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DEER-VEHICLE COLLISIONS: AN UNDERSTANDING OF ACCIDENT CHARACTERISTICS AND DRIVERS' ATTITUDES, AWARENESS, AND INVOLVEMENT

presented by

ALIX MARCOUX

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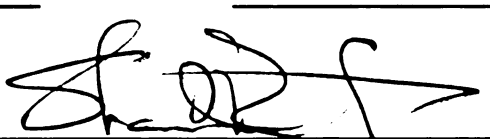
Master of Science degree in Fisheries and Wildlife



Major Professor's Signature

December 15, 2005

Date

DEER-VEHICLE COLLISIONS: AN UNDERSTANDING OF ACCIDENT CHARACTERISTICS AND DRIVERS' ATTITUDES, AWARENESS, AND INVOLVEMENT

By

Alix Marcoux

A THESIS

Submitted to
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ABSTRACT

DEER-VEHICLE COLLISIONS: AN UNDERSTANDING OF ACCIDENT CHARACTERISTICS AND DRIVERS' ATTITUDES, AWARENESS, AND INVOLVEMENT

By

Alix Marcoux

Deer-vehicle collisions (DVCs) create societal impacts throughout the range of white-tailed deer (*Odocoileus virginanus*). Numbers of reported DVCs (currently estimated >65,000/yr) in Michigan increased by nearly 60% between 1992-2003. To better understand where and when to direct education and information programs and to assess drivers' knowledge, awareness, and attitudes regarding DVCs, we used Office of Highway Safety Planning crash data (2001-2003; n = 186,930 accidents) and a self-administered mail survey to identify DVC and driver (n = 1,653 valid responses) characteristics in Washtenaw, Oakland, and Monroe Counties in Michigan. These counties vary in intensity of land use, human and deer densities, and patterns of vehicle traffic. Drivers believed DVCs to be a serious problem in their area, were at particular risk of being involved in DVCs between 6pm-6am, and had insufficient knowledge about avoiding a DVC. Roads with higher posted speed limits provided greater risk to drivers of involvement in a DVC. Middle-aged drivers, particularly males, were at greatest risk of being in a DVC. Reporting rates to insurance or police by drivers involved in DVCs were less than 50%. We identify target audiences for educational programs, and indicate the most effective channels for distribution.

For Mom & Dad,
Your love and support have meant the world to me.
You have encouraged me to be the best I can be.
Thank you.

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THESIS STRUCTURE

This thesis is divided into 3 chapters:

Chapter 1: Situational and driver characteristics associated with deer-vehicle collisions in southeastern Michigan.

Chapter 2: A survey of driver characteristics, attitudes, and knowledge about deer-vehicle collisions in southeastern Michigan.

Chapter 3: Management and research considerations and recommendations for information and education programs aimed at reducing deer-vehicle collisions.

In Chapter 1, I summarize driver and situational characteristics associated with deer-vehicle collisions (DVCs) from Michigan traffic crash reports (2001 – 2003) and calculate the relative risk of each situation involving a deer in Oakland, Washtenaw, and Monroe Counties. Chapter 2 is a summary of driver attitudes, awareness, and knowledge of DVCs in Oakland, Washtenaw, and Monroe Counties. These attitudes and beliefs are compared among drivers who have been involved in a DVC with those who have not. Chapter 3 discusses possible management, communication, and education strategies based on findings from Chapter 1 and 2.

Chapters 1 and 2 include an Abstract, Introduction, Objectives, Methods, Results, Discussion, Literature Cited, and Appendices. Chapter 3 is written as a discussion and includes Literature Cited.

CHAPTER 1

SITUATIONAL AND DRIVER CHARACTERISTICS ASSOCIATED WITH DEER-VEHICLE COLLISIONS IN SOUTHEASTERN MICHIGAN

ABSTRACT

Deer-vehicle collisions (DVCs) create societal impacts throughout the range of white-tailed deer (*Odocoileus virginianus*). In Michigan reported DVCs increased by nearly 60% between 1992-2003, with current estimates at more than 65,000 DVCs per year and a mean of $2,300 vehicle damage. To better understand where to direct education and information programs, we used Office of Highway Safety Planning (OHSP) data, 2001-2003, to profile driver characteristics and accident situations of DVCs in Washtenaw, Oakland, and Monroe Counties in Michigan. Each county varies in intensity of land use, human and deer densities, and available deer habitat. Deer density in Washtenaw, Oakland, and Monroe Counties was 49.5, 21.9 and 8.9 deer per mi^2, respectively, and the annual rate of DVCs in these counties was 5.3, 2.6 and 1.8 per 1,000 licensed drivers. Drivers are at particular risk of being involved in DVCs between 6pm-6am, which includes dawn and dusk commuting hours, and night. Single lane roads and roads with higher posted speed limits provided greater risk to drivers of involvement in a DVC. Middle-aged drivers, particularly males, were at increased risk of deer-related collisions. Results from this study will be combined with survey research to determine how best to educate drivers about risk factors that make occurrence of a DVC more likely.

INTRODUCTION

Annually, more than 1 million deer-vehicle collisions (DVCs) in the United States cause nearly 30,000 driver and passenger injuries, 200 human fatalities (Conover et al. 1995), and an estimated $2,300 in damage per vehicle (R. Miller, AAA safety officer, pers. comm.). The total societal costs of DVCs are unknown due to low reporting rates (< 50%; Allen and McCullough 1976, Decker et al.1990) and the difficulty of estimating costs other than vehicle damage. For example, the social costs of DVCs, which may include human death and often include human injury, property damage, absence from work, and psychological trauma to victims of accidents and their families, are rarely factored into equations calculating expenses related to DVCs (Hansen 1983).

Michigan, like many other states, has seen a marked increase in white-tailed deer (*Odocoileus virginianus*) populations in recent years and an associated surge in the number of DVCs over that same period (Figure 1). In 2003, the Michigan Department of Transportation (MDOT) received 67,790 reports of DVCs (Office of Highway Safety Planning 2004), which represented a 59.5% increase from the 42,494 DVCs reported in 1992 (OHSP 2002). Deer-vehicle collisions reported

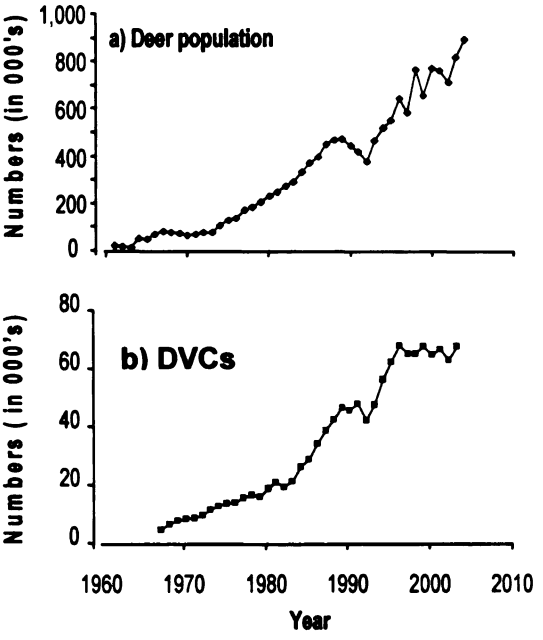

Figure. 1 Trends in a) annual estimate of deer numbers, 1961 – 2004, in Michigan's Southern Lower Peninsula (unpublished MDNR data), and b) reported DVCs in Michigan, 1967 – 2003 (Langenau and Rabe 1987; OHSP 1997, OHSP 2003).

to MDOT in 2003 resulted in 11 fatalities and 1,913 injuries in Michigan.

Wildlife damage management is principally about reducing negative and increasing positive impacts of wildlife to society (Riley et al. 2002). To better understand why DVCs are occurring, and to develop effective education, there is a need to better understand the types of drivers involved in and the physical circumstances associated with DVCs. Most research on DVCs has assessed deer populations, habitat, and road design aspects of the problem (Jahn 1959, Pojar et al. 1972, Puglisi et al. 1974, Groot Bruinderink and Hazebroek 1996, Putman 1997, Hubbard et al. 2000) or their economic implications (Reed et al. 1982, Hansen 1983, Decker et al. 1990, Conover et al. 1995). Engineering solutions directed principally at manipulation of the physical environment (Foster and Humphries 1995) or deer populations, are not likely to be sufficient for reducing impacts of DVCs. Yet, no research has thus far been done to profile drivers involved in DVCs and only limited research has been done to profile the characteristics of the accident scene and the timing of DVCs (Allen and McCullough 1976) or the interrelationship of theses variables.

We analyzed situational and driver characteristics associated with DVCs within 3 counties in southeastern Michigan that represent a gradient of human densities, land use characteristics, and traffic volumes. The aim of the study was to develop improved profiles that will assist wildlife managers and public safety officials to more effectively communicate with drivers about how to reduce their risk of experiencing a DVC. Information and education programs of this type may be a useful tool for supplementing decisions regarding management of deer populations or the design of roads, aimed at minimizing societal impacts of DVCs.

METHODS

Our analyses focused on vehicle crash data from Oakland, Washtenaw and Monroe Counties in southeastern Michigan (Figure 2). These counties were selected because they encompass a variety of deer habitats, industrial, community, and residential development, and traffic conditions found in southern Michigan. Oakland is the most urban of the 3 counties, having experienced the greatest urban sprawl from the Detroit metropolitan area. Monroe County is the most rural, with large-scale farming still comprising a majority of the landscape. Washtenaw County is intermediate between the other 2 counties in terms of human settlement, transportation patterns, and deer habitat and abundance. Ann Arbor is situated near the middle of the county and over the past 30 years has transitioned to a center for high-tech jobs. Much of the rural landscape has been converted to small tract housing amid a mix of state land and farms.

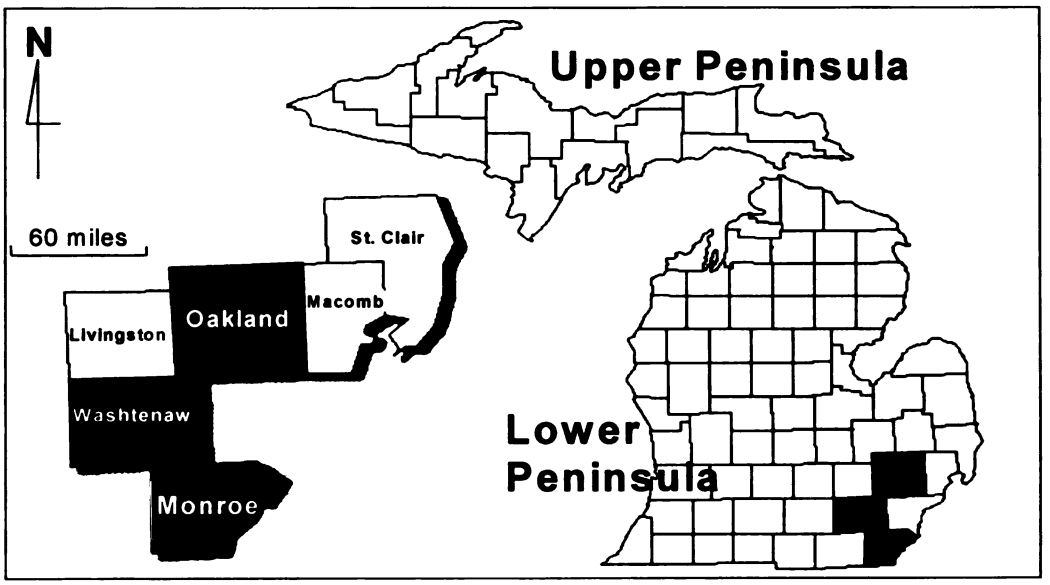

Figure 2. Location of Oakland, Washtenaw, and Monroe Counties in southeast Michigan.

Data Sources

Data on all motor vehicle crashes for the years 2001 – 2003 were obtained from UD-10 Traffic Crash Reports (Appendix A), provided by the Michigan Office of Highway Safety Planning (OHSP). These crash reports were completed by law enforcement and traffic safety officers for all reported vehicle crashes that resulted in ≥ $400 in damage to a vehicle. Drivers involved in crashes were categorized by gender, age, and type of vehicle driven. For the purpose of this study we analyzed the following six vehicle categories: passenger and station wagon (any sedan type vehicle); van or motor home (any large van or motor home); pickup (any pickup truck); truck < 10,000 lbs.; motorcycles; and trucks or buses > 10,000lbs. Accident scene characteristics included: the county the accident occurred in; the number of traffic lanes; speed limit posted at the scene; timing (hour of day, day of week, and month); weather (clear, cloudy, fog, rain, snow); road condition (dry, wet, wintry); and light (daylight, dusk, dawn, dark with artificial lighting, dark with no lighting) conditions.

Human population data from the 3 counties for the period were obtained from the U.S. Census Bureau (USCB 2000) and the Southeast Michigan Council of Governments (SEMCOG) provided information about licensed drivers in the area (Tom Bruff, SEMCOG, unpublished data). Deer population estimates for the Southern Lower Peninsula were obtained from the Michigan Department of Natural Resources (B. Rudolph, MDNR, pers. comm.).

Data Analysis

The raw data provided by the UD-10 reports were counts of DVC and non-DVCs, with associated driver and situational data for each collision. Such counts reflect the risk of collision at a given place and time, together with the extent of exposure to that risk. Risk is determined by situational characteristics of the collision scene in addition to behavior of deer and drivers, whereas exposure is primarily determined by traffic volume. Thus a high number of recorded DVCs may reflect a risky situation, high traffic volumes (usually reported as vehicle miles traveled; VMTs), or both.

Vehicle miles traveled (VMT) data collected by MDOT are available in aggregated form (i.e., per county per year). However, we did not attempt to correct for differences in VMTs associated with factors such as weather and road conditions. Rather, we used the background rate of non-DVCs as a proxy for overall traffic volumes and calculated the relative risk that collisions in a particular situation were DVCs rather than non-DVCs. High relative risk values indicated situations where many more DVCs are occurring than would be expected from the overall accident rate in that situation. Low relative risk values indicate situations where very few deer are involved among occurring collisions. Our risk estimates were thus influenced by circumstances that changed the overall collision rate of drivers.

RESULTS

Location

In 2003, a total of 1,300,647 drivers were licensed in the 3-county study-area (72% in Oakland, 19% in Washtenaw, and 9% in Monroe). More than 95% of households in all 3 counties owned at least 1 vehicle (SEMCOG 2003 *a*, *b*, *c*). Workers in these counties commuted a mean of 25 minutes to and from work (U.S. Census Bureau 2000).

From 2001 – 2003, throughout the study area 186,930 accidents were reported. Of those, 9,790 (5.2%) involved or were caused by deer. Oakland is the largest and most populated with the most roads, vehicle accidents and DVCs (Table 1). Washtenaw has more than twice as many deer as Oakland, a much higher annual DVC rate per 1,000 licensed drivers, and a much higher proportion of DVCs among the vehicle accidents occurring in that county. Monroe, the smallest and least populated county in terms of human and deer density, had the fewest DVCs. Nevertheless, the DVC rate per 1,000 drivers and the proportion of accidents that were DVCs were higher in this agricultural county than in the more urbanized Oakland County. The proportion of drivers involved in DVCs per 1,000 drivers in Washtenaw County was more than 2x greater than Monroe County and approximately 7x greater than as in Oakland County.

Table 1. Human development, traffic conditions, and estimates of deer abundance for Oakland, Washtenaw, and Monroe Counties, Michigan, USA.

	Oakland	**Washtenaw**	**Monroe**
Type of community	Urban/Suburban	Suburban/Rural	Rural
Area (mi^2) [a]	907	723	561
People per mi^2 [a]	1,369	455	265
Total length of roads (mi) [b]	5,582	2,326	1,725
Average commute to work (min)	27	22	24
Percentage of agricultural land [c]	7	41	62
Estimated deer population [d]	19,846	35,815	4,968
Deer per mi^2	21.9	49.5	8.9
Number of licensed drivers	941,669	241,920	117,058
Annual number of DVCs [e] (2001-2003)	1,666	1,293	303
Annual DVC rate (per 1,000 drivers)	1.77	5.34	2.59
Average posted speed limit at location of DVC / Non-DVC accidents (MPH)	47.9 / 42.8	53.0 / 42.5	54.6 / 42.7
Percentage of all vehicle crashes that were DVCs [e]	3.6	9.2	6.5

[a] USCB (2000)

[b] OHSP (2002*a*)

[c] SEMCOG (2003*a,b,c*)

[d] B. Rudolph (pers. comm.)

