2.19	2.62	5.08	2.06	1.21	2.23	1.58
	CI	0.44-9.50	0.91-7.29	2.27-11.39	0.94-4.55	0.66-2.23	1.19-4.23	0.96-2.61
	p-value	0.2197053	0.0646374	0.0000046	0.0475034	0.5200280	0.0068242	0.0563148
Drowning (Non-Boating) Controls								
1993	OR	2.00	1.25	1.23	0.77	1.84	1.18	0.70
	CI	0.84-4.68	0.51-2.98	0.41-3.51	0.12-3.80	0.43-7.44	0.43-3.21	0.25-1.86
	p-value	0.0808556	0.5937754	0.6777525	1.0000000	0.4670988	0.7214134	0.4369362
1992	OR	0.82	1.43	0.65	0.44	1.58	1.97	1.77
	CI	0.26-2.40	0.63-3.19	0.21-1.93	0.07-2.16	0.53-4.61	0.82-4.74	0.75-4.20
	p-value	0.7052885	0.3493339	0.4082993	0.3728405	0.3596222	0.0948998	0.1518751
1991	OR	0.82	1.36	0.00	1.31	0.78	3.26	0.61
	CI	0.29-2.20	0.53-3.38	0-1.45	0.33-4.71	0.23-2.46	1.02-10.33	0.19-1.84
	p-value	0.6748389	0.4749451	0.0846318	0.7473782	0.6492231	0.0476667	0.3431421
Diabetes Mellitus Controls								
1993	OR	3.20	0.94	1.67	1.82	3.40	1.71	1.56
	CI	0.41-19.87	0.30-2.77	0.78-3.60	0.98-3.40	1.55-7.75	0.97-3.07	0.95-2.58
	p-value	0.1536359	0.8987833	0.1523289	0.0422264	0.0007189	0.0509585	0.0653942
1992	OR	0.00	2.21	1.92	1.21	1.65	1.17	2.01
	CI	0-6.33	0.91-5.30	1.01-3.62	0.66-2.22	0.91-3.03	0.74-1.87	1.14-3.62
	p-value	1.0000000	0.0499723	0.0307591	0.5097118	0.0781662	0.4765628	0.0105598
1991	OR	2.19	1.66	2.13	1.81	1.44	2.26	1.49
	CI	Undefined	0.64-4.19	1.01-4.49	0.90-3.67	0.84-2.50	1.24-4.19	0.93-2.43
	p-value	0.4400878	0.2417146	0.0288661	0.0730537	0.1646110	0.0042394	0.0840001

Table 19. Collision with Stationary Objects Death Odds Ratios for Males by Age Group, Control Group, and Year								
		Age						
Year		15-24	25-34	35-44	45-54	55-64	65-74	75+
Poisoning by Solids or Liquids Controls								
1993	OR	2.74	1.99	2.25	2.23	1.12	0.49	0.66
	CI	1.88-3.98	1.56-2.53	1.73-2.93	1.51-3.31	0.58-2.17	0.20-1.19	0.25-1.64
	p-value	<0.0000001	<0.0000001	<0.0000001	0.0000234	0.7190095	0.0875929	0.3283990
1992	OR	1.29	1.96	2.47	1.84	0.80	0.74	1.18
	CI	0.87-1.91	1.55-2.47	1.88-3.25	1.23-2.78	0.41-1.53	0.33-1.62	0.53-2.63
	p-value	0.1896915	<0.0000001	<0.0000001	0.0019608	0.4644208	0.4162975	0.6623662
1991	OR	1.89	1.81	2.62	2.15	1.23	0.86	0.92
	CI	1.34-2.65	1.44-2.27	1.97-3.49	1.39-3.36	0.64-2.37	0.35-2.06	0.43-1.97
	p-value	0.0001286	0.0000001	<0.0000001	0.0002956	0.4974282	0.7114672	0.8215571
Non-Hodgkins Lymphoma Controls								
