



OHIO STATE
HIGHWAY PATROL
Research Brief

Wrong-Way Crashes on Divided Roadways



June 2013



Executive Summary

The Ohio State Highway Patrol research brief “Wrong-Way Crashes on Divided Roadways” provides important information regarding wrong-way crashes that occurred on Ohio’s divided roadways from January 2011 through April 2013. The analyses and results contained in this report are aimed at expanding our understanding of the driving behaviors, personal factors, and other circumstances related to the dangers posed by wrong-way drivers on Interstates and other high-speed roadways. This report is offered as a tool to assist law enforcement planners, legislators, engineers, and all motorists as they take measures to guard against the tragic outcomes that may be caused by wrong-way driving. Notable findings of the study include:

- The 60 wrong-way crashes identified and analyzed in this study resulted in 31 fatalities and 85 non-fatal injuries. Nearly half (48%) of these fatalities were passengers in the wrong-way vehicle or occupants of another vehicle;
- While 37% of wrong-way crashes were fatal, only 0.35% of all crashes on Ohio roadways during the reporting period were fatal. This suggests wrong-way crashes were over 100 times more likely to involve a traffic fatality than all crashes that occurred in the state;
- More than half (58%) of wrong-way drivers were suspected of alcohol or drug impairment at the time of the crash, a rate that is 12 times higher than all at-fault drivers involved in crashes in Ohio during the time period. Further examination of the relationship between impaired driving and wrong-way driving revealed that:
 - At least one in four wrong-way drivers (25%) had at least one OVI conviction prior to the wrong-way crash, with nearly 70% of these drivers having multiple prior OVI convictions;
 - The majority (70%) of wrong-way crashes during the hours of 6:00 pm to 5:59 am were caused by OVI drivers. However, the majority (82%) of wrong-way crashes during the hours of 6:00 am to 5:59 pm were caused by drivers not suspected of OVI;
 - All wrong-way crashes (100%) during Summer months and most crashes (57%) during Winter months were caused by OVI drivers;
 - Female wrong-way drivers were as likely to be OVI (61%) as male drivers (62%);
 - Most (83%) wrong-way drivers age 55 and younger were suspected of OVI at the time of the crash. Conversely, the majority (88%) of drivers age 56 and older were not suspected of operating a vehicle while impaired during the wrong-way crash;
- 93% of wrong-way crashes involved the wrong-way driver’s vehicle and at least one additional vehicle;
- Wrong-way crashes occurred most often (62%) on an Interstate Route, followed by State Routes (23%) and US Routes (15%);
- More than four out of five (81%) wrong-way crashes occurred during nighttime hours;
- Over half (62%) of wrong-way drivers were age 45 or younger at the time of the crash. Additionally, more than half (57%) of wrong-way drivers were male drivers.



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Introduction

In 2009, a wrong-way crash on the Taconic State Parkway in New York resulted in 8 fatalities and garnered national media attention to the prevalence and potential causes of wrong-way driving behavior. Unfortunately, Ohio has experienced a number of notable wrong-way crashes on major roadways in recent years as well. For example, on March 2, 2012 a wrong-way driver on I-75 in Wood County crashed head-on into another vehicle, taking the lives of three members of a local sorority. On December 23 of the same year, an alcohol-impaired wrong-way driver on I-75 in Warren County crashed head-on into another vehicle, killing three adults and a child, and seriously injuring four young passengers in a vehicle traveling in the correct direction. Among those killed were both parents of the injured juveniles.

Although these types of crashes do not occur particularly often, the above examples illustrate much greater potential for severe outcomes compared to most other types of crashes: consider that two vehicles moving toward one another at 65 mph have a combined speed of 130 mph, resulting in a very high force of impact should they meet head-on. Moreover, when the high speeds are combined with low-light (nighttime) conditions and other factors such as impaired driving, the chance of drivers being able to take evasive action in time to avoid full impact is greatly reduced. Because wrong-way drivers pose such a significant risk to other motorists, Ohio legislators recently proposed a bill that seeks to impose harsher penalties on those guilty of this offense.¹

The purpose of the current report is to identify common features of wrong-way crashes, and to provide law enforcement with information about these crashes and the wrong-way drivers who cause them. This report summarizes data from 60 wrong-way crashes that have occurred on divided roadways throughout Ohio.