[e] SEMCOG (2003*d*); data for 2002 only

Accident Scene Characteristics

Vehicle Type

A minimum of 9,837 vehicles were involved in DVCs reported from 2001-2003. There were more vehicles than DVCs (n = 9,790) because a single accident sometimes involved more than 1 vehicle. Of the total number of vehicles involved, 67% involved

passenger vehicles or station wagons, and 20% involved pickup trucks. Of the 328,551 vehicles involved in non-DVCs, 73% were passenger vehicles or station wagons and 13% were pickup trucks. The difference between the number of non-DVCs (n = 177,140) and the number of vehicles involved was much greater for non-DVCs because these accidents often involved more than 1 vehicle, whereas DVCs were mostly 1-vehicle collisions.

Pick-up truck collisions were more at risk than any other vehicle to involve deer (Table 2*a*). Collisions involving pick-up trucks were almost twice as likely as passenger vehicles to involve a deer, whereas trucks and buses > 10,000 lbs. were the least likely vehicles to have collisions that involved deer.

Speed Limit

Roads with speed limits between 45 and 70 mph posed the greatest risk to drivers that collisions would involve a deer (Table 2*b*). For example, roads with posted limits of 55-60 mph had 13x the risk of roads with a 35-40 mph speed limit. Roads with speed limits below 40 mph were the least risky in terms of DVCs.

Road Type

Roads with 2 lanes held the greatest risk that collisions would involve deer, whereas roads with 4 or more lanes held the least risk (Table 2*c*). Two-lane roads were twice as risky as 3-lane roads and almost 10x as risky as roads with 4 or more lanes.

Road Conditions

Accidents occurring on dry roads were nearly 2x as likely to involve deer as accidents that occurred on wet roads (Table 2*d*). Accidents occurring on roads with wintry conditions were the least likely to involve a deer.

Light Conditions

A greater percentage of DVCs (68.1%) were reported to occur in conditions described as dark than non-DVCs (21.8%). Of these DVCs, more than 90% occurred in conditions described as dark unlighted, whereas less than 50% of non-DVCs were reported in these same conditions.

Accidents occurring during dawn, dusk, and at night in unlighted conditions were the most likely to involve deer (Table 2*e*). Of all accidents that occurred in dark unlighted conditions, 25.2% involved deer. Accidents in dark unlighted conditions were nearly 17x as likely to involve deer as accidents that occurred in the daylight. Accidents occurring in the evening with artificial lighting were less likely to involve deer than accidents at dawn, dusk, and unlighted evening conditions.

Weather

The rate of occurrence for DVCs and non-DVCs was similar across different weather conditions. Clear weather conditions were recorded when 54.5% of DVCs and 51.7% of non-DVCs occurred. For 34.0% of DVCs and 28.3% of non-DVCs, cloudy weather was recorded at the time of collision. DVCs were a relatively small proportion of the collisions reported during rainy (DVCs = 5.9% and non-DVCs = 11.2%) and snowy (DVCs = 2.4% and non-DVCs = 7.1%) conditions.

Accidents were particularly likely to involve deer during foggy weather (DVCs comprised 18.1% of all accidents during fog; Table 2*f*). The lowest risk of collisions involving deer was associated with rainy and wintry conditions. Accidents occurring during clear and cloudy weather were 0.31x and 0.35x as likely to involve a deer as accidents occurring during foggy weather.

Table 2. Effect of various factors on number of DVCs, non-DVCs, and % of total crashes that were DVCs in Oakland, Washtenaw, and Monroe Counties, Michigan, USA, 2001-2003.

ACCIDENT FACTOR	DVCs	Non-DVCs	DVCs as % of total
a) Vehicle type:			
Passenger, station wagon	6,544	240,307	2.7
Van, motor home	908	25,161	3.5
Pickup	1,973	41,481	4.5
Trucks < 10,000 lbs.	299	10,060	2.9
Motorcycles	30	1,411	2.1
Trucks and buses > 10,000 lbs.	71	8,683	0.8
b) Posted speed limit (mph):			
0	1	247	0.4
5-20	3	646	0.5
25-30	448	34,584	1.3
35-40	786	44,236	1.8
45-50	3,852	55,314	6.5
55-60	3,223	10,652	23.2
65-70	1,100	22,034	4.8
c) Road type:			
Single lane	254	4,681	5.2
Two lanes	8,078	70,355	10.3
3 lanes	648	27,196	2.3
4 or more lanes	660	70,418	0.9
d) Road conditions:			
Dry	7,940	120,527	6.2
Wet	1,206	33,345	3.5
Ice, slush, snow	300	17,104	1.7
e) Lighting conditions:			
Daylight	1,952	125,953	1.5
Dark, with artificial lighting	499	19,954	2.4
Dawn	697	4,142	14.4
Dusk	389	5,160	7.0
Dark, with no lighting	6,109	18,172	25.2
f) Weather conditions:			
Clear	5,285	90,413	5.5
Cloudy	3,295	49,429	6.3
Fog, smoke	133	603	18.1
Rain, sleet, hail	574	20,054	2.8
Snowing, blowing snow	230	12,382	1.8

Accident Timing Characteristics

Time of day

The non-DVC accident rate was low overnight, showed an initial peak during the 0800-0900 hr commuter traffic, and then increased progressively during the day to a more pronounced peak during the 1700-1800 hr commuter traffic (Figure 3*b*). In contrast, the DVC accident rate had 2 very pronounced peaks at 0600-0700 hr and 1800-1900 hr, a very low rate during the middle of the day, and a moderate rate during the hours of darkness (Figure 3*a*). The proportion of accidents involving deer peaked at dawn, and was consistently higher at night than during the day (Figure 3*c*). These patterns were similar in all 3 counties.

Day of week

Non-DVC accidents were slightly more common on weekdays than during the weekend, particularly in Washtenaw and Oakland counties (Figure 4*b*), whereas, the DVC accident rate was relatively similar throughout the week in all 3 counties (Figure 4*a*). Consequently, the proportion of accidents involving deer increased during the weekend (Figure 4*c*).

Time of year

The rate of non-DVCs was relatively constant seasonally, with only a slight rise in winter months (Figure 5*b*). In contrast, in all 3 counties there was a pronounced increase in the rate and percentage of DVCs from October through January (Figure 5*a,c*).

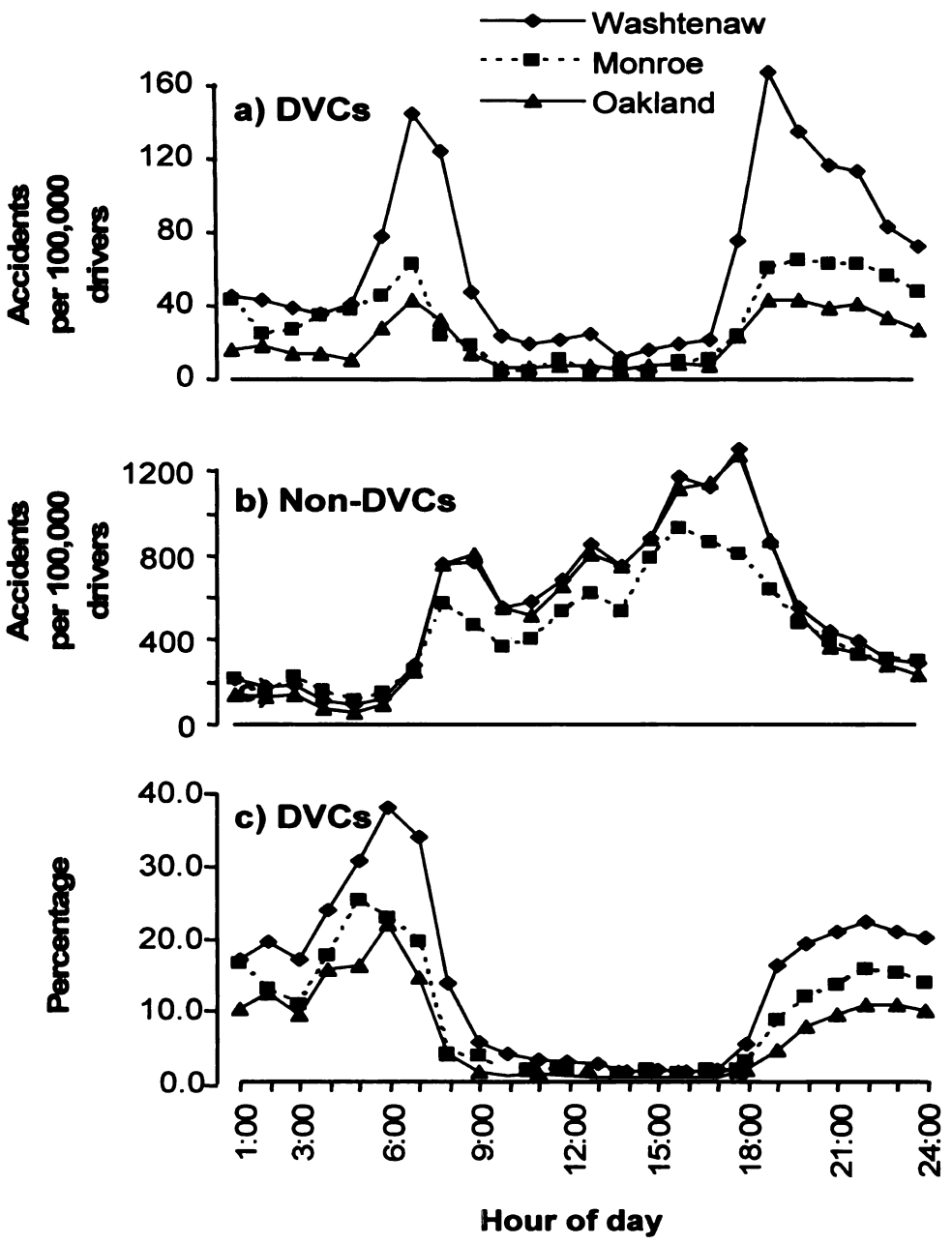

Figure 3. Variation by hour of day on a) the rate of DVCs, b) the rate of non-DVCs, and c) % of all accidents that are DVCs, for Oakland, Washtenaw, and Monroe Counties in Michigan, USA, 2001-2003.

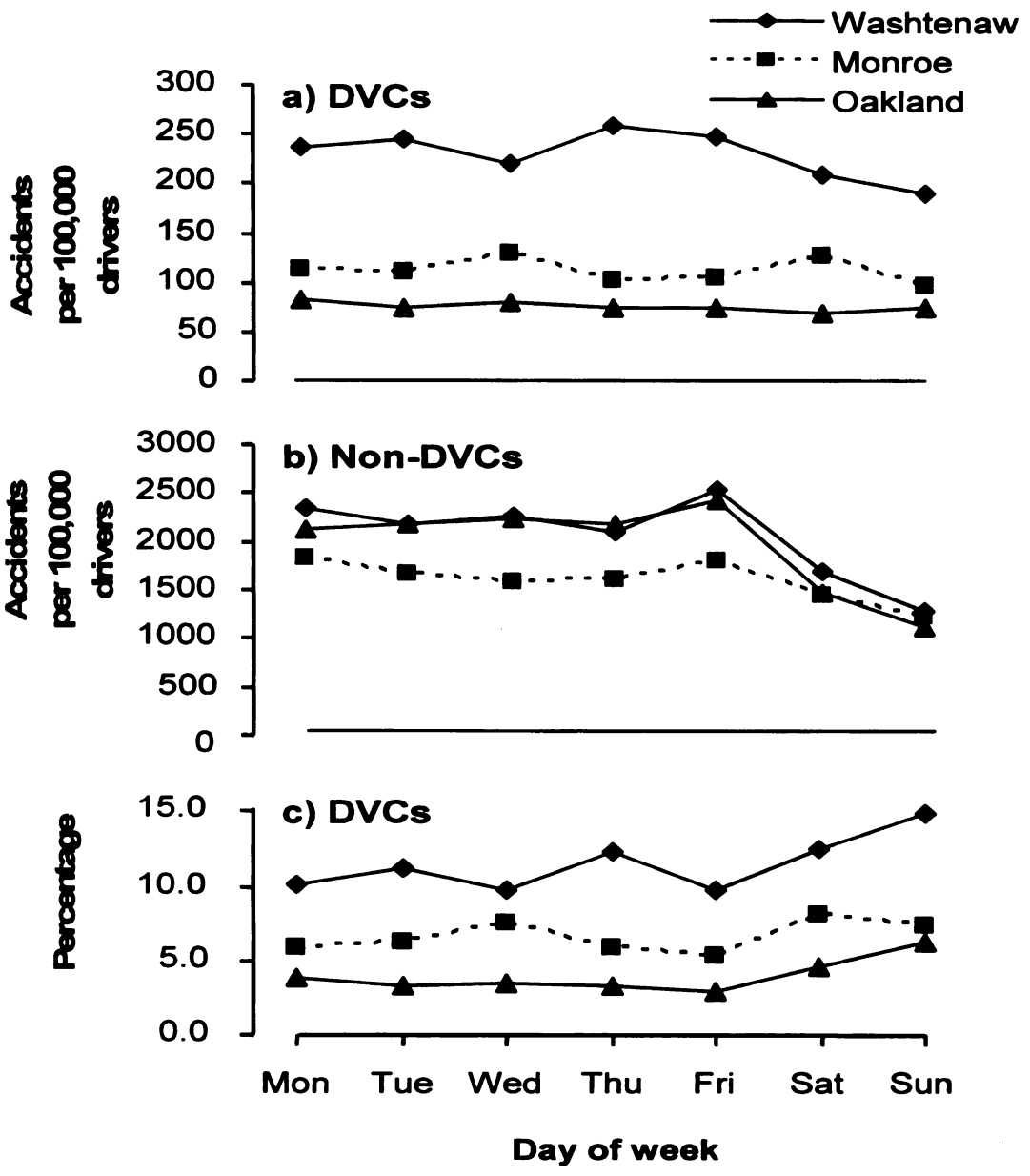

Figure 4. Variation by day of week in a) the rate of DVCs, b) the rate of non-DVCs, and c) % of all accidents that are DVCs, for Oakland, Washtenaw, and Monroe Counties in Michigan, USA, 2001-2003.

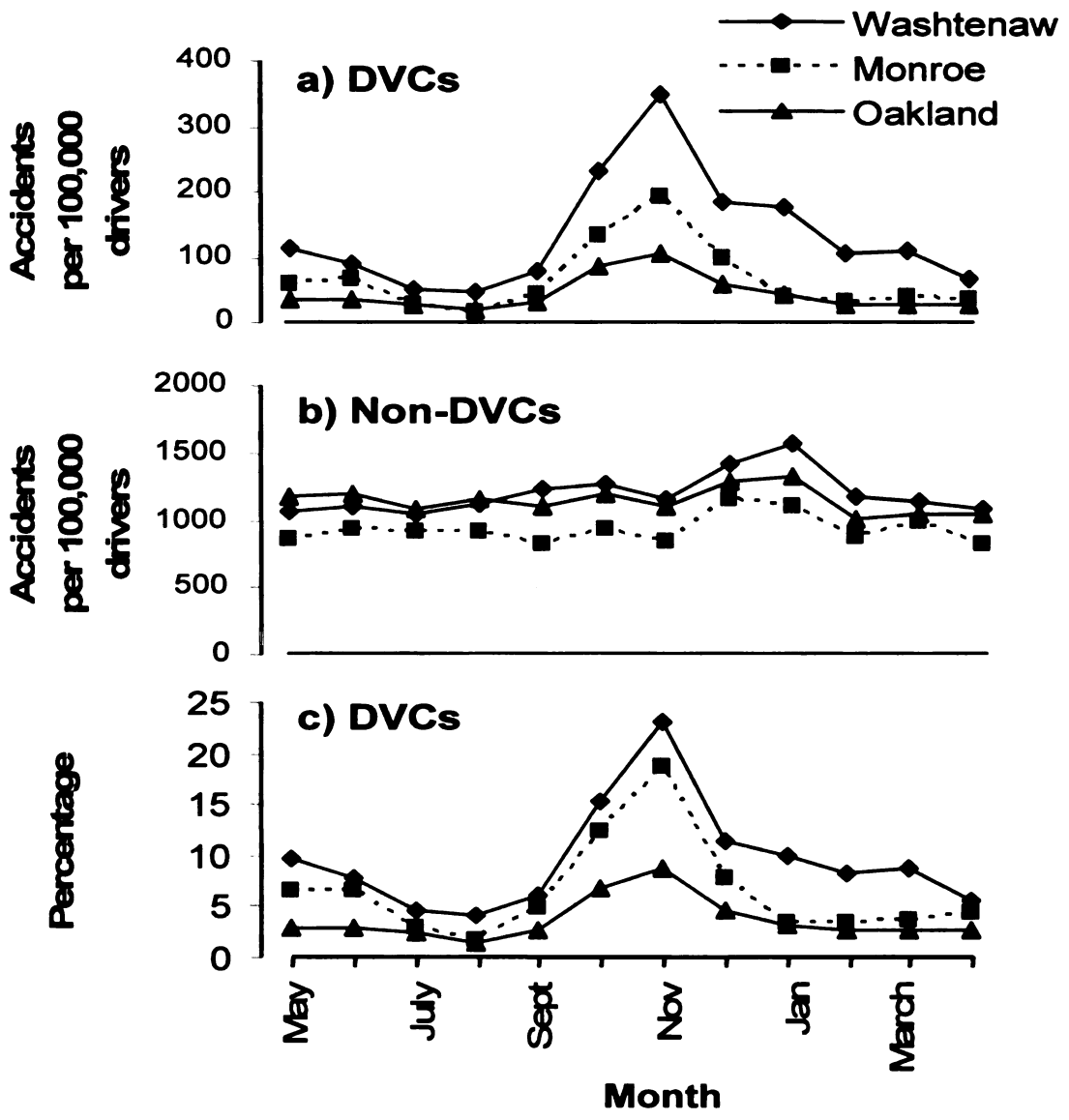

Figure 5. Variation by month in a) the rate of DVCs, b) the rate of non-DVCs, and c) % of all accidents that are DVCs, for Oakland, Washtenaw, and Monroe Counties in Michigan, USA, 2001-2003.

