The Effect of Passenger Age and Gender on Young Driver Crash Risks

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ABSTRACT

This paper studied the effect of passenger age and gender on young driver fatal crash risk using police-reported crash data in Louisiana from 1999 to 2004. Young drivers were divided into three age groups: 16, 17, and 18-20 by gender. Passengers were grouped into 15-17 and 18-20 years of age by gender. A series of analyses of young drivers and young passengers were conducted to study their risks of being involved in fatal crashes. Relative risks and crash rates were used to measure crash risk. The analyses followed step by step disaggregation of driver/passenger characteristics, including the number of passengers, passenger age, and passenger age and gender for each driver age and gender group. It was found that young drivers are negatively impacted by young passengers, especially from their own peer age groups. However, the presence of adult passengers reduces their crash risks. 16 and 17 year old drivers have similar risk patterns that are much higher and different to those of 18-20 year old drivers. 16 and 17 year old drivers are associated with the highest crash risks when driving with their same gender and age group passengers, with male to male driver-passenger combination having higher risk than female to female driver-passenger combination. As age progresses, crash risk differences between male and female young drivers also increase.

INTRODUCTION

Transportation is the number one cause of injury and death for people from 15 to 19 years of age (*1*). Young drivers have much higher crash rates than older drivers. This is particularly true for 16-17 year old drivers no matter what denominator is used in calculating the crash rate (e.g. population, number of licensed drivers, and vehicle-miles-traveled) (*2-5*). Young drivers have a higher propensity to crash at night time (*2, 6*), with passengers (*2, 7*), particularly with passengers of the same age (*4, 7, 8*), and with alcohol consumption (*2, 9*), just to name a few contributing factors. To reduce teen crash rates, many states have adopted graduated driver licensing (GDL) programs. Recently, there has been considerable research on 16-17 year old drivers, especially on the safety effect of number of passengers, passenger age, and passenger gender. Many researchers have used national databases such as the Fatality Analysis Reporting System (FARS), and the General Estimates System (GES) (*2, 6, 10, 11*). Quite a few have used state level data (*12, 13, 14*).

Chen et al. (*6*) used trip-based relative risks to study the effect of the number of passengers on fatal crashes among 16 and 17 year old drivers. Passengers were classified into 3 age groups: 13-19, 20-29, and 30 years of age or older. They found that the risk of death increased significantly for 16 and 17 year old drivers transporting passengers irrespective of the time of day and male drivers were at greater risk. For 16 or 17 year old drivers, the relative risk of death per 10 million trips increased as the number of passengers increased, with 17 year old drivers having higher rates than 16 year old drivers.

Using a quasi-induced exposure technique, Aldridge et al. (*14*) studied the effect of passengers on young driver accident propensity from the police-reported crash data in Kentucky from 1994 to 1996. Young drivers aged 16-20 were used in the analysis. Passengers were classified into three groups: solo (no passengers), peer, and adult or child. They found that young drivers had an increased propensity to cause single-vehicle accidents when traveling with peers, and they had the lowest propensity to cause single- or two-vehicle crashes when traveling with either adults and/or children. In the study, individuals between 12 and 24 were considered peers to a young driver. To classify the passenger group as peer, all passengers in the vehicle had to be between these ages.

Williams and Wells (*4*) found that more teenage passenger deaths occur in vehicles with 16 year old male and female drivers than for any other age among teenagers, and that these drivers also had the greatest rate of teenage passenger deaths in their vehicles, both per licensed drivers and per mile driven, compared to older teenage drivers.

Preusser et al. (*7*) also applied the quasi-induced exposure method to study the effect of teenage passengers on the fatal crash risk of teenage drivers. Teenage drivers from 16-19 years of age were included in the analysis. They found that the relative risk of fatal crash involvement was particularly high for teenage drivers traveling, both day and night, with two or more teenage passengers. The age of the teenage passengers was not specified in the paper.

Knowledge of the impact of different genders among young drivers and passengers is quite limited. Chen et al. (*6*) found the presence of male passengers greatly increased death rates for both male and female drivers. Others have also observed that the presence of young males is associated with unsafe driving practice for teenage drivers in general (*2, 9, 15, 16, 17*). Rolls and Ingham (*18*) found that the presence of women or parents positively impacted young male drivers. Simons-Morton et al. (*16*) found that the presence of a female teenage passenger resulted in low risk driving behavior among teen male drivers. Williams (*2*) pointed out that young male teens transporting female passengers was associated with low crash risk.