Identifying Wrong-Way Crashes

Researchers utilized the State's official electronic crash repository² to conduct a series of exploratory data searches for wrong-way crashes occurring from January 2011 through April 2013. Until recently, Ohio's statewide uniform crash report (OH-1) did not include a means for capturing data on wrong-way crashes; therefore manual processes were utilized to identify crashes to be included for analysis. Further, although the recently updated crash form does provide investigating officers a cause code for wrong-way crashes, there appears to be little consistency thus far in how the code is actually used (e.g., many crashes coded as "wrong-way" were determined by researchers to be "left-of-center" crashes). Researchers applied a range of search parameters to produce a limited set of several thousand crashes to review. They then read report narratives for each of these crashes to verify whether it was a wrong-way crash. A basic web search of media outlets was also conducted for any additional wrong-way crashes not identified using the methods described. In total, researchers identified 90 wrong-way crashes that occurred from January 2011 through April 2013. Of the 90 total wrong-way crashes, 30 took place either on one-way city streets, or on undivided roads (on which the wrong-way driver traveled for an extended period of time in the wrong lane). To further establish the criteria that define wrong-way crashes for analysis purposes, the pool of eligible crashes was limited to those that occurred on divided roadways (i.e.,

¹ Ohio Senate Bill 77, 130th General Assembly

² Ohio Department of Public Safety (ODPS) Electronic Crash Record system



roads with a physical barrier between opposite lanes of travel). This decision resulted in a final sample of 60 wrong-way crashes that are analyzed in the current report.

Data Overview

Variables included in investigative crash reports drove the majority of analyses contained in this report. Researchers also manually coded several variables based on crash report narratives (e.g., suicide, pursuit). If the additional variables could not be determined from crash report narratives they were coded as negative. The majority of these wrong-way crashes were either not hit/skip incidents (88%) or were solved hit/skips (i.e., the at-fault driver was later identified and apprehended; 5%). However, 7% of these wrong-way crashes (n=4) were unsolved hit/skips, thus some data from these crashes was unavailable.

Ohio Bureau of Motor Vehicle (BMV) driving records were obtained for 51 of the 60 wrong-way drivers included in the analysis. There were four wrong-way drivers involved in unsolved hit/skip crashes (thus the wrong-way driver was never identified). Additionally, five wrong-way drivers with a non-Ohio operator’s license did not have records on file with the Ohio BMV. This resulted in a final sample of BMV records for 51 wrong-way drivers. From the BMV history for these 51 drivers, researchers coded the number and type of convictions that occurred any time prior to the wrong-way crash as well as specifically in the 3 years prior to the wrong-way crash.

Overall, nearly all (98%) of the 60 wrong-way crash narratives gave no indication of suicide as a motivation for the wrong-way driver’s actions, while only one report narrative (2%) suggested the driver may have been suicidal. Moreover, most wrong-way drivers (98%) were not fleeing from law enforcement, but one wrong-way driver (2%) may have been engaged in a pursuit at the time they entered the wrong direction of traffic. Collectively, these results on suicide and pursuit suggest that most of the wrong-way crashes included in this analysis likely resulted from unintentional entries to the wrong side of traffic from an exit ramp, or a side road.

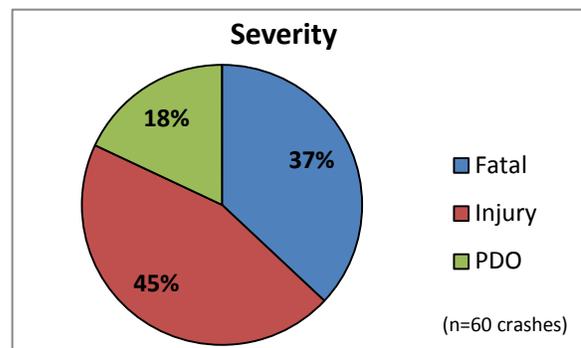
The following analysis of variables is presented in three sections: crash level, wrong-way driver, and OVI specific analyses.

Crash Level Analyses

Researchers examined multiple variables related to wrong-way crashes, including when and where the crash occurred; crash severity; and other factors.

Crash Severity

Over one-third (37%) of wrong-way crashes resulted in one or more fatalities. Nearly half (45%) were injury crashes, and the remaining 18% were considered property damage only (PDO). Across all 60 wrong-way crashes on divided roadways, there were 31 fatalities and 85 persons who sustained non-fatal injuries.



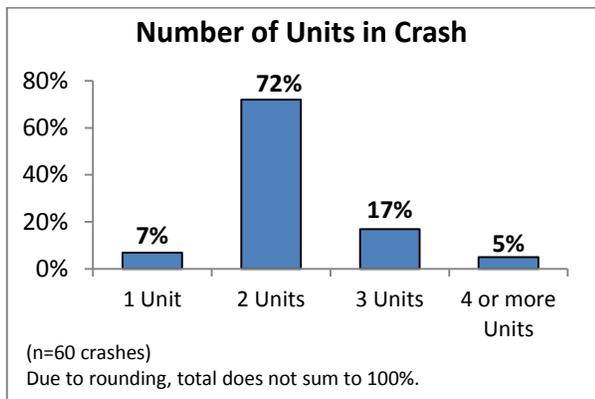
As a comparison, there were over 600,000 crashes throughout Ohio during the same time frame (January 2011 through April 2013). While well under one percent of all crashes were fatal, 37% of wrong-way crashes



analyzed were fatal. This fact helps to illustrate that although wrong-way crashes are uncommon they are much more likely to be fatal, and further examination is needed to identify commonalities that may be addressed by law enforcement, engineers, law-makers, etc.