Driver Characteristics

Gender of driver

The sex ratio of drivers in each county was very close to 1, whereas the percentage of DVCs and non-DVCs were skewed toward male drivers (61.0% and 56.5% male, respectively). Throughout each age range the percentage of male licensed drivers in the population remained consistently around 50%, until around age 65, beyond which the sex ratio became progressively more female-biased. Yet, the percentage of male drivers involved in both DVCs and non-DVCs was greater than 50 for all ages, peaking at 76.7% for 80 – 84 yr old drivers.

Age of driver

The mean age of drivers involved in DVCs (39.9 yr) was slightly greater than the mean age of drivers involved in non-DVCs (37.5 yr). The mode for drivers involved in DVCs, however, was 44 yr with a median of 40 yr, whereas the mode for drivers involved in non-DVCs was 17 yr with a median of 35yr.

In all 3 counties, the proportion of collisions that involved deer increased steadily with age to a peak at ages 45 to 59 yr and then decreased among older drivers (Figure 6*a,b,c*). Male drivers were more likely than female drivers to hit deer, although this gender difference was more pronounced in Washtenaw and Oakland Counties than in Monroe.

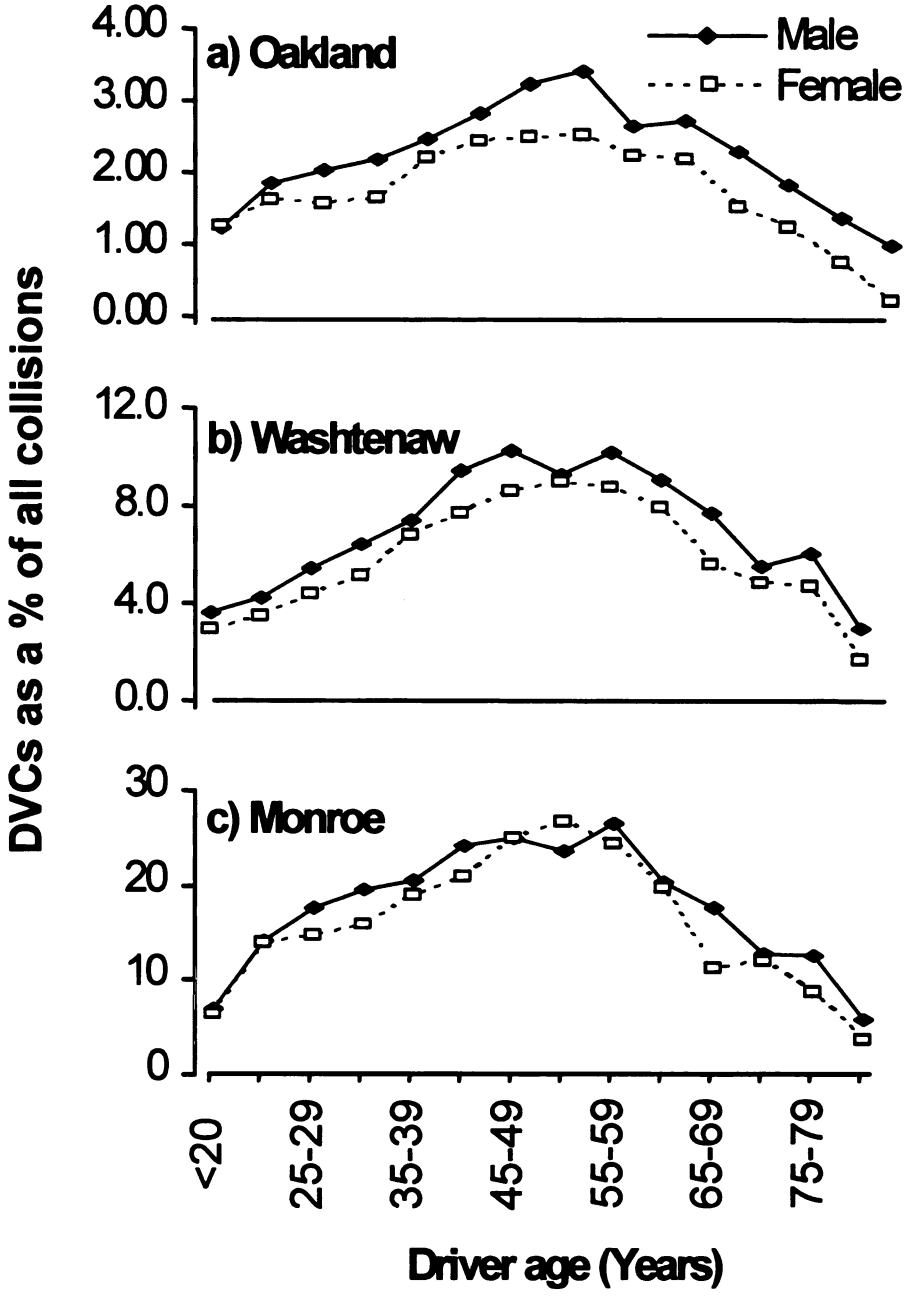

Figure 6. Gender and age effects on the proportion of deer-related vehicle collisions in a) Monroe, b) Washtenaw, and c) Oakland Counties, Michigan, USA, 2001-2003.

DISCUSSION

Deer-vehicle collisions are just one of many hazards facing motorists but the greatest hazard involving wildlife (Romin and Bissonette 1996). Deer may be involved in nearly 15% of all vehicle accidents on roads with speeds of 45 to 60 mph, many which were constructed when the landscape was predominantly rural. Reduction of deer herd size and fencing are perceived by wildlife and transportation managers to be the two techniques with the strongest potential to reduce DVCs (Sullivan and Messmer 2003). Yet, reducing the rate of DVCs in many areas occupied by white-tailed deer will be challenging because of a growing inability to control white-tailed deer populations through public hunting (Riley et al. 2003) and because of excessive cost associated with fencing and other structures (Foster and Humphries 1995).

The higher density of deer in Washtenaw County and higher proportion of drivers commuting to work from rural into urban-suburban areas during the weekday, likely caused more DVCs per 100,000 people than in either of the other counties. The agricultural landscape of Washtenaw and Oakland Counties, like much of the upper Midwest, has gradually shifted from an agriculturally dominated landscape to a mix of remnant farms and small, fragmented land ownership patterns (Johnson 1993, Gobster et al. 2000). Projections about future land-use in southern Michigan suggest increases in commuter traffic volume due to this land-use change are likely to continue through at least 2020 (Madill and Rustem 2001), and as such DVCs are likely to be a continuing impact from wildlife. Residents can be expected to desire reduced deer herd size if the real or perceived risk of DVCs increases further (Stout et al. 1993). If deer herds cannot

effectively be reduced through public hunting (Brown et al. 2000), information and education directed toward motorists may play an important role in management of DVCs.

Educating drivers about the specific factors that put them at greater risk for involvement in a DVC (e.g. hourly, monthly, and seasonal timing of DVCs; speed; and reduced visibility) will give them the choice to modify their driving behavior therefore reducing their risk of involvement in a DVC. Based on our data, information directed towards motorists should focus on raising awareness of when drivers need to be driving more cautiously with deer in mind. These timing characteristics should include time of year: the risks of DVCs increases markedly in fall, with a peak in mid-November. During any 24-hr period, dusk and especially dawn are hazardous times, and the risks increase even more with travel in deer habitat after dark. Allen and McCullough (1976) found a strong relationship between deer activity and the rate of collisions. As evening traffic increased in correspondence with deer feeding times, DVCs also increased; after the morning peak in DVCs, traffic continued to increase but DVCs decreased suggesting a decrease in deer activity. Similarly, increased movement of deer during the fall rut may account for the peak of DVCs during those times.

If posted speed limit is an indicator of the average speed traveled at the point of collision speed affects the chance that occurring collisions will involve a deer. Reducing speed by 10 – 15 mph may considerably decrease the risk of hitting a deer by increasing visibility and reaction time. The large amount of risk associated with 2-lane roads is an indication that DVCs are likely to occur where there are high-speed roads traveling through deer habitat.

Weather conditions affect DVCs by affecting drivers' road visibility, deer activity, and possibly human behavior. Deer are most likely to be less active during foul weather conditions, therefore creating less risk to drivers under wintry weather conditions and icy, slushy, and snowy roads. The same is true, to a lesser degree, with rainy weather and wet road conditions. The high risk associated with foggy weather suggests visibility plays an important role in reducing DVCs.

Understanding who is involved in DVCs can help target communication programs. In southeast Michigan, these drivers are most likely to be commuters. The individual risk of DVCs, however, may be pre–commuter time and affect those people who drive for a variety of reasons after dusk and before dawn. The youngest age classes of drivers are typically the focus of driver education because of their per capita rate of crashes. To reduce DVCs, however, information and education will have to also focus on people $\geq$ 30yr old, in the middle of their working years, with special attention to male drivers.

Much of the categorical UD-10 crash data is subjective to the judgment of law enforcement officials at the scene of the accident or to the accident victim who reported the DVC. These data reflect judgments of various officers, who filled out UD-10 Traffic Crash Reports. We recognize judgments by so many different data collectors likely introduced biases in the data. These biases, however, were not revealed in numerous discussions over a 2-year period with personnel from MDOT and OHSP.

All drivers should be educated about the risk factors that make an occurrence of a DVC more likely. Drivers can lower their risk of being involved in a DVC by using more caution, slowing their speed, and remaining alert and aware in areas and at times

associated with increased DVC risk. Drivers fitting the 'at risk' gender and age profile should use extra caution at all times. Future research should focus on specific approaches for most effectively getting this information to drivers.

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CHAPTER 2

A SURVEY OF DRIVER CHARACTERISTICS, ATTITUDES, AND KNOWLEDGE ABOUT DEER-VEHICLE COLLISIONS IN SOUTHEASTERN MICHIGAN.

ABSTRACT

More than 1 million deer-vehicle collisions (DVCs) are reported annually in the United States, resulting in nearly 30,000 driver and passenger injuries, 200 human fatalities, and an estimated $2,300 in damage per vehicle. In Michigan, more than 65,000 DVCs are reported annually; an increase of nearly 60% since 1992. To facilitate the development of driver education and information programs we investigated characteristics, knowledge, and attitudes of drivers regarding DVCs in Oakland (urban-suburban), Washtenaw (suburban-rural) and Monroe (rural) counties in southeast Michigan. A self-administered, mail-back survey was sent to 3,681 licensed drivers in the 3 counties, and we received 1,653 (48.4%) valid responses. Responses indicated 17.2% of respondents had been involved as drivers in a DVC. Males were involved in 66.7% of DVCs and only 46.3% of DVCs were reported to police and 52.1% reported to an insurance agency. Drivers were unaware of situations where risk of DVC involvement was greatest. Respondents involved in DVCs were most likely to want reduced deer population sizes. We identify target audiences for educational programs.

INTRODUCTION

Deer-vehicle collisions (DVCs) have increased in recent years throughout the range of white-tailed deer (*Odocoileus virginanus*), creating serious costs to society while killing or injuring millions of animals (Conover et al. 1995). These costs can include human death but more often include human injury, property damage, absence from work, and psychological trauma to victims of accidents and their families (Hansen 1983). More than 65,000 DVCs have been reported annually in Michigan since 1996 resulting in an average of 7 fatalities and 1,880 injuries to humans per year (OHSP 2004).

Actual costs of DVCs are difficult to accurately estimate due to underreporting rates, which were speculated to be as high as 50% (Allen and McCullough 1976; Decker et al. 1990). Numbers of DVCs reported to the Wisconsin Department of Transportation through police accident reports (n = 19,595 DVCs) were greatly exceeded by the number of deer road-kill carcasses (n = 41,829) picked up by the Wisconsin Department of Transportation, and also conflicted with the number of DVC insurance claims (n = 45,684) submitted in that state (Krohm 2000).

Efforts to reduce the number of DVCs are likely to require more effective information and education programs aimed at changing driver behaviors. Previous studies suggested education as a means for reducing DVCs (Allen and McCullough 1976, Groot Bruinderink and Hazebroek 1996, Decker et al. 1996, Romin and Bissonette 1996), yet little information exists about drivers involved in DVCs on which to base such programs. Better demographic and socioeconomic information are needed about drivers

to determine who may be involved in DVCs and where they obtain their educational information. We surveyed drivers in southeast Michigan to learn about their knowledge, beliefs, and attitudes toward DVCs and the effect of DVCs on attitudes towards deer and agencies managing deer and transportation. Based on this research, we recommend how education and communication campaigns aimed at reducing the frequency of DVCs can be improved.

METHODS

Study Area

Oakland, Washtenaw, and Monroe Counties in southeast Michigan were selected for study because they represent a range of deer habitats, human development, and traffic conditions that currently occur or will likely occur in the near future throughout southern Michigan. Situated close to Detroit, Oakland County is the most urban in the study area. Monroe County, the most rural, has a landscape consisting mostly of large amounts of farmland. Washtenaw is a mostly suburban county with the city of Ann Arbor, located near the middle of the county, drawing a large number of commuters from surrounding rural landscapes. Approximately 95% of the households in all 3 counties own at least 1 vehicle (SEMCOG 2003 *a*, *b*, *c*). The working population in each of these counties commutes an average of 25 minutes to work (U.S. Census Bureau 2000). Comprehensive community data were obtained from the Southeast Michigan Council of Governments (SEMCOG) and the U.S. Census Bureau (USCB). SEMCOG maintains a website that provides data on land use, population and community statistics, and transportation data (SEMCOG 2005).

Washtenaw contains the largest deer population of the 3 counties, with approximately 50 deer/mi^2 (Brent Rudolph, Michigan Department of Natural Resources, pers. comm.). The proportion of all crashes that are DVCs is highest in Washtenaw County, even though Oakland has the larger overall number of DVCs (>1,600 annually). Monroe, with the smallest population of deer and fewest roadways, has the fewest DVCs yet the second largest proportion of DVCs to total crashes of the 3 counties.

Survey Design

We used a self-administered mail survey to determine driver attitudes and knowledge towards DVCs and characteristics of their involvement with DVCs. To develop the survey instrument, 30 open-ended interviews (10 in each county) of adult drivers ≥18 years were conducted at parks and malls in each county during summer and fall 2003. The purpose of these interviews was to identify salient issues and understand terminology used among drivers. Results were then used to develop questions for the self-administered survey.

Questions on the survey were designed to gather information relevant to 4 main objectives: 1) compare profiles of drivers involved in DVCs with driver profiles obtained previously from UD-10 traffic crash reports (Marcoux et al. 2005); 2) estimate reporting rates of drivers involved in DVCs; 3) examine how involvement in a DVC affects attitudes of drivers; and 4) examine respondents' current knowledge of DVCs and identify areas where knowledge may be lacking.

Profiles of respondents were determined by a series of demographic questions including the type of area they lived in, the type of vehicle they drove most regularly, and their gender, age, and highest level of education. Drivers, who had been involved in a DVC, were asked to fill out a special section addressing the situational characteristics of their particular DVC. The number of respondents from this section indicating they did not report their DVC (within the last 5 years) to authorities was used to determine reporting rates to police and insurance agencies. Respondents were asked why they chose not to report their DVC.