The brief review indicates that while there have been numerous studies in the area of young drivers, few have studied the effect of age and gender among young passengers and drivers in a comprehensive way. Many of the conclusions were drawn at aggregate levels and need to be explored at more disaggregate levels. First of all, driver and passenger age groups have tended to be too aggregate. For example, some studies have aggregated drivers to an age group from 16 to 20 years of age. For passengers, the aggregation has tended to be even greater. For example, Aldridge el al. (*14*) considered passengers 12-24 years old as peer groups. Others simply used teenagers. However, as pointed by Williams (*2*), crash rate comparisons can vary tremendously depending on how young drivers are grouped. Second, study on the impact between young drivers and young passengers in terms of different combinations of age and gender is particularly limited. For example, a comprehensive study of crash risks should ideally include the following combinations of driver and passenger genders across age groups:

- male drivers and male passengers,
- male drivers and female passengers,
- male drivers and mixed gender passengers,
- female drivers and male passengers,
- female drivers and female passengers, and
- female drivers and mixed gender passengers.

The objective of this paper is to analyze youth crash risks under different driver/passenger age and gender combinations, as shown above. Only fatal crash results are discussed in this paper. First, a comprehensive design of young driver/passenger age groups is conducted based on the incidence of crashes involving passengers of different age groups. Then, a series of analyses of driver and passenger populations are conducted to study the risks of being involved in fatal crashes when driver and passenger ages and genders are taken into account. The study follows step by step disaggregation of the driver/passenger characteristics, including number of passengers, driver/passenger age, and driver/passenger age and gender.

DATA AND METHODOLOGY

Police-reported crash data from 1999 to 2004 in the state of Louisiana were used in this study. It is well known that crash data depend heavily on the subjective judgments of the police who attempt to reconstruct the crash after the fact, and are sometime incomplete and inconsistent (*19*). However, the information used in this study, such as driver and passenger age and gender for fatal crashes, are expected to be reliable. Young drivers were defined as being from 16-20 years of age. There are 274,376 crash records involving young drivers that were used in this study. 98 percent of the young drivers were driving passenger cars, light trucks/pickups, or vans. Because 15 year olds are not allowed to drive unsupervised in Louisiana and they have very few crashes, they were not included in the study.

Louisiana's GDL program has been in effect since the beginning of 1998 (*20*). The crash data in this study were from 1999 to 2004, and would thus include the impact of GDL. The minimum age to have a learner's license in Louisiana is 15 with the requirement of adult supervision at all times. Provisional licenses may be issued at 16 with restrictions on unsupervised driving from 11 p.m. to 5 a.m. until the age of 17. No passenger restrictions are required. At age 17 a full license can be granted with a good record.

Crash risk is measured either by crash rate or relative crash risk in this study. Crash rate is defined as the number of fatal crashes per 100,000 licensed drivers and are used to measure the propensity of young drivers to be involved in motor vehicle crashes. Relative crash risk is defined as the ratio of the crash rates between the group of interest (for instance young drivers stratified by age and gender) and a reference group (for instance drivers 21 years and older). However, to reduce the difference in driving exposure, crash rates are normalized by dividing the crash rates when driving alone before calculating the relative crash risk, as will be explained later. Confidence intervals were calculated by the substitution method described by Dale (*21*).

ANALYSIS

Identifying Driver and Passenger Age Groups

In this study, the grouping of young drivers is based on several considerations, including the similarity of age, gender, driving behavior, crash rates, license and alcohol restrictions, as well as the ability to conveniently define passenger groups. From the data it is observed that 16-17 year old drivers are the most vulnerable to crashes and behave very differently from 18-20 year old drivers. In addition, there are behavioral differences between 16 and 17 year old drivers. Among the 16-17 year old drivers involved in crashes from 1999 to 2004, 16 year old drivers accounted for 37%, and 17 year old drivers for 63% of all crashes. There are approximately equal numbers of drivers who are 18, 19, and 20 years of age. Given the above information, it was decided to divide young drivers into 16, 17, and 18-20 years of age. Such division also facilitates the selection of passenger groups discussed below.