1993	OR	1.32	1.43	2.05	2.12	1.25	0.97	0.98
	CI	0.29-5.09	0.76-2.65	1.29-3.26	1.34-3.37	0.76-2.06	0.62-1.51	0.62-1.58
	p-value	0.7194295	0.2277001	0.0012279	0.0006780	0.3598911	0.8773682	0.9453114
1992	OR	0.78	1.68	2.59	1.92	0.97	1.36	1.50
	CI	0.12-3.64	0.92-3.04	1.65-4.05	1.20-3.08	0.62-1.52	0.85-2.20	0.89-2.55
	p-value	1.0000000	0.0704604	0.0000074	0.0039672	0.9045333	0.1767090	0.1076231
1991	OR	1.07	2.46	2.32	1.73	1.50	1.74	0.99
	CI	0.31-3.38	1.38-4.37	1.49-3.61	1.07-2.80	0.91-2.48	1.02-3.00	0.60-1.63
	p-value	0.7818099	0.0007962	0.0000638	0.0181040	0.0901230	0.0322208	0.9555560
Drowning (Non-Boating) Controls								
1993	OR	0.73	0.65	1.00	1.13	3.18	0.68	0.62
	CI	0.52-1.02	0.45-0.94	0.67-1.51	0.65-1.95	1.79-5.67	0.34-1.35	0.29-1.34
	p-value	0.0570997	0.0176386	0.9799561	0.6456476	0.0000184	0.2416885	0.1911735
1992	OR	0.61	0.83	1.32	0.65	0.67	1.18	0.73
	CI	0.42-0.87	0.58-1.18	0.89-1.94	0.36-1.19	0.36-1.27	0.60-2.30	0.32-1.66
	p-value	0.0040745	0.2740834	0.1475841	0.1370176	0.1918936	0.6111474	0.4166852
1991	OR	0.83	0.94	1.11	1.41	0.85	0.93	0.45
	CI	0.60-1.14	0.69-1.28	0.72-1.70	0.80-2.47	0.42-1.70	0.42-2.04	0.18-1.12
	p-value	0.2299298	0.6772750	0.6294998	0.1987070	0.6198051	0.8371090	0.0622853
Diabetes Mellitus Controls								
1993	OR	0.00	0.75	1.18	1.03	1.50	0.92	0.94
	CI	0-2.81	0.25-2.05	0.71-1.94	0.63-1.66	0.95-2.37	0.60-1.39	0.60-1.48
	p-value	0.3775291	0.5535854	0.4941213	0.9106213	0.0688409	0.6647700	0.7760408
1992	OR	1.03	1.43	2.43	1.01	0.87	1.34	1.56
	CI	0.23-3.79	0.76-2.66	1.56-3.78	0.64-1.59	0.58-1.31	0.85-2.12	0.94-2.61
	p-value	1.0000000	0.2256845	0.0000227	0.9722265	0.4850835	0.1876393	0.0681948
1991	OR	0.77	2.22	1.56	1.74	1.90	1.62	1.10
	CI	0.12-3.57	1.19-4.13	0.94-2.57	1.11-2.73	1.20-3.05	0.97-2.75	0.68-1.78
	p-value	1.0000000	0.0061496	0.0646069	0.0106341	0.0040263	0.0535656	0.6818561

Table 20. Collision with Stationary Objects Death Odds Ratios for Females by Age Group, Control Group, and Year

		Age						
Year		15-24	25-34	35-44	45-54	55-64	65-74	75+
Poisoning by Solids or Liquids Controls								
1993	OR	4.20	1.93	2.24	1.44	1.21	0.51	0.93
	CI	1.80-9.80	1.17-3.18	1.28-3.95	0.56-3.82	0.40-3.67	0.15-1.61	0.38-2.227
	p-value	0.0001350	0.0063670	0.0025947	0.4107131	0.7121349	0.2016328	0.8586759
1992	OR	1.69	1.90	2.84	0.62	0.86	0.46	1.52