Number of Vehicles

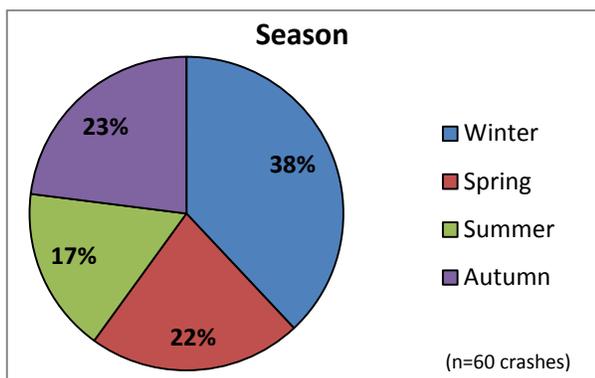
The majority (72%) of wrong-way crashes involved 2 vehicles. Less than one-fifth (17%) involved 3 vehicles, and only 5% involved 4 or



more units. Finally, only 7% of wrong-way crashes involved just one vehicle (i.e., the wrong-way driver's vehicle).

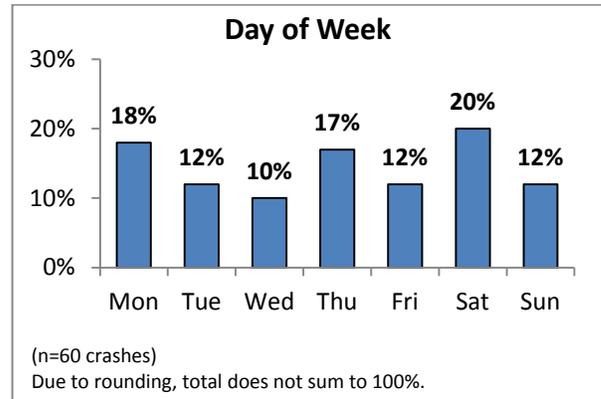
Season, Day of Week, and Time of Day

In addition to the aforementioned analyses, it is also important to examine when the wrong-way crash occurred to see if there are commonalities across crashes.



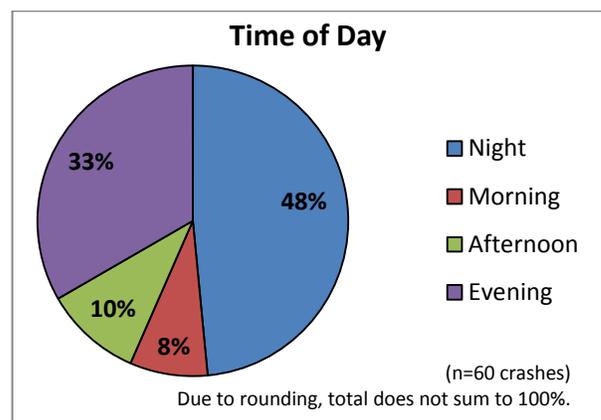
More than one-third of crashes (38%) occurred during the Winter months

(December through February). Approximately equal numbers of wrong-way crashes occurred during Spring (22% in March through May) and Autumn (23% in September through November). The least common time for wrong-way crashes (17%) was during the Summer months (June through August).



The most common days of the week for wrong-way crashes were Saturday (20%) and Monday (18%), while the least common day was Wednesday (10%). However, there was no clear pattern of wrong-way crashes occurring on a particular range of days (e.g., week days vs. weekends).

The final variable relating to when the wrong-way crashes occurred was time of day. Nearly half (48%) of wrong-way crashes happened over night (12:00 am to 5:59 am). One-third (33%) of crashes were during the evening hours (6:00 pm to 11:59 pm). Comparatively fewer wrong-way crashes

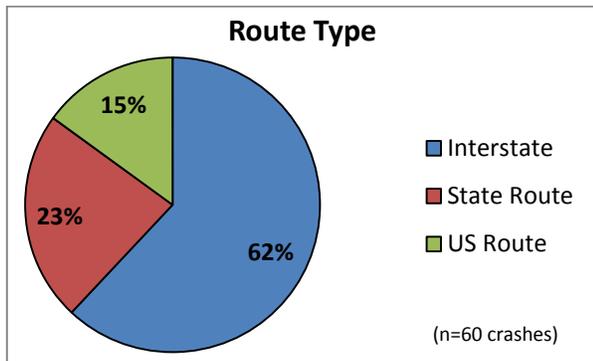




occurred during the morning (8%; 6:00 am to 11:59 am) or afternoon (10%; 12:00 pm to 5:59 pm) hours.