Data on attitudes, beliefs, and behaviors of drivers and passengers in DVCs were compared to equivalent data from drivers who had not experienced a DVC. These questions focused on driver behaviors associated with DVCs and the level of concern drivers held about the possible consequences of being involved in a DVC. In particular, we investigated whether level of concern regarding involvement in a DVC was great enough to change driving behavior in a manner intended to decrease the probability of being involved in a DVC.

We also asked a series of 5 questions that measured motorists' knowledge of behaviors that will help to avoid a DVC and awareness of conditions in which DVCs are most likely to occur. We tested motorists by using information that the Michigan Deer Crash Coalition, an organization of traffic and safety professionals working to reduce DVCs, considered correct at the time of the survey. For each knowledge question, responses were coded as 2 if the respondent answered 'definitely true', 1 if 'probably true', and 0 for 'definitely false', 'probably false', and 'unsure' responses. Points for each question were totaled, with each respondent receiving a score between 0 and 10. Only those respondents who answered at least 4 of the 5 questions were included in this part of the analysis; if a respondent missed only 1 question they were assigned a 0 for that particular question. We considered an 'unsure' response to indicate a lack of knowledge and therefore included those answers in our analyses. We used independent samples *t*-tests to compare mean knowledge scores of male and female drivers, and mean scores of drivers who had been involved in DVCs in the last 5 years with those who had not. The non-response survey was designed to detect potential bias in our results from people who did not respond to the original survey. To encourage response, the non-response

questionnaire was limited to 7 key questions regarding demographics, experience with deer, DVC involvement, and reasons for not answering the original survey. We mailed the non-response questionnaire to all drivers who had not returned the original survey within 6 weeks of the first mailing.

Survey Implementation

A random sample was chosen from a database of licensed drivers aged 18 and older, who were registered in Oakland, Washtenaw, and Monroe Counties on 24 March 2004. A complete list of licensed drivers was requested for Washtenaw and Monroe Counties. Oakland County, with its highly urban population, was assumed to have fewer drivers involved in DVCs in its most urbanized areas; therefore, to ensure a greater likelihood of sampling drivers who had been involved in a DVC, we requested a list of drivers living in zip codes somewhat removed from the convergence of several major highways close to Detroit. The list for Oakland County was further filtered to remove names of those who lived in surrounding counties, but shared a zip code with communities in Oakland. Approximately 1,200 records were randomly picked from each county for a total of 3,681 surveys sent to drivers in our study counties.

The survey instrument, developed during fall and winter 2003-2004, was first mailed on 19 April 2004. The mailing procedure was guided by a modified version of the Tailored Design Method (Dillman 2000). We sent up to 4 mailings (Appendices B-E) to each person in the sample frame. In addition to our own cover letter, a letter from SEMCOG encouraging participation in the study was included with the first mailing of the questionnaire to Oakland and Monroe Counties. (Due to a mistake by the printing

company Washtenaw received only the general cover letter.). As an incentive to complete and return the survey, 3 first-class postage stamps were included in the first mailing of the survey. Those who had not returned the survey within 6 weeks of the first mailing received a short survey (Appendix F) to assess non-response bias. Confidentiality of respondents was maintained by placing identification numbers on each survey.

Questionnaire development and survey protocol were reviewed by the University Committee on Research Involving Human Subjects, and approved under Internal Review Board # 04-075.

Data Analysis

We used SPSS for all data analyses and database management (SPSS 2003). Frequencies and summary statistics were calculated for all variables (Appendix G). Respondents involved in a DVC as a driver answered situation-specific questions regarding characteristics of their individual DVC. Drivers who had been involved in DVCs were further divided into 2 groups based on the time elapsed since their accidents ($\leq$5 years and >5 years ago). We limited all analyses concerning DVC involvement to only those respondents who had been a driver in a DVC in the past 5 years. We used independent-samples *t*-tests to test for differences between DVC involvement as a driver and mean knowledge scores and mean miles driven for work (t_w) and personal (t_p) reasons. We used analysis of variance to test for differences in mean knowledge scores for the HIT variable (i.e., driver in DVC, passenger in DVC, both, or none) and for the residential area variable. We used crosstabs and chi-square analyses to test for differences in DVC involvement and several categorical variables.

RESULTS

Response rate and respondent demographics

After excluding all ineligible surveys (e.g., from bad addresses or death of the intended respondent), we achieved a response rate of 48.4% (n = 1,653). An overall sampling error of $\pm$2.4% was estimated at a 95% confidence level using the most conservative estimate (50%) of the standard error of a binomial (Salant & Dillman 1994; Babbie 1998). Response rates were similar for the 3 counties (Table 3) with respondents residing in urban (16.7%), rural (38.0%), and suburban (45.3%) areas (Table 4). The average age of the drivers was 47.8 yrs (s.d. 15.5; range 18 – 90 yrs.). Males and females each make up 50% of the licensed driver population in the study area (Tom Bruff, SEMCOG, unpublished data), but we received slightly more responses from females (52.7%). Nearly 75% of respondents had attended at least some college, with 21.9% having earned a 4-year college degree and 19.7% having attained a graduate or professional degree.

Table 3. Number of respondents, response rate (%), and % of male and female responses in Oakland, Washtenaw, and Monroe Counties, Michigan, USA.

County	**Number of Respondents**	**Response Rate[1]**	**Percent Male**	**Percent Female**
Oakland	551	47.5	47.8	51.5
Washtenaw	547	49.4	43.9	55.2
Monroe	554	48.2	46.9	51.4
Overall	**1,653**	**48.4**	**46.2**	**52.7**

[1] About 1% of respondents did not provide information of their gender on the survey.

We received 196 responses (10.2% response from respondents who had not previously responded) to the short non-response survey. Average age (46.9 years; s.d. 17.8; range 18-92 years), proportion of female respondents (53.0%), and proportion of respondents from each residential area in the non-respondent sample were similar to the original survey sample (Table 4). The highest proportion of responses to the non-response survey came from residents of Washtenaw County and the smallest proportion of responses came from Oakland County residents.

Of non-respondents, 19.1% (n = 36) stated they were involved in a DVC either as a driver or a passenger. Drivers in DVCs made up 12.7% (n = 24) of the sample and passengers made up 6.4% (n = 12) of the sample. Males were involved in 56.5% of DVCs as a driver and only 27.3% as a passenger. Of those involved in DVCs (passenger or driver) 36.1% (n = 13) were involved in more than 1 DVC.

Although we received slightly more responses to the overall survey from females (52.7%), we suspect a male bias in the reporting of involvement in DVCs. The reason we suspect this response bias is because the proportion of responses from male drivers involved in DVCs (66.7%) was higher than the proportion of DVCs involving males (61.0%) from the UD-10 traffic crash data (See Chapter 1).

Table 4. Age (range, mean, S.D. and *n*), and % of gender, residential area, and county of all respondents and non-respondents; DVC involvement (*n* and %) and number and % of gender of passengers and drivers involved in DVCs for both respondents and non-respondents in Oakland, Washtenaw, and Monroe County, Michigan, USA.

Variable	Statistic	Respondents	Non-Respondents
Age[1]	Range	19 – 90 yrs	17 – 92 yrs
	Mean	47.9 yrs	46.8 yrs
	Std. Dev.	15.5	17.8
	n[4]	1,602	170
Gender[2]	% Male	46.7	47.0
	% Female	53.3	53.0
	n[4]	1,635	183
Residential Area[3]	% Rural	38.0	37.9
	% Suburban	45.3	42.3
	% Urban	16.7	19.8
	n[4]	1,629	182
County	% Oakland	33.3	28.2
	% Washtenaw	33.1	41.5
	% Monroe	33.6	30.3
	n[4]	1,651	195
DVC Involvement[6]	% Driver	11.9 (17.2)[7]	15.7
	% Passenger	6.2	7.8
	n[5]	1,652	153
Drivers	% Male	66.3	56.5
	% Female	33.7	43.5
	n[5]	196	23
Passengers	% Male	50.5	27.3
	% Females	49.5	72.7
	n[5]	101	11

[1] In what year were you born? (Age = 2004 – year born)

[2] Are you male or female?

[3] In what type of area do you live?

[4] Calculated from all respondents

[5] Calculated from respondents with DVC involvement

[6] Original survey asked if they had been in a DVC as both a driver and a passenger, whereas non-response survey asked if they had ever been a driver or passenger in a DVC. Therefore, percentages could be overlapping for original survey respondents; drivers and passengers could include some of the same people.

[7] Percentage DVC involvement within the past 5 years (Percentage DVC involvement ever)

Experience with deer

Almost 90% of respondents observed deer in the wild and 79% believed deer were common in the area where they live (Table 5). Most respondents (94.3%) reported that they had seen a deer while driving and 30.8% reported seeing them at least weekly. Only 5.2% of respondents reported that they had never seen a deer while driving. Respondents involved in DVCs as drivers were more likely to see deer at least weekly or more often (50.6%) and most respondents, who were not a driver in a DVC, saw deer monthly or less often (71.8%; $\chi^2 = 64.64$, df = 4, $p < 0.001$).

Table 5. Percentage and *n* of respondents for variables representing respondents' experiences with deer in Oakland, Washtenaw, and Monroe Counties, Michigan, USA.

Variable	Statistic	No DVC	DVC	Combined
Have you observed deer in the wild in the past 5 years?	% yes	87.1	93.4	88.0
	n	1,368	196	1,652
Do you believe deer are common where you live?	% Very common	35.3	58.6	38.4
	% Somewhat common	42.3	30.4	40.7
	% Not common at all	16.0	8.3	14.8
	% Not present	3.5	1.7	3.4
	% Unsure	2.9	1.1	2.7
	n	1,259	181	1,519
Have you observed deer while driving in the past 5 years?	% yes	93.6	98.5	94.3
	n	1,368	196	1,652
How often do you see deer while driving?	% Daily	4.0	14.4	5.3
	% Weekly	20.8	36.2	22.8
	% Monthly	39.7	32.2	38.8
	% Yearly	32.1	16.7	30.1
	% Never	3.4	0.6	3.0
	n	1,178	174	1.352

Attitudes Towards Deer

The majority of respondents reported that they are always (53.0%) or sometimes (34.5%) excited to see deer while driving, yet nearly 95% worried that deer would run in front of their vehicle (Table 6). Several written-in comments indicated respondents do not like to see dead deer on the sides of the roads and wanted information on who was responsible for removing them. Most respondents (85.5%) perceived DVCs as a serious problem in Michigan. Drivers in DVCs were more apt to report believing DVCs were a serious problem in Michigan than those who had not been in a DVC ($\chi^2 = 20.42$, df = 3, $p < 0.001$).

Nearly 48% of respondents reported a desire to see the deer population in their area remain the same, whereas 22.7% wanted a reduction, and only a small percentage (8.0%) wanted the deer population to increase. A sizable percentage (21.4%) was unsure about their beliefs toward the future size of the deer population. However, drivers involved in DVCs were more likely to want decreased deer populations than were drivers who had not been involved in such collisions ($\chi^2 = 20.89$, df = 5, $p < 0.001$)

Driver Concerns

Drivers had different levels of concern regarding potential outcomes of a DVC (Table 7). The most frequent concern (92.0% of respondents) was losing control of their car while swerving to miss a deer. Injuring passengers or others (91.4%) and the cost of repairing damages to the car (90.3%) were also common concerns. Respondents were more concerned about injuring or killing deer (75.8%) than about the costs of medical

Table 6. Respondent attitudes toward deer (% and *n* for each variable) in Oakland, Washtenaw, and Monroe Counties, Michigan, USA.

Variable	Statistic	No DVC	DVC	Combined
I am excited to see it.[1]	% Never	11.5	19.4	12.5
	% Sometimes	34.2	37.1	34.5
	% Always	54.3	43.5	53.0
	n	1,208	170	1,378
I worry it will run out in front of my vehicle.[1]	% Never	6.9	2.3	6.3
	% Sometimes	36.3	27.7	35.2
	% Always	56.8	70.1	58.5
	n	1,218	177	1,395
Deer-vehicle collisions in Michigan are a serious problem.[2]	% Definitely not true	1.8	0.6	1.6
	% Probably not true	7.6	5.0	7.6
	% Probably true	44.0	34.4	42.8
	% Definitely True	32.8	51.1	35.1
	% Unsure	13.5	8.9	12.9
	n	1,249	180	1,429
Deer population preferences[3]	% Greatly reduced	4.5	9.7	5.2
	% Somewhat reduced	16.5	24.6	17.5
	% Kept the same	48.9	41.5	47.9
	% Somewhat increased	6.5	6.7	6.5
	% Greatly increased	1.6	0.5	1.5
	% Unsure	22.0	16.9	21.4
	n	1,353	195	1,548

1 When you see a deer standing alongside the road while you are driving, how often would you say each of the following is true?

2 To what extent do you believe the following statement to be true or not true?

3 Do you believe the size of the deer population in your area should be....?

bills resulting from a DVC (67.6%). These concerns ranked in the same order among respondents who had been in a DVC and those who had not, with only 1 exception: drivers who had been in a DVC ranked costs of repairing damages to their car as their top concern. Concerns about losing control of the car while swerving to avoid a deer dropped to 3rd on their list.

Table 7. Respondent concerns toward DVCs (% and *n*), placed in order of most concern to least concern, for Oakland, Washtenaw, and Monroe Counties, Michigan, USA.

Driver Concern[1]	*n*	Concerned	Not Concerned	Unsure
Losing control of car swerving to avoid a deer	1,625	92.0	7.1	0.9
Injuring passengers or others	1,619	91.4	8.2	0.5
Cost of repairing damages to car	1,621	90.3	8.8	0.9
Being injured	1,628	87.9	11.2	0.8
Insurance rate increase	1,612	81.8	14.4	3.8
Injuring or killing the deer	1,615	75.8	22.8	1.3
Cost of repairing other property damage	1,594	74.7	21.8	3.5
Medical bills due to injury	1,610	67.6	30.7	1.6
Receiving a ticket if reporting DVC to police	1,614	37.4	55.5	7.1

[1] When you think about deer-vehicle collisions, how concerned would you say you are about each of the following situations?

Driver Behavior

When respondents were presented with a scenario that involved seeing a deer while driving, 74.9% indicated they would slow down and drive more cautiously (Table 8). Yet, only 43.7% reported they would slow down in response to a scenario that involved spotting a deer crossing sign while driving. Drivers, who had been involved in DVCs, were more likely to say they would slow down in reaction to a deer crossing sign than those who had no prior DVC involvement ($\chi^2 = 7.30$, df = 1, p = 0.007). The majority of respondents (whether or not involved in a DVC) reported they would drive more cautiously (80.0%) and pay attention to the sides of the road (80.5%) when driving past deer crossing signs.

Respondents (76.5%) expressed a willingness to reduce speed by 10 mph if that would significantly reduce their chances of being in a DVC. Most drivers (75.7%), however, said they were unwilling to take a special driver's education course or eliminate driving at dawn, dusk, or after dark. There was no statistical indication that prior DVC involvement had a significant influence on any of these driver intentions.

Table 8. Behavioral intentions of respondents (% and *n*) to potential scenarios involving deer in the road or deer crossing signs, for Oakland, Washtenaw, and Monroe Counties, Michigan, USA.

Variable	Statistic	No DVC	DVC	Combined
Slow down and drive more cautiously[1]	% Never	3.1	2.8	3.1
	% Sometimes	22.8	16.7	22.0
	% Always	74.0	80.6	74.9
	n	1,240	180	1,420
Slow down[2]	% checked	42.4	53.1	43.7
	n	1,258	179	1,437
Reduce speed by 10mph[3]	% Not Likely	23.1	26.6	23.5
	% Somewhat Likely	38.5	32.1	37.7
	% Very Likely	38.5	41.3	38.8
	n	1,274	184	1,458
Take a special driver's education course[3]	% Not Likely	76.3	72.0	75.7
	% Somewhat Likely	17.7	20.3	18.1
	% Very Likely	6.0	7.7	6.2
	n	1,235	182	1,417
Not drive during dusk and dawn[3]	% Not Likely	91.2	91.2	91.2
	% Somewhat Likely	5.5	6.0	5.5
	% Very Likely	3.3	2.7	3.3
	n	1,262	182	1,444
Not drive after dark[3]	% Not Likely	92.8	90.8	92.6
	% Somewhat Likely	4.2	6.0	4.4
	% Very Likely	3.0	3.3	3.1
	n	1,253	184	1,437

[1] When you see a deer standing alongside the road while you are driving, how often would you say each of the following is true?