	CI	0.84-3.39	1.11-3.27	1.45-5.67	0.27-1.42	0.27-2.66	0.17-1.24	0.65-3.63
	p-value	0.1075895	0.0125361	0.0008974	0.2202696	0.7698631	0.0911858	0.3023168
1991	OR	2.71	2.66	3.78	0.89	0.43	0.95	0.74
	CI	1.36-5.40	1.55-4.59	1.86-7.85	0.39-2.07	0.17-1.09	0.37-2.51	0.32-1.73
	p-value	0.0018046	0.0001276	0.0000429	0.7648004	0.0489183	0.9169987	0.4413933
Non-Hodgkins Lymphoma Controls								
1993	OR	0.00	1.35	1.51	1.27	1.38	1.10	0.78
	CI	0-8.22	0.49-3.61	0.63-3.62	0.49-3.39	0.58-3.39	0.55-2.21	0.38-1.61
	p-value	1.0000000	0.5228944	0.3123615	0.5996183	0.4396388	0.7828568	0.4609626
1992	OR	5.18	2.32	3.92	1.12	1.52	0.82	1.10
	CI	1.37-19.57	0.88-6.03	1.68-9.20	0.05-2.49	0.68-3.44	0.43-1.56	0.53-2.38
	p-value	0.0095593	0.0560744	0.0003526	0.7657740	0.2713369	0.5118613	0.7826218
1991	OR	1.85	2.47	4.29	0.90	0.73	0.98	0.89
	CI	0.38-7.99	0.84-7.06	1.72-10.83	0.38-2.14	0.35-1.52	0.45-2.19	0.42-1.92
	p-value	0.4092579	0.0752611	0.0003734	0.8006356	0.3607257	0.9658132	0.7477311
Drowning (Non-Boating) Controls								
1993	OR	2.40	0.90	0.86	0.63	0.74	0.63	0.41
	CI	0.96-5.91	0.37-2.13	0.29-2.45	0.08-3.60	0.17-3.08	0.21-1.83	0.13-1.26
	p-value	0.0348045	0.7967604	0.7624410	0.7200976	0.7568201	0.3490113	0.0834294
1992	OR	0.56	1.42	0.96	0.37	1.10	1.41	1.03
	CI	0.18-1.62	0.60-3.29	0.28-3.11	0.05-1.91	0.33-3.63	0.53-3.77	0.39-2.78
	p-value	0.2511531	0.3823727	0.9372773	0.3485207	0.8621227	0.4493301	0.9438806
1991	OR	0.69	1.28	0.00	0.57	0.47	1.44	0.34
	CI	0.25-1.85	0.49-3.27	0-1.28	0.14-2.18	0.13-1.61	0.40-5.10	0.09-1.22
	p-value	0.4351425	0.5769704	0.0668435	0.3660279	0.1843979	0.5237346	0.0627098
Diabetes Mellitus Controls								
1993	OR	3.84	0.68	1.17	1.48	1.36	0.91	0.92
	CI	0.48-24.70	0.22-1.98	0.54-2.52	0.62-3.64	0.60-3.24	0.47-1.80	0.46-1.88
	p-value	0.1484888	0.4425766	0.6587545	0.3468426	0.4343323	0.7714754	0.8146271
1992	OR	0.00	2.19	2.81	1.01	1.15	0.84	1.17
	CI	0-4.29	0.87-5.46	1.30-6.11	0.50-2.07	0.54-2.52	0.45-1.57	0.57-2.50
	p-value	0.5995393	0.0624528	0.0037245	0.9756953	0.6973088	0.5544443	0.6534722
1991	OR	1.85	1.57	1.80	0.79	0.87	1.00	0.84
	CI	Undefined	0.59-4.06	0.76-4.30	0.36-1.74	0.44-1.73	0.47-2.18	0.40-1.79
	p-value	0.4905061	0.3163768	0.1429860	0.5260959	0.6683884	0.9941201	0.6270433

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