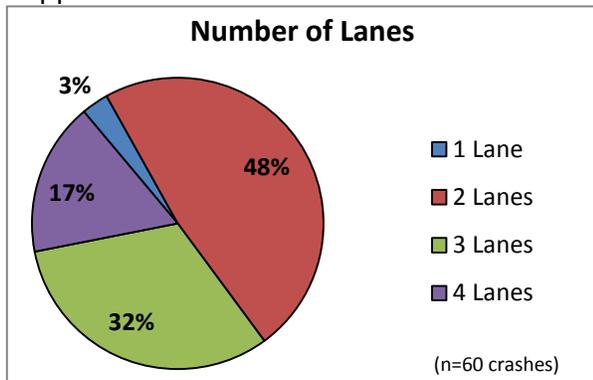
Road Type and Location

Another set of factors researchers examined related to the location where the wrong-way crashes occurred. As previously discussed, all wrong-way crashes in the current report occurred on divided roadways. Over half (62%) of these crashes occurred on an Interstate Route, while a smaller number of crashes happened on a State Route (23%) or US Route (15%).



Additionally, just over half (55%) of wrong-way crashes were in urban (incorporated) areas, while the remaining 45% were in rural (unincorporated) areas.

Researchers also analyzed the number of lanes on the side of the divided roadway where the crash occurred. Nearly half of crashes (48%) occurred on a portion of roadway with two lanes traveling in the same direction. Almost one-third (32%) of crashes happened where there were 3 lanes on that

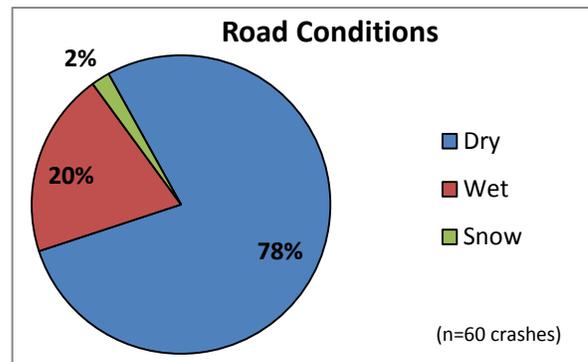


side of the divided roadway. Only 17% of crashes were on 4-lane roadways, and the remaining 3% of wrong-way crashes occurred on a divided roadway with only a single lane of traffic in that direction (e.g., exit ramp).

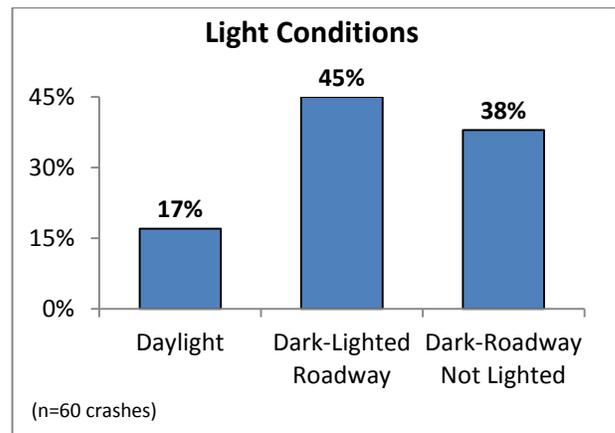
Finally, it should be noted that the majority (98%) of crashes did not occur in a marked construction zone. Only one crash report (2%) indicated the crash happened in a work zone, specifically in the activity area.

Road and Light Conditions

Researchers examined the road conditions at the crash scene. The majority (78%) of wrong-way crashes were on dry roads. One-fifth (20%) of crashes happened on wet roads, and only 2% of crashes were on roads with snow.



The majority of wrong-way crashes occurred in the dark, either on a lighted roadway (45%) or unlighted roadway (38%). Only 17% of crashes had daylight marked as the primary light condition. These findings are





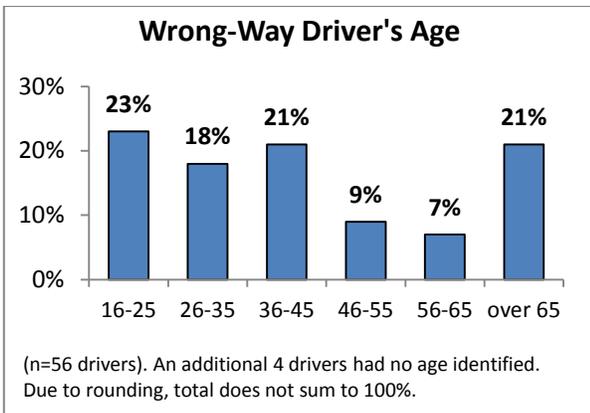
consistent with the majority (81%) of wrong-way crashes occurring during the evening and overnight hours.