Figure 1 presents the passenger age distribution by driver age for young drivers who were involved in crashes. The diagram shows that the majority of the passengers are of similar age to the driver in each age group. For 16 and 17 year old drivers, 15-17 year olds are the top three passenger age groups. Passengers from these three years account for about 79 percent and 68 percent of the total passengers in figure 1 for 16 and 17 year old drivers respectively. For 18-20 year old drivers, 18-20 year olds are the top three passenger age groups. Passengers from 18-20 account for about 57% of the total passengers in figure 1 for 18-20 year old drivers. As a result, young passengers are divided into two age groups, namely, 15-17 and 18-20 years of age.

Young Driver Relative Crash Risk by Number of Passengers

To analyze the young driver relative crash risk by number of passengers, the crash rates with zero, one, two, and three or more passengers per 100, 000 licensed drivers for 16, 17, and 18-20 year old drivers were first calculated. However, such crash rates may be impacted by the degree of exposure. For example, the analysis of crash rates showed that 18-20 year old drivers have higher fatal crash rates per 100,000 licensed drivers than 16 and 17 year old drivers when driving alone. This does not necessarily mean that 16 and 17 year olds are safer drivers, as indicated by many studies. Instead, this may be due to the fact that 16 and 17 year old drivers drive less than 18-20 year old drivers, resulting in lower exposure. To reduce the impact of exposure when comparing the crash risks with different passengers, the crash rates with passengers for each age group are normalized by taking the ratio of the crash rates with passengers and those without passengers for each age group. Finally, the relative crash risks with passengers for each age group are calculated by taking the ratios of the normalized values for each age group and the normalized values for 21+ year old drivers. The normalization removes the exposure differences with respect to driver age and taking the normalized values of 21+ drivers as reference provides a

comparison of relative risks across different age groups. The relative fatal crash risks by number of passengers are presented in figure 2. Note that the relative risks for all drivers without passengers and for 21+ drivers are one, indicating that the risks are relative to when drivers of each age group driving alone and are compared with drivers of 21+ years of age. The 95 percent confidence intervals are presented by solid lines in figure 2. As can be seen, the confidence intervals are not symmetric and are long on the right-end side. Passenger ages are not taken into account. The following observations can be made regarding figure 2:

1. Young drivers (both 16-17 and 18-20) have significantly higher crash risks than adult drivers (21+) when passengers are present, as indicated by the relative risks greater than one.
2. 17 year old drivers have slightly higher risks than 16 year old drivers when there are one or two passengers. However, when there are three or more passengers, 17 year old drivers have a clearly higher relative risk to 16 year old drivers. This is in agreement with the findings from Chen et al. (6).
3. 16 and 17 year old drivers have much higher crash risks than 18-20 year old drivers when passengers are present. For example, on average, the relative crash risk for 16 and 17 year old drivers is 1.5 times that for 18-20 year old with one or two passengers, and 1.8 times that with three or more passengers.
4. The relative crash risks increase as the number of passengers increases for young drivers. This increase reaches a peak when there are two passengers for 18-20 year old drivers. However, the increase continues for 16 and 17 year old drivers as the number of passengers increases from two to three or more. This observation is corroborated by the findings of Chen et al. (6). Moreover, the rate of increase is much higher for 16 and 17 year old drivers than for 18-20 year old drivers. This seems to indicate that the 16 and 17 year old drivers are more negatively impacted by the presence and by increased number of passengers than 18-20 year old drivers. Since the fatal crash rates for adults decrease slightly as the number of passengers increases (*2*) and most passengers for 16 and 17 year old drivers are from their peer age group, this suggests that passenger restrictions for drivers of this age group has a great potential to save lives. Chen et al. (*11*) found that even with a low compliance scenario, in which only 20% of 16-17 year old drivers and their passengers obey the passenger restrictions by either driving alone or with an adult as a passenger, a 7% reduction in road user deaths is likely given an equal proportion of driving alone and driving with an adult as a passenger.

The above analyses are relative to the crash rates when drivers from each age group drive without passengers. Actual crash rates for each driver age group without passengers are presented in figure 3 along with their 95 percent confidence intervals in solid lines.