[2] Which of the following best describes your reaction to deer crossing signs?

[3] If each of the following situations were to greatly decrease your chances of being involved in a deer-vehicle collision, how likely are you to do each of the following?

DVC Rates

Overall, 20.3% of respondents had been involved in a DVC in their lifetime. Limiting this analysis to those who had been in a DVC in the past 5 years, 10.1% of respondents had been a driver in a DVC, 3.3% had been a passenger, and 2.4% had been involved as a passenger and driver in separate collisions (Table 9). Only 1 injury (passenger or driver) was reported among the drivers (n = 196) who had been involved in a DVC in the past 5 years. Of those involved in DVCs, 18.3% of the drivers and 17.6% of the passengers were involved in more than 1 DVC. The majority (57.7%) of DVCs involved drivers in passenger vehicles, and a further 24.8% involved drivers in pickup trucks. The other 17.5% involved drivers in minivans, large trucks, and motorcycles.

Drivers in DVCs were more likely to be male (66.7%) than female (33.3%; χ^2 = 38.02, df = 1, $p < 0.001$) and reside in rural (54.7%) or suburban (36.3%) areas than in urban (8.9%) areas (χ^2 = 30.55, df 2, $p < 0.001$).

Drivers involved in DVCs in the past 5 years ($\bar{x}_w$ = 204.97; $\bar{x}_p$ = 123.83) had different mean miles driven for work ($_w$) and personal ($_p$) reasons than those not involved in DVCs ($\bar{x}_w$ = 146.81; $\bar{x}_p$ = 100.14; t_w = 3.32, df = 1,335, p = 0.001; t_p = 2.94, df = 1,477, p = 0.013) (Table 10). Mean miles driven for work and personal reasons per week were also greater for males ($\bar{x}_w$ = 206.75; $\bar{x}_p$ = 111.82) than females ($\bar{x}_w$ = 109.64; $\bar{x}_p$ = 94.18; t_w = 8.56, df = 1,402, $p < 0.001$; t_p = 3.43, df = 1,557, p = 0.001).

Table 9. Involvement in DVCs; passenger and driver involvement in >1 DVC; and gender and residential area of drivers involved in a DVC within the past 5 years, Oakland, Washtenaw, and Monroe Counties, Michigan, USA.

Variable	Statistic	Result
DVC Involvement	% Driver	10.1
	% Passenger	3.3
	% Both	2.4
	% None	84.2
	n	1,564
Involvement in more than 1 DVC	% Passengers	18.0
	n	89
	% Drivers	18.4
	n	196
Gender of DVC drivers	Male	66.7
	Female	33.3
	n	195
Residential area of DVC drivers	% Rural	54.7
	% Suburban	36.3
	% Urban	8.9
	n	190

Table 10. Mean number of miles driven for work and personal reasons by drivers who had been in a DVC and those who had not in Oakland, Washtenaw, and Monroe Counties, Michigan, USA.

Variable	Work Miles	Personal Miles
DVC	204.97	123.83
No DVC	146.81	100.14
Males	206.75	111.82
Females	109.64	94.18

Reporting rates

Less than one-half of drivers (46.3%) involved in a DVC in the past 5 years reported their DVC to the police (95% CI, 39.2 – 53.4%), whereas 52.1% reported their DVC to an insurance agency (95% CI, 45.0 – 59.2%). The most commonly cited reason by respondents for not reporting a DVC to police or insurance companies was that they did not think it was necessary (Table 11). The next most common reason for not reporting a DVC to police was because there were no injuries or little to no vehicle damage. Some of those who did not report it to their insurance also cited concern that insurance rates would be affected (14.3%) or they believed they did not have the proper coverage (10.5%).

Reporting rates had no association with gender, vehicle type, or the type of area (urban, rural, or suburban) where the respondent resided. Drivers, who believed their insurance rates would increase if they reported the DVC to their insurance company, were less likely to report to their insurance company than were drivers who did not believe this was so ($\chi^2 = 7.58$, df = 2, p = 0.023). Concerns and beliefs about insurance rates being affected and receiving a ticket had no detectable association on reporting rates.

Responsibility

A majority of respondents (64.2%) indicated that drivers were most responsible for preventing DVCs (Table 12); yet 78.6% of drivers involved in DVCs believed their DVC could not have been prevented. Respondents listed a range of agencies they believed should share some responsibility of DVCs with drivers – the most commonly

cited agency being the MDNR (53.0%). There was no apparent influence of DVC involvement on drivers' assignment of responsibility for DVCs.

Table 11. Number of respondents who did not report DVC to police or insurance and % of each reason given for not reporting DVC to police or insurance agency, in Oakland, Washtenaw, and Monroe Counties, Michigan, USA.

Police	$n = 135$	**Insurance**	$n = 105$
Thought not necessary	69.4	Thought not necessary	39.0
No injuries or damage	14.9	Little or no damage	28.6
Not enough time	6.7	Affect insurance rates	14.3
Affect driving record	2.2	Insurance coverage	10.5
Other	5.9	Other	5.7
Get Ticket	0.7	Not enough time	1.9

Table 12. Respondent choices for responsibility for DVC prevention in Oakland, Washtenaw, and Monroe Counties, Michigan, USA.

Category Choice[1]	**% in support of**[2] **$n = 1,621$**
Drivers	64.2
Michigan Department of Natural Resources	53.0
Office of Highway Safety Planning	33.6
Michigan Department of Transportation	30.5
County governments	13.6
Local Police	8.9
Secretary of State	8.8

[1] Which of the following, if any do you feel should be responsible for preventing deer-vehicle collisions? (*Please check all that apply*)

[2] Respondents could choose more than 1 response

Knowledge

Drivers involved in DVCs had higher mean knowledge scores ($\bar{x}$ = 4.03 out of 10) than those not involved ($\bar{x}$ = 3.48 out of 10; t = 3.56, df = 1,418, $p < 0.001$). Further grouping of respondents (driver in DVC, passenger in DVC, both driver and passenger, or no DVC involvement) showed the 4 groups had significantly different mean knowledge scores (F = 5.01, df = 3, 1,415, p = 0.002) (Table 13). Respondents, who had been involved in a DVC as both a driver and a passenger at 1 point, had the highest mean knowledge score ($\bar{x}$ = 4.11 out of 10) followed by drivers, passengers, and no involvement.

There was no significant difference in knowledge scores between males ($\bar{x}$ = 4.08 out of 10) and females ($\bar{x}$ = 3.92 out of 10) who had been involved in a DVC (t = 0.53, df = 175, p = 0.595). There were significant differences, however, in the mean knowledge scores between males ($\bar{x}$ = 3.74 out of 10) and females ($\bar{x}$ = 3.30 out of 10) who had not been involved in DVCs (t = 3.99, df = 1,228, $p < 0.001$).

Differences in mean knowledge scores existed for those drivers from urban ($\bar{x}$ = 3.50 out of 10), suburban ($\bar{x}$ = 3.36 out of 10), and rural ($\bar{x}$ = 3.72 out of 10) areas who were not involved in a DVC (F = 4.23, df = 2 & 1,345, p = 0.015). However, no difference was detected for drivers from those areas who were involved in DVCs (F = 0.027, df = 2 & 169, p = 0.973). Respondents checked 'unsure' 19 – 33% of the time on most knowledge-based questions; respondents who had been a driver in a DVC checked 'unsure' half as often as expected from a Chi-Square cross tabulation.

Table 13. Mean knowledge scores for respondents based on their level of involvement in DVCs, gender, and residential area and comparison of means test statistic, degrees of freedom, and p-value for each variable, Oakland, Washtenaw, and Monroe Counties, Michigan, USA.

Variable	**Respondent**	*Mean*	**Test statistic**	**df**	**p-value**
DVC[1]	None	3.48	$t = 3.56$	1,418	$p < 0.001$
	Drivers	4.03			
HIT[2]	None	3.46	$F = 5.01$	3, 1,415	$p = 0.002$
	Passenger	3.89			
	Driver	4.01			
	Both	4.11			
Gender - DVC	Male	4.08	$t = 0.53$	175	$p = 0.595$
	Female	3.92			
Gender – No DVC	Male	3.74	$t = 3.99$,	1,228	$p < 0.001$
	Female	3.30			
Area - DVC	Rural	4.08	$F = 0.03$	2, 169	$p = 0.973$
	Suburban	4.03			
	Urban	4.17			
Area – No DVC	Rural	3.72	$F = 4.23$	2, 1,173	$p = 0.015$
	Suburban	3.36			
	Urban	3.50			

[1] Driver involvement in a DVC within the last 5 years (yes or no)

[2] Level of respondent involvement in DVCs (as driver, passenger, both, or no involvement)

Education and Information Disbursement

Only 11.9% of respondents checked they were not interested in receiving information and education (Table 14). For those that did want information, newspapers were nearly twice as likely as brochures or billboards to be the desired channel of communication for information and education about DVCs.

Table 14. Respondent (%) choices for dispersal of information and education programs regarding DVCs in Oakland, Washtenaw, and Monroe Counties, Michigan, USA.

Education Channels[1]	n = 1,591	%
Newspaper		47.0
Brochures		26.8
Billboards		26.6
Driver's Ed		20.7
Magazine		14.4
TV[2]		3.8
Internet[2]		3.2
Radio[2]		2.5
License/Registration Renewal[2]		1.3

[1] Respondents could check more than 1 channel

[2] Respondents were not presented with these choices, rather they wrote them in themselves

DISCUSSION

Deer-vehicle collisions involve 3 components – humans, deer, and the environment. Overall, respondents expressed a desire for the deer population to remain the same; yet deer populations in Michigan have steadily increased since the 1960s, partially reflecting a growing inability to control white-tailed deer populations through public hunting (Brown et al. 2000). Anticipated housing and urban development in southern Michigan (USCB 2000), concurrent with increasing deer populations, will likely increase interactions among the 3 components that contribute to DVC distribution and abundance. Therefore, mitigation efforts addressing the human component should focus on increasing awareness and changing behavior.

Educational programs designed to reach various segments of the driving public are needed. Michigan motorists are a diverse group, consisting of people ranging from age 16 to the elderly who are commuters, errand runners, and tourists. Each group is likely to respond differently to exposure from various educational and communication programs. Specifically targeting these diverse groups of drivers puts information and education programs where they are likely to be recognized (Jacobson 1999).

Respondents hold themselves, as drivers, most responsible for preventing DVCs, yet most believe DVCs are unavoidable. Conflicting attitudes among respondents shows a need to teach drivers that DVCs can be avoided with awareness of risks and implementation of proper reactions to risk situations. Langenau & Rabe (1987) reported that 90% of their respondents believed their particular DVCs were unavoidable compared to the 70% in this study. Although this attitude seems to be decreasing, further education

is needed to communicate specific factors that put drivers at the greatest risk of involvement.

Overall, drivers had low knowledge scores, which may indicate they are not aware of the proper reactions to help in avoiding a DVC. Drivers and passengers involved in DVCs presumably possess greater knowledge of DVCs due to past involvement in one. Mean knowledge scores, however, were low among all respondents, in part because of the large number of respondents who were unsure about the correct precautionary behaviors to avoid DVCs. One potentially important audience to inform about DVCs is drivers who have no prior involvement.

People generally enjoy being able to view deer until some type of upsetting event, such as a DVC, changes their attitude (Stout & Knuth 1995). Stout et al. (1993) suggested past involvement in a DVC, or fear of being involved in one, might negatively affect attitudes towards state wildlife and transportation agencies, as well as preferences for smaller deer population sizes. Similarly, our results showed that DVC involvement did affect drivers' preference for reductions in deer numbers. People who have been in a DVC and want a smaller deer herd may believe agencies are not listening to the public. They then may believe better management practices are needed on the part of wildlife or transportation agencies and therefore may distrust these agencies to produce the results they want (Stout et al. 1993). Better understanding of public preference for deer population size, and the impacts they may create, can lead to better management objectives for deer from a stakeholder perspective (Stout & Knuth 1995). Without a clear understanding of the number of DVCs occurring and the impacts from these collisions, wildlife officials may misinterpret acceptable limits for deer populations or DVCs.

Although a majority of respondents enjoy their experiences with deer, most also worry that DVCs are a serious problem. Whether or not they have prior involvement influences their specific worries in regard to DVCs. Drivers who experienced a DVC without injury worried about the costs of repairing vehicle damage. Drivers who had no previous experience worried about losing control of their car if they were to be involved in a DVC, which may create elevated levels of dread about outcomes from a DVC. This heightened dread could provide an opportunity to increase awareness using information and education campaigns. Costs of repairs from DVCs are often underestimated (R. Miller, AAA Safety Officer, pers. comm.), which our data suggest is an important factor in not reporting a DVC.

While the true nature of the non-reporting bias remains unknown, we estimate an underreporting rate at over 50%. Combining the reporting rate with the average cost of vehicle repairs estimated at $2,300 per occurrence (R. Miller, AAA safety officer, pers. comm.), DVCs in Michigan could cost an average of over $320,000,000 per year, although this may be an overestimate because unreported crashes may, on average, cause less than the $2,300 estimated for reported accidents. To reduce the number and cost of DVCs occurring, studies have suggested an interagency approach to DVC mitigation may be beneficial (Langenau & Rabe 1987; Sullivan & Messmer 2003). Targeted communication programs developed by agencies and delivered by credible messengers (Stout & Knuth 1995) will increase driver awareness of DVCs and teach drivers the skills needed to avoid a DVC.

A greater percentage of pickup trucks represented in the survey sample (24.8%) than in the state traffic crash data (MDOT 2004; 20.0%) may be a contributing factor to

the underreporting rate; drivers of pickup trucks appear less likely to report their DVCs. Presumably, these larger vehicles sustain less damage than smaller vehicles. My data suggests drivers also hesitate to file claims with insurance agencies for fear of an increase in their insurance rates. In Michigan, DVCs are covered under comprehensive insurance, which does not result in an increased cost of a driver's personal insurance policy. Educating drivers that their insurance rate will not be affected could result in a higher reporting rate of DVCs and more coverage of costs for drivers. Higher reporting rates will give management agencies a more accurate representation of the actual number of DVCs occurring, allowing for better management, policy, and funding decisions.

Care must be taken to make sure any declines in future DVC rates are actual drops in the number of DVCs occurring rather than just a drop in the number that are being reported. At the time of the survey, Michigan state law required accidents that caused more than $400 in damage to be reported to police. That amount has since risen to $1,000, which will likely result in an even larger non-reporting rate. Better communication between wildlife and transportation agencies may result in a more complete and accurate database of DVCs (Knapp 2005).

Drivers previously indicated they did not believe DVCs were a serious problem in Michigan (Langenau & Rabe 1987). We found the opposite to be true, whether or not respondents had any previous DVC involvement. Despite these beliefs and concerns about injuries and costs, the only behavior drivers stated they were willing to change was their driving speed. Speed limits were found to affect the number and severity of DVCs occurring when speed limits were decreased from 70mph to 55mph in the 1970s (Langenau & Rabe 1987). Enforcement of speed limits in areas where deer migration

routes exist may be useful in reducing DVCs (Hedlund et al. 2003). Willingness among drivers to reduce speed should be promoted, because high speed is one of the most significant risk factors for likelihood of DVC involvement (Marcoux et al. 2005).

Drivers often become habituated to deer crossing signs (Romin & Bissonette 1996). No research, however, has determined if deer crossing signs are located in effective locations, which may cause drivers to ignore them if deer are repeatedly not observed in the area (Knapp & Li 2003). Our data suggest prior involvement causes drivers to be more aware of deer crossing signs and adjust their speed accordingly; yet poor placement of these signs (Langenau & Rabe 1987) may cause drivers to compensate for deer that are not likely to be in that location. Educating drivers to recognize environmental characteristics and risk factors associated with DVCs may reduce dependence of drivers on deer crossing signs to trigger safer driving behaviors.

Commuters are likely to be at an increased risk of DVC involvement; a greater number of work miles were associated with an increased number of DVCs. Travel during commuter hours results in greater concentrations of drivers traveling at the time of day when the risk of a DVC is greatest. A greater number of personal miles driven pose less of a risk of DVC involvement presumably because the number of drivers and volume of traffic is not as consistently concentrated as it is during commuter traffic.

Although we do not have specific locations of where respondents experienced their DVCs, most DVCs occur in the county where drivers reside (Langenau & Rabe 1987). We found that reported gender and type of area that drivers involved in DVCs resided (urban, suburban, rural) were consistent with an earlier study of traffic crash data

(Marcoux et al. 2005) that identified factors providing the greatest risk to a driver for DVC involvement. Drivers in these areas should be made aware of their increased risk.