Wrong-Way Driver Analyses

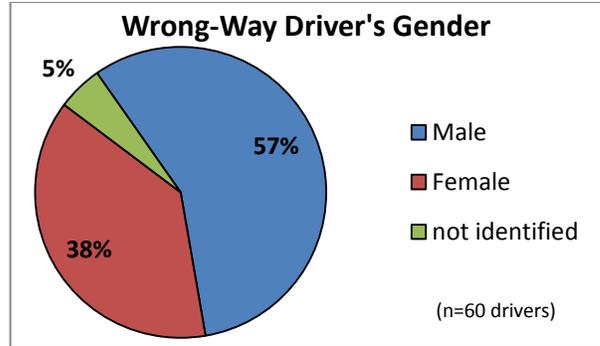
Researchers coded and analyzed a range of characteristics related to wrong-way drivers. Personal and crash-specific demographics were obtained from crash reports, and BMV conviction histories were also obtained for most of the wrong-way drivers. As discussed previously, there were four unsolved hit/skip crashes in the data set. Thus, some of the person level variables for these four crashes are unknown or were left blank on the crash report. Analysis sample is denoted in each figure.

Wrong-Way Driver Demographics

Of the 56 drivers with an age identified on the crash report, over half (62%) were age 45 or younger at the time of the crash.

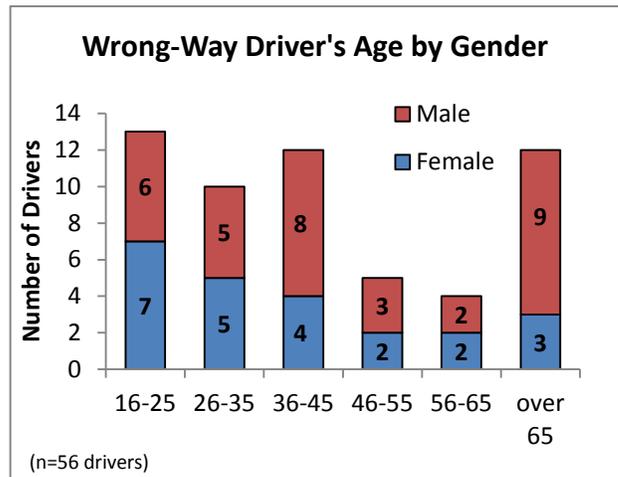


Specifically, 23% of drivers were 16 to 25 years old, 18% were 26 to 35 years old, and 21% were 36 to 45 years old. A smaller number of wrong-way drivers were ages 46 to 55 (9%) or 56 to 65 (7%). However, more than one-fifth (21%) of wrong-way drivers were over the age of 65. By comparison, only 7.5% of all crashes during the reporting period were caused by drivers over 65 years old.

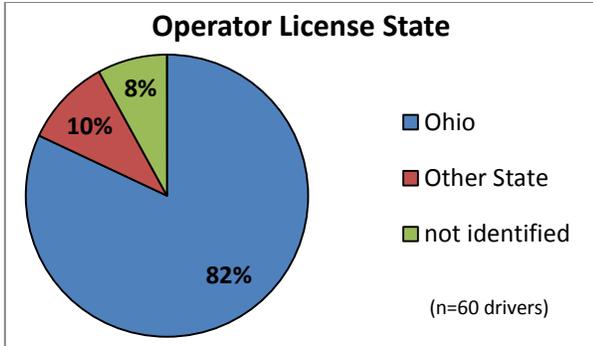


More than half (57%) of wrong-way drivers were male. Over one-third (38%) were female, and gender was not identified for 5% of drivers (i.e., unsolved hit/skip crashes).

Researchers examined the interaction between age and gender for those 56 wrong-way drivers for whom both age and gender data was known. Specifically, only in the youngest age group (ages 16-25) were there more female wrong-way drivers than males (7 vs. 6). In all other age groups, numbers of male drivers either equaled or exceeded numbers of female wrong-way drivers. In the most pronounced example, 75% of wrong-way drivers over age 65 were male.



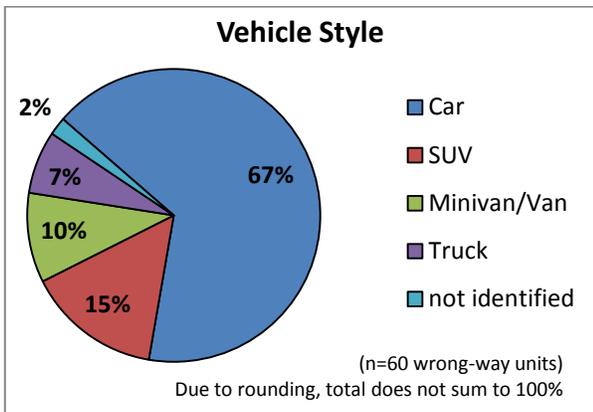
The majority (82%) of wrong-way drivers had an operator's license issued from Ohio. Only 10% of drivers had a license issued from another state (including Michigan, Illinois, Indiana, and Pennsylvania). The license-



issuing state could not be determined for the remaining 8% of wrong-way drivers (i.e., 4 were drivers from unsolved hit/skip crashes; 1 driver did not have an operator’s license from any state).