Lack of a strong preference among respondents for a particular education channel indicates a diverse population that needs to be educated about DVC avoidance. Education can be specifically aimed at drivers who are considered at a greater risk of DVC involvement. However, all drivers should be made aware of the particular driving situations and locations that pose the greatest risk (Puglisi et al. 1974; Langenau & Rabe 1987; Williams 1994; Romin & Bissonette 1996) and their individual level of risk, as each person has their own level of acceptable risk (Stout & Knuth 1995). Several communication channels will be needed to disburse this educational information to several target audiences.

Sullivan and Messmer (2003) found that state wildlife and transportation agencies each believe that the other agency should be more financially responsible for the management of DVCs. While we found that more drivers believed the MDNR should be most responsible for the management of DVCs, our data currently indicate drivers do not know who is responsible for the management of DVCs, including removing carcasses from roadways. More clearly communicated roles and responsibilities, if they exist, may help build trust and more opportunities for education.

Our research-based results are limited to southeastern Michigan and similar landscapes represented by the 3-county study area, but they provide information about driver attitudes, knowledge, and behavior that can be used to develop programs aimed at influencing driver behavior and promoting awareness of DVCs. Different channels for

communication can now be more strategically identified for specific segments of the population (Jacobson 1999).

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CHAPTER 3

MANAGEMENT AND RESEARCH CONSIDERATIONS AND RECOMMENDATIONS FOR INFORMATION AND EDUCATION PROGRAMS AIMED AT REDUCING DEER-VEHICLE COLLISIONS

The 2 previous chapters identified 1) factors that provide the greatest level of risk for DVC involvement and 2) attitudes, awareness, and behaviors of drivers toward DVCs. This chapter proposes recommendations for education messages based on the two previous chapters – to whom education and information might be delivered and what information should be conveyed to reduce the frequency and impacts of DVCs. I also identify additional research needs for assessing the impact of educational and informational programs after they are formed.

Evans (1996) suggests driver behavior has the greatest potential for a positive effect on the safety of drivers. Therefore, a change in driver behavior can be a solution for avoiding crashes and decreasing harm to drivers. Previous studies examined various mitigation efforts for DVCs (Romin and Bissonette 1996; Sullivan and Messmer 2003). However, very few studies, especially related to actions drivers can take to avoid DVCs, have been evaluated (Hedlund et al. 2003). Drivers already believe DVCs are a serious problem; therefore the major attitude to change is the belief that DVCs cannot be avoided. Once this attitude has been changed, behavior will be easier to change. Many of these studies have indicated education and communication in combination with other mitigation techniques may be a useful tool in reduction of DVCs (Groot Bruinderink and Hazebroek 1996; Romin and Bissonette; 1996 Schwabe et al. 2002).

Changing human driving behavior is not easy. Most change comes from drivers' adherence to new laws and enforcement of these laws (Williams 1994). In a survey of drivers, Redmon (2003) found drivers more willing to exhibit safer driving behaviors at the threat of receiving a ticket than at the possibility of endangering a human life. Other effective ways to influence behavior involve some type of incentive (Zaza et al. 2001). As respondents who had already experienced a DVC were most worried about costs, campaigns could draw attention to the high cost of car repair and medical bills incurred from involvement in DVCs as an incentive to implement safer driving behaviors to avoid DVCs.

Hartwig (1993 in Groot Bruinderink and Hazebroek 1996) found that improper reactions by drivers caused 60% of collisions. Many existing programs attempt to relay proper reaction information to drivers but they are not directly aimed at those drivers who are at the greatest risk. Driver education programs are often completed early in the life of a driver (age 16-18), but these are not the drivers at the highest risk of involvement in a DVC. Teaching younger drivers how to react to animals or obstacles in the road is important to continue teaching in driver's education; however, for most it will be approximately 20 years before they will need to implement the skills required for avoiding a DVC. Means of educating older drivers, and continuing education of younger drivers, must be found.

Effective communication involves a source, message, audience, channel, and feedback (Shanahan et al. 2001). Communication messages are best received by the public when public images of the sources (agencies) are viewed positively by the audience (targeted population of drivers) (Shanahan et al. 2001). Awareness of public

attitudes toward management agencies with regard to DVCs provides agencies an opportunity to improve public perception, thereby developing trusting relationships with stakeholders. Better relationships between agencies and the public present agencies with a chance to obtain the attention of impacted stakeholders (the audience) and make the public aware of education and information programs about DVCs and how to best avoid them. Agencies (MDOT, MDNR, insurance) can work together to develop and disperse information and education programs. It will be important to know which agencies drivers trust so that information will be seen as coming from a credible source.

The presence of deer carcasses on roadsides, another problem linked to DVCs, not only can be distracting to drivers, but can also be upsetting to people who are concerned for the welfare of deer or about disease transmission (Stout & Knuth 1995). This, in turn, may affect attitudes toward agencies believed to be responsible for removing carcasses from roadsides as well as the MDNR, who people believe should be responsible for the number of DVCs occurring in their community. Carcass removal and permit information are not readily available to the public (Knapp 2005).

Our research indicated there was no one particular channel from which drivers would like to receive education messages. Drivers involved in DVCs are a diverse group; therefore a widespread education campaign is needed using multiple channels. Although survey data indicate about 50% of drivers get their information mostly from newspapers, 50% of the population still needs to be reached. Mass media (TV, radio, newspapers, etc.) during high-risk seasons would raise awareness of the problem at key moments during the year. An additional option, as several respondents indicated voluntarily, is to include educational pamphlets in vehicle registration envelopes and at

the time of license renewal. This is an opportunity that deserves further investigation as a way to ensure that the majority of the licensed drivers and vehicle owners receive the information annually with registration renewal envelopes.

Williams (1994) suggests potential benefits from aiming education at people who can influence those at greatest risk, such as programs that educate parents about drugs and alcohol effects so they may influence their children (Ashery et al. 1998). One option, in addition to educating middle-aged drivers, may be to educate school-age children who can bring this information home to parents who are likely to be at risk. This type of low-cost program has been successful in changing environmental attitudes of some parents (Ballantyne et al. 1998).

Both the state traffic crash data and our survey data indicate that male drivers are at a slightly higher risk of DVC involvement. We recommend educating drivers aged 35 – 65 years because these are the ages in greatest risk of a DVC. More DVCs occur during commuter hours so educating commuters about the risk of DVCs may help in raising awareness of the problem in these drivers. It is particularly important to convey to drivers the highest risk of DVCS occurs while driving in dark, unlighted areas. Drivers must be educated on how to look for deer in dark areas, to slow down in these areas to improve reaction time due to reduced visibility, and how to properly react should a collision be unavoidable.

Other important factors relating to increased probability of a collision involving a deer are those relating to time. There was a higher risk of DVCs in fall and early winter and also during the hours of 6pm until 6am. If drivers are aware of these risks, they can adjust their behavior based on their own personal risk level (Stout & Knuth 1995).

Broadcasting public service announcements during these times, especially over the radio, so that drivers will be reminded while they are driving during high-risk times, could be beneficial in getting individuals to drive more cautiously and specifically be on the lookout for deer.

A final factor contributing to a higher risk of a DVC is reduced visibility. This was especially true in our findings of the high risk involved during foggy weather. Also thought to be of risk are roads where there is reduced sight distance, such as curvy roads or places where forest extends to the edge of the road. Teaching drivers to recognize these areas, instead of relying on deer crossing signs, gives them the power to react accordingly when they see associated risk areas or drive during times of high risk.

Previous recommendations have indicated that educating drivers about the risk factors of DVCs (Puglisi et al. 1974, Romin & Bissonette 1996), implementing a combination of mitigations efforts (Romin & Bissonette 1996; Hedlund et al. 2003), or working cooperatively with a number of agencies to develop mitigation strategies (Sullivan & Messmer 2003; Langenau & Rabe 1987) may lead to reductions in DVCs. In Michigan, however, access to education and information is not readily available or easy to locate. Most mitigation efforts and no education programs have been evaluated for their effectiveness (Romin & Bissonette 1996; Hedlund et al. 2003).

In summary, we recommend using several channels to raise awareness of DVCs in all drivers. However, focused education for middle-aged drivers is recommended to teach them the high risk factors associated with DVCs and the proper driving behaviors needed to minimize chances of involvement in a DVC. We recommend a cooperative effort among agencies to develop these programs and distribute the information through

the most credible and trusted agency among drivers. Any information or education program that is implemented will need to be evaluated for its effectiveness.

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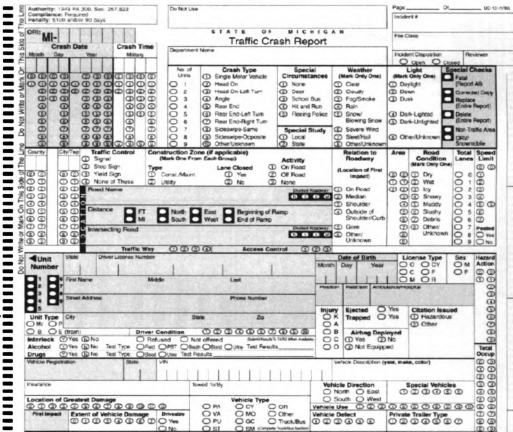
APPENDIX A

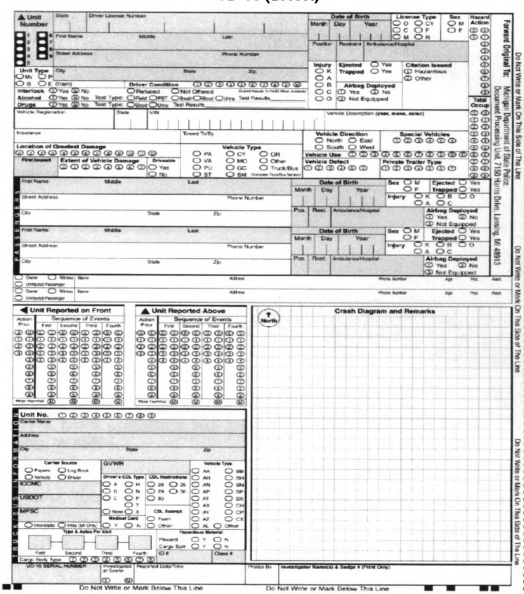
Appendix A. UD-10 Traffic Crash Report form.

UD-10 (FRONT)



Appendix A. (cont'd.)

UD-10 (BACK)



Appendix B. Pre-notice letter for the first wave of survey mailings.

March 28, 2004

«First_name» «Middle_Name» «Last_name»
«Street»
«City», «State» «Zip»

««««GreetingLine»»»»

In a few days you will receive a request in the mail to fill out a questionnaire for an important research project being conducted by the Michigan State University Department of Fisheries and Wildlife.

This study is part of an effort to better inform transportation and wildlife managers about deer-vehicle collisions, based on views of Michigan drivers.

I am writing in advance because we understand that many people like to know ahead of time that they will be contacted.

If you have any questions about this project now or after you receive your questionnaire, feel free to call me **toll free at 1-888-290-0413**. If you have questions or concerns regarding your rights as a study participant, or are dissatisfied at any time with any aspect of this study, you may contact – anonymously, if you wish – Peter Vasilenko, Chair of the University Committee on Research Involving Human Subjects (UCRIHS) by phone: (517) 355-2180, fax: (517) 353-2976, email: ucrihs@msu.edu, or regular mail: 246 Administration Building, East Lansing, MI 48824.

It's only with the generous help of people like you that our research can be successful. Thank you for your time and consideration.

Sincerely,

Alix Marcoux
Project Manager

P.S. As our way of saying thanks for your participation, we will be enclosing a small gift with your survey. Remember, your survey will arrive in a couple of days. We look forward to hearing from you.

Appendix C. Cover letter, SEMCOG letter, and survey for mailing #2, 21 April 2004.

April 21, 2004

«First_name» «Middle_Name» «Last_name»
«Street»
«City», «State» «Zip»

««GreetingLine»»

I am writing to ask for your help in a study of Michigan drivers. This study, conducted by the Michigan State University Department of Fisheries and Wildlife, is an effort to learn more about the views of people with regard to deer-vehicle collisions.

We are contacting a random sample of current Michigan licensed drivers in Monroe, Oakland, and Washtenaw counties to ask their opinions about and experiences with (if any) deer-vehicle collisions. Results from the survey will be used to help transportation and wildlife managers develop better ways to help drivers avoid deer-vehicle collisions.

Your answers are completely confidential. The survey has identifying information for mailing purposes only. This is so that we may check your name off our mailing list when your survey is returned. Your name and address will never be associated with your responses in any way and your privacy will be protected to the maximum extent allowable by law. While your response to this survey and any of the questions is completely voluntary, you can help us by taking a few minutes to share your views about deer-vehicle collisions in your community. By completing and returning this survey, you indicate your voluntary agreement to participate in this study.

As our way of saying thank you for your participation, a small gift of postage stamps has been included with your survey – these are for your own personal use. We look forward to hearing from you soon.

If you have any questions or comments about this study, we would be happy to talk with you. Feel free to call me **toll free at 1-888-290-0413** or write to the address on the letterhead. If you have questions or concerns regarding your rights as a study participant, or are dissatisfied at any time with any aspect of this study, you may contact – anonymously, if you wish – Peter Vasilenko, Chair of the University Committee on Research Involving Human Subjects (UCRIHS) by phone: (517) 355-2180, fax: (517) 353-2976, email: ucrihs@msu.edu, or regular mail: 246 Administration Building, East Lansing, MI 48824.

Thank you very much for helping with this important study.

Sincerely,

Alix Marcoux
Project Manager

Appendix C. (cont'd.)

SEMCOG Letterhead

«First_name» «Middle_Name» «Last_name»
«Street»
«City», «State» «Zip»

May 3, 2004

««GreetingLine»»

Enclosed, please find an important survey regarding deer-vehicle collisions in southeastern Michigan. This questionnaire is part of a larger study, in cooperation with Michigan State University, which is researching people's experiences and views about deer-vehicle collisions. I urge your participation in this important study. Please complete this survey and return it as soon as possible.

Programs that develop from this research will help make southeastern roads safer for you and your family. **The researchers are interested in responses from all licensed drivers aged 18 years old and older regardless of whether you have been in a deer-vehicle collision.** Information gathered from drivers who have not been in a collision and from those who have been in a collision will help to develop characteristics of all drivers.

The intent of this important research is to increase driver safety on Michigan roads for everyone. Your help is urgently needed to obtain this information. Thank you for taking the time to complete this important survey. And please remember we want to hear from all licensed drivers over the age of 18.

Sincerely,

Thomas Bruff
Engineer Coordination
Transportation

Deer-Vehicle Collisions in Michigan: A Survey of Your Views

Michigan State University
Department of Fisheries & Wildlife
13 Natural Resources Building
East Lansing, MI 48824

Appendix C. (cont'd.)

Deer-Vehicle Collisions in Michigan:
A Survey of Your Views

This questionnaire is part of a study to assist wildlife and transportation managers with making better decisions about transportation and deer-vehicle collisions. Your views are very important to us and your response will give us a better understanding of how people feel about deer-vehicle collisions and other issues involving deer. Please keep in mind that we are interested in everyone's responses, **not just those who have been in a deer-vehicle collision.**

Please complete this questionnaire at your earliest convenience, seal it, and drop it in any mailbox (no envelope needed). Return postage is provided. The questionnaire should take about 10 minutes to complete.

Your responses will remain confidential
and will never be associated with your name.

As a thank you for completing and returning this questionnaire 3 complimentary postage stamps have been included for your personal use. If you have questions regarding this survey, please write Alix Marcoux, Project Manager, at the address on the front page or call her **toll free at 1-888-290-0413.**

Please use the inside back cover of this questionnaire to record any additional comments about wildlife and transportation, particularly those about deer in southeastern Michigan.

Thank you for your assistance!

If you choose not to complete the survey please return it with a note on the inside back cover. Simply seal it and drop it in a mailbox. Return postage is provided.

For the purpose of this survey, a **deer-vehicle collision is defined** as any incident caused by a deer, including hitting a deer, **or** swerving to miss a deer and hitting another vehicle, **or** swerving off the road and hitting objects on the side of the road.

1. **How often do you participate in the following activities?** ***(Please check ☑ only one response for each statement.)***

		Never	Sometimes	Regularly
a.	Read about wildlife	❑	❑	❑
b.	Watch wildlife related TV, movies, or videos	❑	❑	❑
c.	Spend time viewing wildlife	❑	❑	❑
d.	Hike/walk in natural areas	❑	❑	❑
e.	Camp	❑	❑	❑
f.	Feed birds or other wildlif (other than deer)	❑	❑	❑
g.	Feed deer	❑	❑	❑
h.	Fish	❑	❑	❑
i.	Hunt (other than deer)	❑	❑	❑
j.	Hunt deer	❑	❑	❑
k.	Other outdoor activities (please specify) _____			

2. **People in Michigan have varied experiences with deer whether or not they are driving. Please indicate which, if any, of the following types of interactions with deer you have experienced in the last five years (since 1999).** ***(Please check ☑ all that apply.)***

- ❑ Observed deer in the wild
- ❑ Observed deer near my house
- ❑ Observed deer while driving
- ❑ Almost hit a deer while driving
- ❑ Read or heard about other people **nearly** involved in a deer-vehicle collision
- ❑ Read or heard about other people involved in a deer-vehicle collision
- ❑ Had a family member or friend **nearly** involved in a deer-vehicle collision
- ❑ Had a family member or friend involved in a deer-vehicle collision
- ❑ Been a passenger in a deer-vehicle collision
  If more than 1 collision, how many? _____
- ❑ Been a driver in a deer-vehicle collision
  If more than 1 collision, how many? _____
- ❑ None of the above
- ❑ Other (please specify) _____

3. How common would you say deer are where you live? ***(Please check ☑ only one response.)***

- ❑ Very common
- ❑ Somewhat common
- ❑ Not common at all
- ❑ Not present
- ❑ Unsure

Driving & Deer

4. How frequently do you see deer while driving? ***(Please check ☑ only one response.)***

- ❑ Daily
- ❑ Weekly
- ❑ Monthly
- ❑ Yearly
- ❑ Never
- ❑ Unsure

5. When you see a deer standing alongside the road while you are driving, how often would you say each of the following is true? ***(Please check ☑ only one response for each statement.)***

		Never	Sometimes	Always
a.	I am excited to see it.	❑	❑	❑
b.	I worry it will run out in front of my vehicle.	❑	❑	❑
c.	I slow down to get a better look at it.	❑	❑	❑
d.	I slow down and drive more cautiously.	❑	❑	❑
e.	I speed up to get past the deer.	❑	❑	❑

6. To what extent do you believe each of the following statements to be true or not true? ***(Please check ☑ only one response for each statement.)***

		Definitely True	Probably True	Probably Not True	Definitely Not True	Unsure
a.	Most deer-vehicle collisions occur at dawn/sunrise.	❑	❑	❑	❑	❑
b.	Most deer-vehicle collisions occur at dusk/sunset.	❑	❑	❑	❑	❑
c.	Most deer-vehicle collisions occur during early winter months.	❑	❑	❑	❑	❑
d.	Deer-vehicle collisions are most likely to occur on 2-lane roads.	❑	❑	❑	❑	❑
e.	Driving fast makes it harder to avoid a deer-vehicle collision.	❑	❑	❑	❑	❑
f.	Deer-vehicle collisions are a serious problem in Michigan.	❑	❑	❑	❑	❑
g.	Your insurance rates will increase if you report a deer vehicle collision to your insurance agency.	❑	❑	❑	❑	❑
h.	You will be ticketed if you report a deer-vehicle collision to the police.	❑	❑	❑	❑	❑

7. Which of the following best describes your reaction to deer crossing signs? ***(Please check ☑ all that apply.)***

- ❑ Slow down
- ❑ Drive more cautiously
- ❑ Watch sides of roads
- ❑ Look for deer in the area
- ❑ Do nothing
- ❑ Unsure

8. If each of the following situations were to greatly decrease your chances of being involved in a deer-vehicle collision, how likely are you to do each of the following? ***(Please check ☑ only one response for each statement.)***

		Very Likely	Somewhat Likely	Not Likely	Unsure
a.	Reduce speed by 10 mph	❑	❑	❑	❑
b.	Reduce speed by 20 mph	❑	❑	❑	❑
c.	Not drive during dusk/sunset and dawn/sunrise	❑	❑	❑	❑
d.	Not drive after dark	❑	❑	❑	❑
e.	Pay complete attention to the area, including the sides of the road	❑	❑	❑	❑
f.	Not participate in other activities while driving (for example - talking on a cell phone or eating)	❑	❑	❑	❑
g.	Take a special driver education course focused on deer-vehicle collisions and how to prevent them	❑	❑	❑	❑
h.	Other (please specify) _____				

9. Do you believe the size of the deer population in your area should be....? ***(Please check ☑ only one response.)***

- ❑ Greatly reduced
- ❑ Somewhat reduced
- ❑ Kept the same
- ❑ Somewhat increased
- ❑ Greatly increased
- ❑ Unsure

10. When you think about deer-vehicle collisions, how concerned would you say you are about each of the following situations? ***(Please check ☑ only one response for each statement.)***

		Very Concerned	Somewhat Concerned	Not Concerned	Unsure
a.	Being injured	❑	❑	❑	❑
b.	Injuring passengers or others	❑	❑	❑	❑
c.	Medical bills due to injury	❑	❑	❑	❑
d.	Injuring or killing the deer	❑	❑	❑	❑
e.	Cost of repairing damages to your car	❑	❑	❑	❑
f.	Insurance rate increase	❑	❑	❑	❑
g.	Cost of repairing other property damage	❑	❑	❑	❑
h.	Receiving a ticket if you were to report the accident to the police	❑	❑	❑	❑
i.	Losing control of the car while swerving to avoid hitting a deer	❑	❑	❑	❑

j. Other (please specify) _____

_____

11. Which of the following, if any, do you feel should be responsible for preventing deer-vehicle collisions? (*Please check ☑ all that apply.*)

- ❑ Michigan Department of Transportation
- ❑ Michigan Department of Natural Resources
- ❑ Michigan Secretary of State
- ❑ Office of Highway Safety Planning
- ❑ Local police or sheriff
- ❑ County governments
- ❑ Drivers
- ❑ Unsure
- ❑ Other (please specify) _____

Your Involvement in Deer-Vehicle Collisions

Please respond to the following questions regarding your most recent deer-vehicle collision in which you were the driver. **If you have never been involved in a deer-vehicle collision as a driver, please check here ❑ and skip to question 18 on the following page.**

12. Was the deer-vehicle collision reported to the police? ***(Please check ☑ only one response.)***

❑ Yes
❑ No ➡

12a. ***If no,* what was the main reason you chose not to report the collision?** ***(Please check ☑ only one response.)***

- ❑ Not enough time
- ❑ Did not think it was necessary
- ❑ Believed it would affect your driving record
- ❑ Believed you would get a ticket
- ❑ Other (please specify) _____

13. Was the deer-vehicle collision reported to your insurance agency? ***(Please check ☑ only one response.)***

❑ Yes
❑ No ➡

13a. ***If no,* what was the main reason you chose not to report the collision?** ***(Please check ☑ only one response.)***

- ❑ Not enough time
- ❑ Did not think it was necessary
- ❑ Believed it would affect your insurance rates
- ❑ Other (please specify) _____

14. Were there any personal injuries to you or any one else as a result of the deer-vehicle collision? ***(Please check ☑ only one response.)***

- ❑ Yes
- ❑ No
- ❑ Unsure

15. Which of the following best describes why you were driving at the time of the deer-vehicle collision? *(Please check ☑ only one response.)*

- ❑ Driving to or from work
- ❑ Running errands
- ❑ Visiting family or friends
- ❑ Vacationing
- ❑ Other (please specify) _____

16. At the time of the collision, what type of vehicle were you driving? *(Please check ☑ only one response.)*

- ❑ 4-door/2-door passenger vehicle
- ❑ Mini –van
- ❑ SUV/Pickup truck
- ❑ Truck – non tractor trailer
- ❑ Tractor trailer
- ❑ Other (please specify) _____

17. Do you believe the collision could have been prevented if you did any of the following things? *(Please check ☑ all that apply.)*

- ❑ Braked
- ❑ Swerved
- ❑ Drove more slowly
- ❑ It could not have been prevented
- ❑ Unsure
- ❑ Other (please specify) _____

Sources of Information

The following questions will help us understand which sources you would like to use to gather information about deer and transportation issues.

18. Do you read a daily newspaper? *(Please check only ☑ one response.)*

- ❑ Yes
- ❑ No *(If no, please skip to question **20**)*

19. What is the name of the daily paper (if any) you use the most to get news about wildlife and wildlife management issues?

Name of the paper: _____

20. From which sources would you like to get information focused on reducing deer-vehicle collisions? ***(Please check ☑ all that apply.)***

- ❑ Newspaper ➡ **Newspaper name**_____
- ❑ Magazine articles ➡ **Magazine name** _____
- ❑ Brochures ➡ **Location where you would pick up a brochure (e.g., grocery store)** _____
- ❑ Driver's education classes
- ❑ Billboards
- ❑ Friends
- ❑ Unsure
- ❑ Not interested
- ❑ Other (please specify) _____

Background Information

In order for us to more fully understand people's responses to the previous questions, we need to know a few things about your background. Remember that your responses are **completely confidential** and that neither your name nor your address will be directly linked to your responses in any way.

21. Approximately how many miles per week do you drive for work? ***(Please include mileage for getting to work and mileage for getting back home, plus any driving you do for work.)***_____ Miles

22. Approximately how many miles per week do you drive for personal (non-work) reasons? _____Miles

23. What type of vehicle do you drive regularly?
Make _____
Model _____

24. How many years have you lived in your current county of residence? _____ Years

25. In what type of area do you live? ***(Please check ☑ only one response.)***

- ❑ Rural
- ❑ Urban
- ❑ Suburban
- ❑ Other (please specify)_____

26. Are you:

- ❑ Male
- ❑ Female

27. In what year were you born? 19_____

28. What is the highest level of formal education that you have completed? ***(Please check ☑ only one response.)***

- ❑ Less than high school
- ❑ High school graduate or equivalent
- ❑ Some college
- ❑ Associate's degree
- ❑ Technical/vocational
- ❑ College graduate (Bachelor's or 4 year degree)
- ❑ Graduate or professional degree

29. Please use the space below for any additional comments you wish to make with regard to deer-vehicle collisions in Michigan.

Results of this survey can be found at
http://www.fw.msu.edu/people/riley/Survey_DVC_Michigan.pdf

To return the survey, simply seal it and place it in any mailbox. Return postage is provided.

Thank you for your participation!

Appendix C. (cont'd.)

A. Marcoux
Department of Fisheries & Wildlife
Michigan State University
13 Natural Resources Building
East Lansing, MI 48824

A. Marcoux
Department of Fisheries & Wildlife
Michigan State University
13 Natural Resources Building
East Lansing, MI 48824

Appendix D. Thank you/Reminder postcard mailed May 5, 2004

May 5, 2004

Recently you were mailed a questionnaire seeking your views on deer-vehicle collisions in Michigan.

If you have already completed and returned the survey, please accept our sincere thanks! If not, please do so today. Because wildlife and transportation managers are interested in serving the public of Michigan, it is vital that we receive your input.

If by some chance you did not receive the questionnaire, or it got misplaced, please call me **toll free at 1-888-290-0413** and I will mail another one to you.

Sincerely,

Alix Marcoux
Project Manager

(front)

A. Marcoux
Department of Fisheries & Wildlife
Michigan State University
13 Natural Resources Building
East Lansing, MI 48824

«First_name» «Middle_Name» «Last_name»
«Street»
«City», «State» «Zip»

(back)

Appendix E. Cover letter for final survey mailing (mailing included survey instrument - see Appendix 2).

May 19, 2004

«First_name» «Middle_Name» «Last_name»
«Street»
«City», «State» «Zip»

««GreetingLine»»

A few weeks ago I sent you a questionnaire asking you for your views about deer-vehicle collisions in Michigan. To the best of our knowledge, the questionnaire has not yet been returned. If this letter and your completed survey have crossed in the mail, please accept our sincere thanks for your participation in this study!

Your views are crucially important, regardless of whether or not you have been in a deer-vehicle collision. The comments of people who have already responded show that Michigan drivers hold a wide variety of opinions about deer-vehicle collisions. We think the results will be useful to managers of transportation and wildlife, who are trying to make more informed decisions about how to manage deer-vehicle collisions.

A few people have written to say that they should not have received the questionnaire because they no longer live in Michigan. If this applies to you, please give the survey to an adult in your household who is a licensed Michigan driver. If no one in your household is eligible, please indicate this on the survey and send it back to us. We would really appreciate it, and this way we can take you off our mailing list.

An identification number is written on the cover of the questionnaire so that we can check your name off of the mailing list when it is returned. We do not use this number for any other purpose, and we will not share your personal information with anyone else. Your name will never be associated with your responses in any way and your privacy will be protected to the maximum extent allowable by law.

Your response to the survey and any of its questions is completely voluntary. We hope that you will fill out and return the questionnaire soon. By completing and returning this survey, you indicate your voluntary agreement to participate in this study. If, however, for any reason, you prefer not to answer it, please let us know by returning the questionnaire with a note on the back page stating your desire not to participate in the study.

If you have any questions about this survey, please feel free to contact me **toll-free at 1-888-290-0413**. If you have any questions or concerns regarding your rights as a study participant, or are dissatisfied at any time with any aspect of this study, you may contact – anonymously, if you wish – Peter Vasilenko, Chair of the University Committee on Research Involving Human Subjects (UCRIHS) by phone: (517) 355-2180, fax: (517) 353-2976, email: ucrihs@msu.edu, or regular mail: 246 Administration Building, East Lansing, MI 48824.

Sincerely,

Alix Marcoux
Project Manager

June 2, 2004

Recently you were mailed a questionnaire seeking your views about deer-vehicle collisions. Our response rate to this survey was lower than we had hoped. We would like to ask you a few questions so we can understand the nature of this non-response.

We are not asking you to fill out anything like the survey we previously sent you. Rather, we have attached a stamped, addressed postcard for you to fill out, detach, and drop in the mail. It should take no more than a minute or two to fill out the postcard. We would sincerely appreciate your taking the time to get this back to us soon, as it will provide valuable information for our study.

As before, your response to this is voluntary. Nevertheless, your input is important for insuring that transportation and wildlife managers have the very best information on which to base decisions. You may be assured of complete confidentiality. The postcard has an identification number for mailing purposes only. Your name will never be linked to your responses.

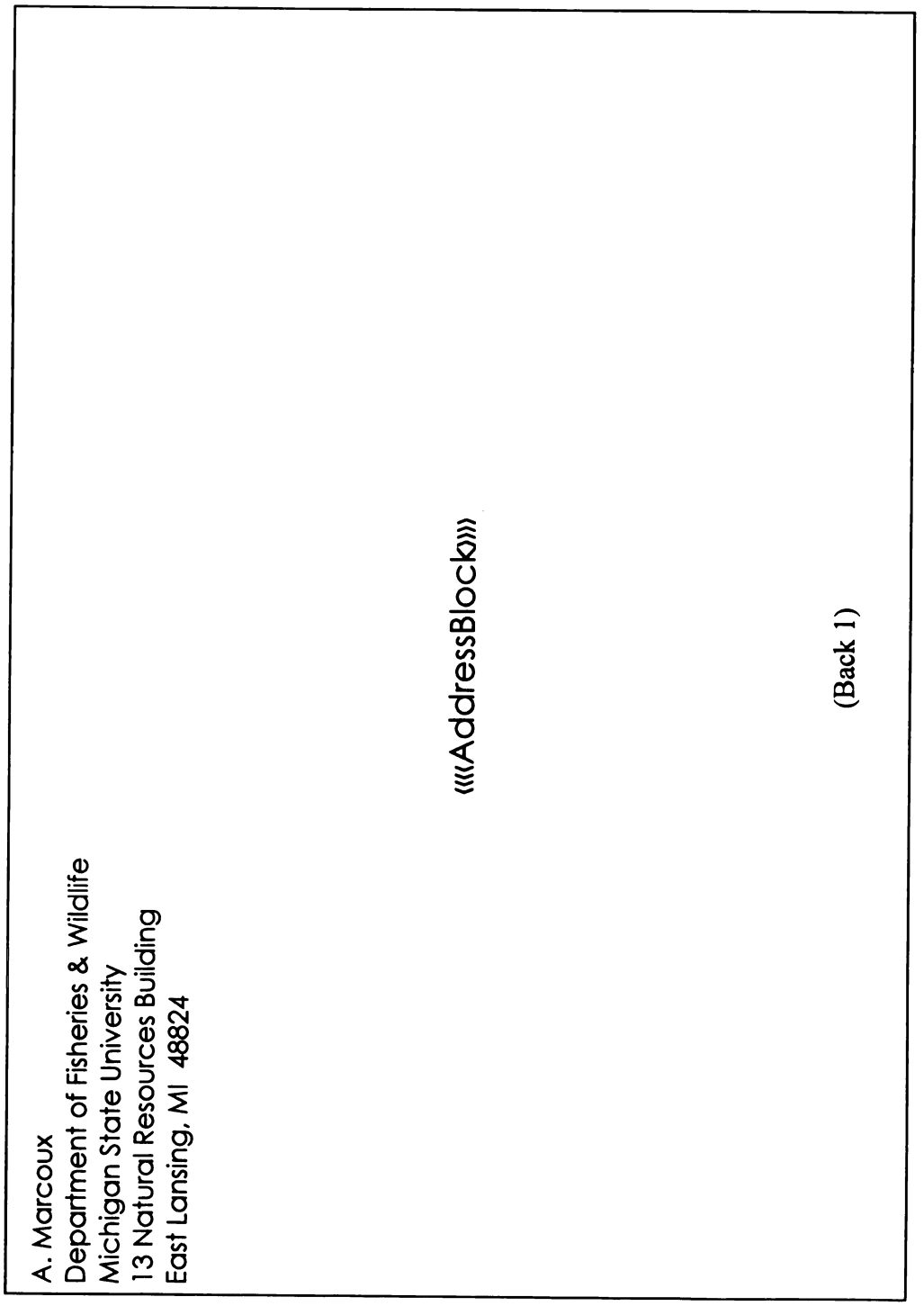
Your cooperation is greatly appreciated. Thank you in advance for taking the time to help us in this matter.