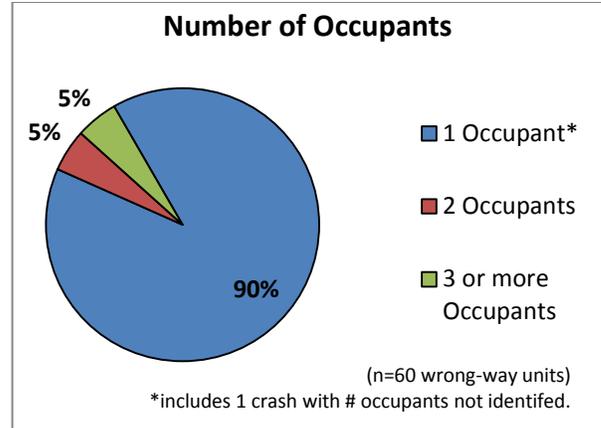
Vehicle Style and Occupants

Researchers examined two variables related to the at-fault vehicle in the wrong-way crashes: the vehicle style for the wrong-way driver, and the number of occupants in the wrong-way driver’s vehicle.



The majority (67%) of wrong-way drivers were operating a passenger car. Considerably fewer wrong-way drivers were driving an SUV (15%), mini-van or van (10%), or pickup truck (7%). One unit’s vehicle style (2%) was not identified.

The majority (90%) of wrong-way drivers had only 1 occupant (i.e., themselves) in the vehicle at the time of the crash. Only 5% of wrong-way drivers had 2 occupants in their vehicle, and 5% had 3 or more occupants in their vehicle at the time of the wrong-way

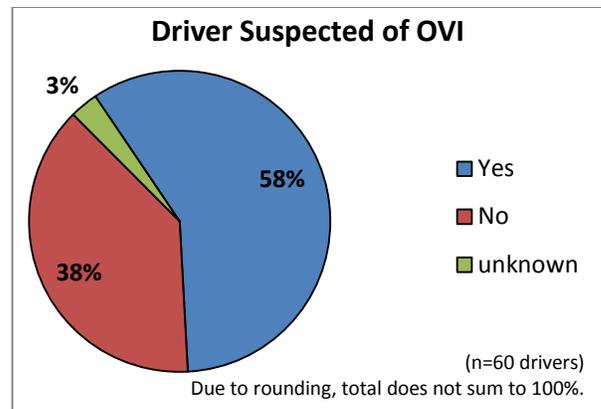


crash. In total, there were 72 total occupants in the 60 wrong-way vehicles. Of the 12 passengers in wrong-way vehicles, 2 passengers sustained fatal injuries, and 5 passengers had non-fatal injuries.

By comparison, these 60 wrong-way crashes involved an additional 74 units (not at-fault) that contained a total of 107 occupants. These individuals from not-at-fault vehicles suffered 51 non-fatal injuries and 13 fatalities. Thus, roughly half of those killed in wrong-way crashes (52%) were the wrong-way drivers themselves, while the other half (48%) were their passengers or occupants of other vehicles.

OVI Status at Wrong-Way Crash

Nearly three out of five (58%) wrong-way drivers were suspected of operating a vehicle



while impaired by alcohol and/or drugs (i.e., OVI) at the time of the wrong-way crash. Over one-third (38%) were not suspected of OVI,

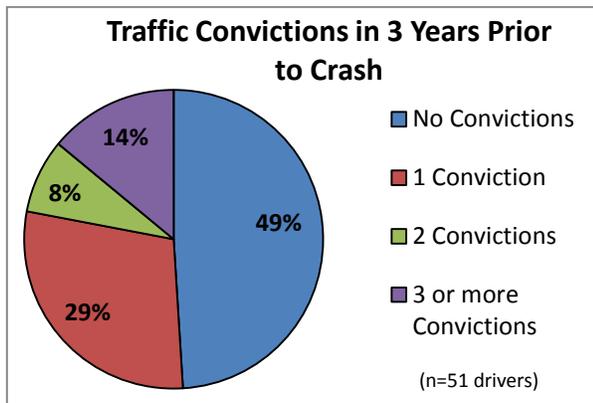


and the OVI status was unknown for 3% of wrong-way drivers.

As a comparison, less than 5% of all crashes in Ohio during the reporting period were caused by an OVI driver. Thus, wrong-way crashes were much more likely to be caused by an impaired driver.

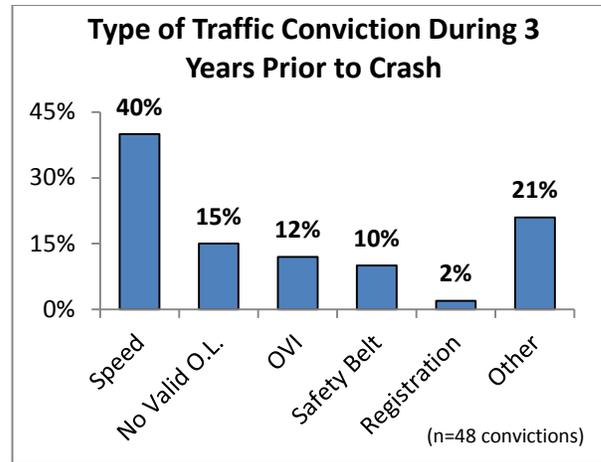
Prior Traffic-Related Convictions

As previously mentioned, Ohio BMV driving records were obtained for 51 wrong-way drivers (85% of all wrong-way drivers in the current report). Of these drivers, over half (51%) had at least one traffic-related conviction during the three years prior to the crash. In particular, 29% had 1 conviction, 8%



had 2 convictions, and 14% had 3 or more convictions in the three years preceding the wrong-way crash. The remaining 49% had no convictions on their driving record in the three years prior to the wrong-way crash.

Overall, there were 26 wrong-way drivers who had a combined total of 48 convictions in the three years before the wrong-way crash. Of these 48 convictions, researchers analyzed the type of conviction. Specifically, 40% were speed-related convictions; 12% were for OVI; and similar numbers of convictions were for not having a valid operator’s license (15%) or safety belt violations (10%). Two percent (2%) were for vehicle registration violations, while the remaining 21% of convictions were for another offense (spanning 8 different types of



traffic-related convictions). Although driving records clearly indicated prior number and type of convictions, researchers were unable to determine suspensions in place at the time of the wrong-way crash (e.g., driving under suspension).

Researchers were also interested in the number of OVI convictions that occurred any time prior to the wrong-way crash. Of the 51 wrong-way drivers with available driving records, 25% of wrong-way drivers (i.e., 13 drivers) had at least one OVI conviction sometime prior to the wrong-way crash. Of these 13 drivers, 85% were also suspected of OVI at the time of the wrong-way crash. The table below shows the OVI status of wrong-way drivers by the number of their prior OVI convictions.

Number of Prior OVI Convictions by OVI Status at Wrong-Way Crash		
# Prior OVI Convictions	OVI at Crash	Non-OVI at Crash
None	21 drivers	17 drivers
1 Prior OVI	3 drivers	1 driver
2 Prior OVIs	5 drivers	None
3 Prior OVIs	2 drivers	None
4 Prior OVIs	1 driver	1 driver

(n=51 drivers)

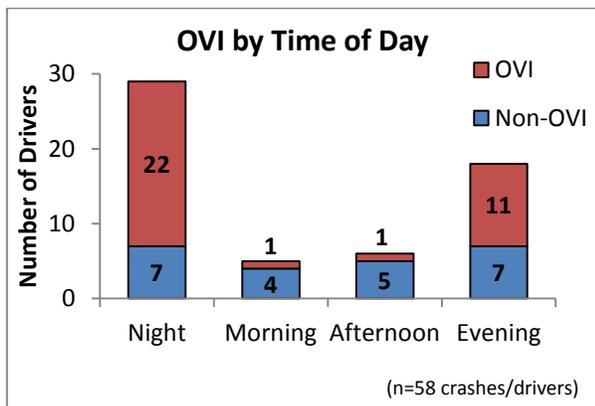


OVI Specific Analyses

Because over half (58%) of wrong-way drivers included in this analysis were suspected of OVI at the time of the wrong-way crash, it is important to consider how driver impairment interacts with the other variables analyzed. For example, is the most common time of day for wrong-way crashes the same for OVI drivers versus non-OVI drivers? This section summarizes findings from a series of analyses examining OVI status across other crash and driver characteristics.

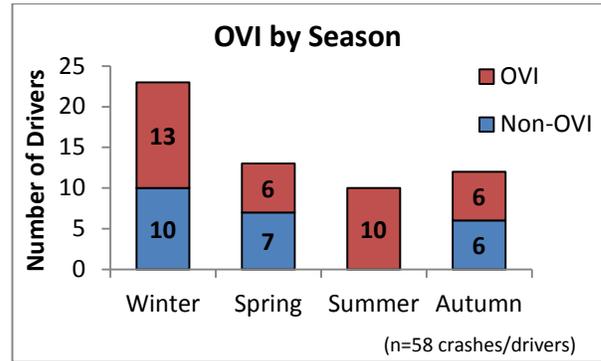
OVI Status by When the Crash Occurred

Among the 58 crashes and drivers with complete data for OVI status and time of day, the majority of wrong-way crashes during the morning (80%) and afternoon (83%) were caused by drivers who were not alcohol- or drug-impaired. Conversely, the majority of crashes in the evening (61%) and night (76%) were caused by drivers suspected of OVI. Thus, crashes in the daylight hours were less likely to be caused by an OVI driver, while crashes during the dark were more likely to be caused by an impaired driver.