Sincerely,

Alix Marcoux
Project Manager

(Front 1)

Appendix F (cont'd.)



1. **Was there a particular reason you did not respond to our survey on deer-vehicle collisions in Michigan?** ***(Please check ☑ all that apply.)***
   - ❑ I never received the survey
   - ❑ I do not like answering surveys
   - ❑ I do not have time to answer surveys
   - ❑ I know very little about deer-vehicle collisions
   - ❑ The survey looked too long and/or complicated
   - ❑ I am not interested in the issues in the survey
   - ❑ I have never been involved with a deer-vehicle collision
   - ❑ I would prefer being contacted by phone
   - ❑ Another reason (please specify) _____

2. **How frequently do you see deer while driving?** ***(Please check ☑ only one response.)***
   ❑ Daily ❑ Weekly ❑ Monthly ❑ Yearly ❑ Never ❑ Unsure

3. **Have you ever been involved in a deer-vehicle collision?** ***(Please check ☑ only one response.)***
   ❑ Yes ❑ No
   3a. **If yes**, how many deer vehicle collisions have you been involved with? _____ deer-vehicle collisions
   3b. **Were you the driver or the passenger?** ***(Please refer to your most recent collision and check ☑ only one response.)***
   ❑ Driver ❑ Passenger

4. **Which of the following do you feel should be responsible for preventing deer-vehicle collisions?** ***(Please check ☑ all that apply.)***
   - ❑ Michigan Department of Transportation
   - ❑ Drivers
   - ❑ Michigan Department of Natural Resources
   - ❑ Other _____

5. **In what type of area do you live?** ***(Please check ☑ only one response.)***
   ❑ Rural ❑ Urban ❑ Suburban ❑ Other (please specify) _____

6. Are you male or female? ❑ Male ❑ Female
7. In what year were you born? 19_____

Thank You For Your Participation!

(Please detach and mail this section back. Postage provided.)

(Front 2)

Appendix F (cont'd.)

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(Back 2)

Appendix G. Survey frequencies, % response for each question.

1. **How often do you participate in the following activities?** ***(Please check ☑ only one response for each statement.)***

		Never	Sometimes	Regularly	n
a.	Read about wildlife	17.5	64.9	1.6	1,634
b.	Watch wildlife related TV, movies, or videos	8.6	67.2	24.2	1,639
c.	Spend time viewing wildlife	9.8	60.9	29.4	1,625
d.	Hike/walk in natural areas	14.5	63.6	22.0	1,625
e.	Camp	43.9	43.8	12.3	1,618
f.	Feed birds or other wildlife (other than deer)	26.8	36.4	36.8	1,614
g.	Feed deer	79.9	15.7	4.4	1,621
h.	Fish	50.2	39.6	10.3	1,617
i.	Hunt (other than deer)	81.5	13.0	5.6	1,621
j.	Hunt deer	81.9	8.6	9.5	1,574
k.	Other outdoor activities (please specify) _____				

2. People in Michigan have varied experiences with deer whether or not they are driving. Please indicate which, if any, of the following types of interactions with deer you have experienced in the last five years (since 1999). *(Please check ☑ that apply.)*

	n	yes	no
❑ Observed deer in the wild	1,652	88.0	12.0
❑ Observed deer near my house	1,652	64.3	35.7
❑ Observed deer while driving	1,652	94.3	5.7
❑ Almost hit a deer while driving	1,652	45.0	55.0
❑ Read or heard about other people **nearly** involved in a deer-vehicle collision	1,652	79.5	20.5
❑ Read or heard about other people involved in a deer-vehicle collision	1,652	83.1	16.9
❑ Had a family member or friend **nearly** involved in a deer-vehicle collision	1,652	48.8	51.2
❑ Had a family member or friend involved in a deer-vehicle collision	1,652	51.4	48.6
❑ Been a passenger in a deer-vehicle collision If more than 1 collision, how many?	1,652	6.2	93.8
❑ Been a driver in a deer-vehicle collision If more than 1 collision, how many?	1,652	11.9	88.1
❑ None of the above	1,652	1.0	99.0
❑ Other (please specify) _____			

3. How common would you say deer are where you live? ***(Please check ☑ only one response.)***

❑ Very common	3.4	n = 1,519
❑ Somewhat common	14.8	
❑ Not common at all	40.7	
❑ Not present	38.4	
❑ Unsure	2.7	

Driving & Deer

4. How frequently do you see deer while driving? ***(Please check ☑ only one response.)***

❑ Daily	2.8	n=1,513
❑ Weekly	28.0	
❑ Monthly	36.7	
❑ Yearly	21.8	
❑ Never	5.2	
❑ Unsure	5.6	

5. When you see a deer standing alongside the road while you are driving, how often would you say each of the following is true? ***(Please check ☑ only one response for each statement.)***

		Never	Sometimes	Always	n
a.	I am excited to see it.	12.9	34.4	52.7	1,455
b.	I worry it will run out in front of my vehicle.	6.3	34.9	58.9	1,471
c.	I slow down to get a better look at it.	24.6	46.4	29.0	1,435
d.	I slow down and drive more cautiously.	2.9	21.8	75.2	1,498
e.	I speed up to get past the deer.	93.2	6.4	0.4	1,427

6. To what extent do you believe each of the following statements to be true or not true? ***(Please check ☑ only one response for each statement.)***

		Definitely True	Probably True	Probably Not True	Definitely Not True	Unsure	n
a.	Most deer-vehicle collisions occur at dawn/sunrise.	13.9	38.8	20.4	2.9	24.0	1,499
b.	Most deer-vehicle collisions occur at dusk/sunset.	20.5	51.2	8.7	1.1	18.6	1,501
c.	Most deer-vehicle collisions occur during early winter months.	4.6	29.7	27.0	5.6	33.1	1,490
d.	Deer-vehicle collisions are most likely to occur on 2-lane roads.	4.0	38.9	24.4	10.5	22.2	1,502
e.	Driving fast makes it harder to avoid a deer-vehicle collision.	43.0	31.1	7.8	11.7	6.4	1,504
f.	Deer-vehicle collisions are a serious problem in Michigan.	35.8	42.4	7.6	1.5	12.7	1,508
g.	Your insurance rates will increase if you report a deer vehicle collision to your insurance agency.	9.5	33.7	18.9	5.5	32.4	1,501
h.	You will be ticketed if you report a deer-vehicle collision to the police.	0.9	2.5	32.0	43.5	21.0	1,504

7. Which of the following best describes your reaction to deer crossing signs?
(Please check ☑ all that apply.)

		yes	no
❑ Slow down	n = 1,516	43.9	51.4
❑ Drive more cautiously		80.0	20.0
❑ Watch sides of roads		80.5	19.5
❑ Look for deer in the area		69.5	30.5
❑ Do nothing		3.1	96.9
❑ Unsure		0.3	99.7

8. If each of the following situations were to greatly decrease your chances of being involved in a deer-vehicle collision, how likely are you to do each of the following? *(Please check ☑ only one response for each statement.)*

		Very Likely	Somewhat Likely	Not Likely	Unsure
a.	Reduce speed by 10 mph	37.4	36.6	23.1	3.0
b.	Reduce speed by 20 mph	19.2	25.5	51.2	4.1
c.	Not drive during dusk/sunset and dawn/sunrise	3.0	5.3	87.8	39
d.	Not drive after dark	2.8	4.2	89.7	3.3
e.	Pay complete attention to the area, including the sides of the road	67.1	28.5	3.3	1.1
f.	Not participate in other activities while driving (for example - talking on a cell phone or eating)	51.3	2.8	16.6	2.4
g.	Take a special driver education course focused on deer-vehicle collisions and how to prevent them	5.9	16.7	70.7	6.7
h.	Other (please specify) _____				

9. Do you believe the size of the deer population in your area should be....? *(Please check ☑ only one response.)*

❑	Greatly reduced	5.1	n = 1,633
❑	Somewhat reduced	17.7	
❑	Kept the same	48.1	
❑	Somewhat increased	6.4	
❑	Greatly increased	1.7	
❑	Unsure	21.1	

10. When you think about deer-vehicle collisions, how concerned would you say you are about each of the following situations? *(Please check ☑ only one response for each statement.)*

		Very Concerned	Somewhat Concerned	Not Concerned	Unsure
a.	Being injured n=1,628	52.2	35.7	11.2	0.8
b.	Injuring passengers or others n = 1,619	58.6	32.8	8.2	0.5
c.	Medical bills due to injury n = 1,610	31.6	36.0	30.7	1.6
d.	Injuring or killing the deer n = 1,615	38.9	36.9	22.8	1.3
e.	Cost of repairing n = 1,621 damages to your car	58.5	31.8	8.8	0.9
f.	Insurance rate increase n = 1,612	47.7	34.1	14.4	3.8
g.	Cost of repairing other property damage n = 1,594	36.8	37.9	21.8	3.5
h.	Receiving a ticket if you were to report the n = 1,614 accident to the police	20.7	16.7	55.5	7.1
i.	Losing control of the car while swerving to avoid hitting a deer n = 1,625	65.5	26.5	7.1	0.9
j.	Other (please specify) _____				

11. Which of the following, if any, do you feel should be responsible for preventing deer-vehicle collisions? (*Please check ☑ all that apply.*)

n = 1,621	**yes**	**no**
❑ Michigan Department of Transportation	30.5	69.5
❑ Michigan Department of Natural Resources	53.0	47.0
❑ Michigan Secretary of State	8.8	91.2
❑ Office of Highway Safety Planning	33.6	66.4
❑ Local police or sheriff	8.9	91.1
❑ County governments	13.6	86.4
❑ Drivers	64.2	35.8
❑ Unsure	16.4	83.6
❑ Other (please specify) _____		

Appendix G (cont'd.)

Your Involvement in Deer-Vehicle Collisions

Please respond to the following questions regarding your most recent deer-vehicle collision in which you were the driver. **If you have never been involved in a deer-vehicle collision as a driver, please check here ❑ and skip to question 18 on the following page.**

12. Was the deer-vehicle collision reported to the police? ***(Please check ☑ only one response.)*** n = 284 DVCs, 88 over 5 yrs ago;196 w/in 5 yrs

❑ Yes
❑ No ➡

n = 278
Yes = 51.4
No = 48.6

12a. ***If no*, what was the main reason you chose not to report the collision?** ***(Please check ☑ only one response.)*** n = 130

❑ Not enough time	6.9
❑ Did not think it was necessary	71.5
❑ Believed it would affect your driving record	2.3
❑ Believed you would get a ticket	0.8
❑ Other (please specify)	18.5

13. Was the deer-vehicle collision reported to your insurance agency? ***(Please check ☑ only one response.)***

❑ Yes
❑ No ➡

n = 275
Yes = 55.6
No = 44.4

13a. ***If no*, what was the main reason you chose not to report the collision?** ***(Please check ☑ only one response.)*** n = 110

❑ Not enough time	1.8
❑ Did not think it was necessary	37.3
❑ Believed it would affect your insurance rates	13.6
❑ Other (please specify) _____	47.3_____

14. Were there any personal injuries to you or any one else as a result of the deer-vehicle collision? ***(Please check ☑ only one response.)***

n = 274

❑ Yes	0.4
❑ No	98.5
❑ Unsure	1.1

15. Which of the following best describes why you were driving at the time of the deer-vehicle collision? ***(Please check ☑ only one response.)***

n = 275

❑ Driving to or from work	40.4
❑ Running errands	14.5
❑ Visiting family or friends	17.1
❑ Vacationing	14.9
❑ Other (please specify) _____	13.1 _____

16. At the time of the collision, what type of vehicle were you driving? ***(Please check ☑ only one response.)***

n = 274

❑ 4-door/2-door passenger vehicle	57.7
❑ Mini –van	9.9
❑ SUV/Pickup truck	24.8
❑ Truck – non tractor trailer	4.0
❑ Tractor trailer	1.5
❑ Other (please specify) _____	2.2 _____

17. Do you believe the collision could have been prevented if you did any of the following things? ***(Please check ☑ all that apply.)***

	n	yes	no
❑ Braked	271	2.2	97.8
❑ Swerved	271	0.7	99.3
❑ Drove more slowly	271	10.3	89.7
❑ It could not have been prevented	271	78.6	21.4
❑ Unsure	271	7.0	93.0
❑ Other (please specify) _____			

Sources of Information

The following questions will help us understand which sources you would like to use to gather information about deer and transportation issues.

19. Do you read a daily newspaper? ***(Please check only ☑ one response.)***

n = 1,602

❑ Yes	62.6
❑ No ***(If no, please skip to question 20)***	37.4

20. What is the name of the daily paper (if any) you use the most to get news about wildlife and wildlife management issues?

Name of the paper: _____ n = 942 _____ no response = 61 __

20. From which sources would you like to get information focused on reducing deer-vehicle collisions? ***(Please check ☑ all that apply.)***

- ❑ Newspaper ➡ **Newspaper name** 598 n = 1,591 yes = 47.0 no = 53.0
- ❑ Magazine articles ➡ **Magazine name** 152 n = 1,591 yes – 14.4 no = 85.6
- ❑ Brochures ➡ **Location where you would pick up a brochure (e.g., grocery store)** 282 n = 1,591 yes = 26.8 no = 73.2
- ❑ Driver's education classes n = 1,591 yes = 20.7 no = 79.3
- ❑ Billboards n = 1,591 yes = 26.6 no = 73.4
- ❑ Friends n = 1,591 yes = 9.0 no = 91.0
- ❑ Unsure n = 1,591 yes = 13.0 no = 87.0
- ❑ Not interested n = 1,591 yes = 11.9 no = 88.1
- ❑ Other (please specify) _____

Background Information

In order for us to more fully understand people's responses to the previous questions, we need to know a few things about your background. Remember that your responses are **completely confidential** and that neither your name nor your address will be directly linked to your responses in any way.

21. Approximately how many miles per week do you drive for work? ***(Please include mileage for getting to work and mileage for getting back home, plus any driving you do for work.)***

__n = 1,408 Mean (std. dev.) = 156.27 (217.81) _____ Miles

22. Approximately how many miles per week do you drive for personal (non-work) reasons? n = 1,565 Mean (std. dev.) = 102.19 (101.53) _____Miles

23. What type of vehicle do you drive regularly?

Make _____

Model _____

24. How many years have you lived in your current county of residence? _____ Years

25. In what type of area do you live? ***(Please check ☑ only one response.)***

- ❑ Rural 36.5 n = 1,629
- ❑ Urban 16.0
- ❑ Suburban 43.5
- ❑ Other (please specify) 4.0 _____

Appendix G (cont'd.)

26. Are you:

❑ Male	46.7	n = 1,635
❑ Female	53.3	

27. In what year were you born? 19__ n = 1,602 mean age (std. dev.) = 47.85 (15.45)_____

28. What is the highest level of formal education that you have completed? ***(Please check ☑ only one response.)*** n = 1,637

❑ Less than high school	3.3
❑ High school graduate or equivalent	18.8
❑ Some college	23.3
❑ Associate's degree	6.8
❑ Technical/vocational	6.2
❑ College graduate (Bachelor's or 4 year degree)	21.9
❑ Graduate or professional degree	19.7