Researchers also discovered notable findings when examining the OVI status of drivers and season in which the wrong-way crash occurred. Half (50%) of wrong-way crashes during Autumn were caused by an impaired driver. Likewise, nearly half (46%) of

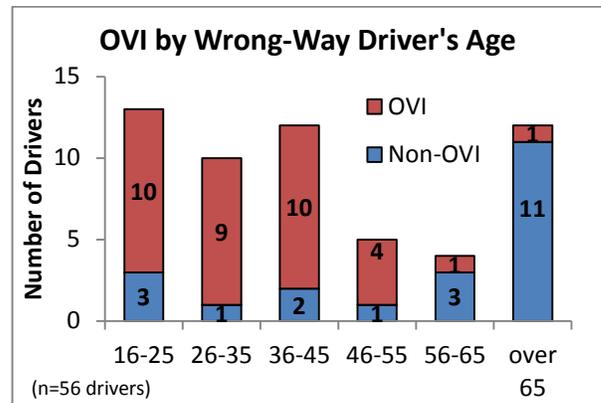
Spring crashes and just over half (57%) of Winter crashes were caused by an OVI driver.



However, all (100%) of the wrong-way crashes during Summer were caused by an OVI driver.

OVI Status by Wrong-Way Driver Demographics

Researchers also examined OVI status of the wrong-way driver by their age. Among the 56 drivers for whom researchers had age and OVI status data, the majority of wrong-way drivers ages 16-25, 26-35, 36-45, and 46-55 were impaired when they caused the crash. However, the majority of older age groups (i.e., 56-65, over 65) were not operating a vehicle impaired.

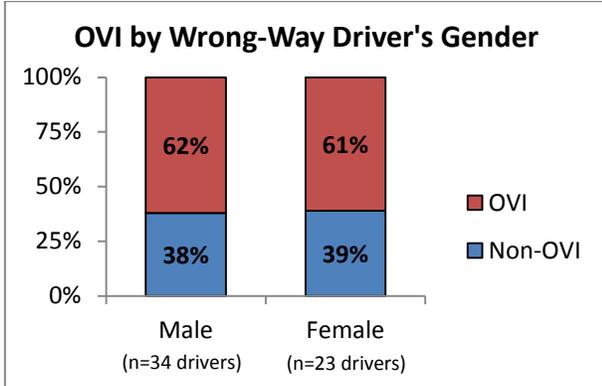


Thus, the majority (83%) of wrong-way drivers age 55 and younger were suspected of operating a vehicle while impaired. However, the majority (88%) of drivers age 56 and older were not suspected of OVI.

Another notable finding emerges when we consider OVI status by gender of the wrong-way driver. Across the 57 drivers with gender



and OVI status data, the majority (62%) of male wrong-way drivers were suspected of OVI at the time of the crash. A nearly identical amount (61%) of female drivers were also

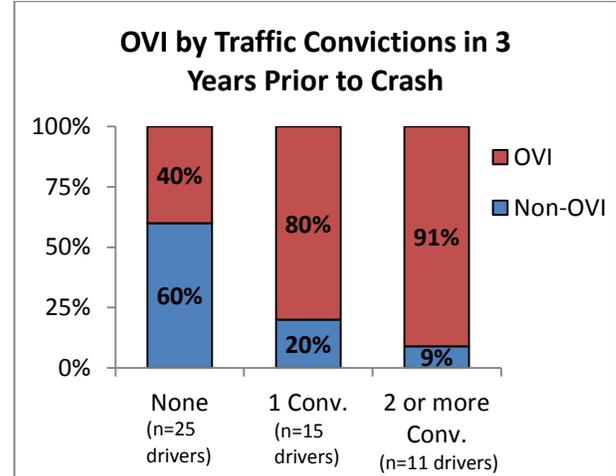


suspected of operating a vehicle while impaired. Conversely, over one-third of male (38%) and female (39%) drivers were not suspected of OVI at the time of the crash. Thus, male wrong-way drivers were as likely as female wrong-way drivers to be operating a vehicle while impaired at the time of the crash.

OVI Status by Prior Traffic-Related Convictions

Finally, researchers examined the number of traffic-related convictions that drivers had in the 3 years prior to the wrong-way crash by their OVI status at the time of the crash. The majority (60%) of wrong-way drivers without any convictions in the 3 years preceding the crash were not OVI at the time of the crash. However, the majority of drivers with 1

conviction (80%) and 2 or more convictions (91%) during the 3 years prior to the crash were suspected of OVI at the time of the wrong-way crash.



Among these 51 drivers for whom we have driving records, the 32 OVI wrong-way drivers had a combined total of 42 traffic-related convictions on their driving records in the three years prior to the crash. By comparison, there were 6 total convictions during that time frame for the 19 drivers who were not OVI at the crash. On average, OVI wrong-way drivers had 1.3 convictions in the three years prior to the crash, while non-OVI wrong-way drivers had an average of 0.3 convictions in the three years preceding the crash.

Conclusion

Although they do not occur especially often, wrong-way crashes – particularly those on Interstate Routes and other high-speed, divided roadways – are typically severe and result in the death or injury of innocent victims. This analysis has revealed a strong association between wrong-way driving and impaired driving. Increased enforcement efforts; stronger punitive measures; engineering strategies; public education and awareness; and new legislation aimed at reducing alcohol- and/or drug-impaired driving may prove to be effective means for simultaneously combatting wrong-way driving.