It can be seen from figure 3 that when passengers are absent, young driver fatal crash rates per 100,000 licensed drivers are much higher than that of adult drivers. Notice that 16 and 17 year old drivers have lower crash rates than 18-20 year old drivers. However, the work of Williams (2003) indicated that without passengers, 16-17 year old drivers have a higher crash rate than 18-19 year old drivers, a conclusion that seems contradictory to the result here. The difference lies in the fact that Williams used the number of crashes per 10,000 trips, while this study used the number of crashes per 100,000 licensed drivers. It is very likely that 16 and 17 year old drivers drive less than 18-20 year old drivers, and hence have lower exposure. As a result, using the number of licensed drivers as the denominator to calculate the crash rate will result in a lower crash rate for 16 and 17 year old drivers than when the number of trips is used. Nonetheless, adult drivers drive significantly more than young drivers, and hence have higher exposure. Therefore, crash risks for young drivers driving alone may be underestimated using

crash rates per 100,000 licensed drivers if the degree of exposure is accounted for. This conclusion may lead to even higher crash risks for young drivers than observed from figure 2.

Figure 4 presents a trend analysis of number of passengers for young drivers involved in traffic crashes from 1999 to 2004. For each year, the percentages of crashes with zero, one, two, and three or more passengers were first calculated. Then the percentages for 1999 were set as 100% and the values for the rest of the years were calculated and given in figure 4. The results demonstrate that for young drivers who were involved in crashes from 1999 to 2004 in Louisiana, the percentage of young drivers driving alone had decreased, while driving with passengers had increased. The increase of driving with multiple passengers outgrows the increase of driving with one passenger. During this period, there was less than one percent decrease in the number of licensed young drivers. If this increase is representative of the overall young driver population, this will likely lead to more crashes, and hence more loss of life and property, according to the above analyses.

Young Driver Relative Crash Risk by Passenger Age

The above analysis only included the number of passengers but disregarded the impact of passenger age. Conclusions from this may be misleading. For example, the impact of the presence of adult passengers is different from that of teenage passengers (*12, 14*). The impact of passenger age on the relative crash risks for young drivers is analyzed next. The relative risks are calculated in a similar manner to earlier to reduce the impact of exposure. The normalization is done by dividing the crash rates per 100,000 licensed drivers with different passenger age groups with those without passengers. Then the relative crash risks for different drivers with different passenger age groups are obtained by taking the ratios of the normalized values for each young driver and passenger group and the normalized values for 21+ year old drivers. Figure 5 presents the relative risks for young drivers with passengers of different age groups. Note that the relative risks for all drivers without passengers and for 21+ drivers are one. The 95 percent confidence intervals are shown in solid lines. The following observations can be made from figure 5:

1. The presence of adult passengers (21+) is associated with the lowest crash risks for young drivers, with relative risk values considerably lower than one. This shows that this group of otherwise high risk drivers have the lowest crash risks with adult presence. This observation is supported by the findings from Aldridge et al. (14). The relative crash risks are 0.19, 0.67, and 0.76 for 16, 17, and 18-20 year old drivers. This result seems to indicate the benefit of adult presence in reducing teen crash risk, especially for 16 year old drivers.
2. For young drivers, having 15-17 year old passengers are associated with the highest crash risks. The risks decrease as the driver age increases from 16 to 17. There is a sharp decrease as the driver age increases to 18-20 years of age. Having 18-20 year old passengers are associated with higher risks compared with adult passengers. Among young drivers, 16 year old drivers have the lowest relative risk with 18-20 year old passengers, while 17 and 18-20 year old drivers have higher and similar crash risks with 18-20 year old passengers.
3. 17 year old drivers seem to be in transition from 16 to 18-20 year old drivers in terms of crash risk with passenger age groups. On one hand, they have similar (though slightly lower) relative crash risk than 16 year old drivers when 15-17 year old passengers are present; on the other hand, they have similar relative crash risk as 18-20 year old drivers when 18-20 year old passengers are present.

4. There is a cross age group impact that is associated with increased crash risks among young drivers and young passengers. However, the impact is not symmetric. 15-17 year old passengers have a much stronger negative impact on 18-20 year old drivers than 18-20 year old passengers on 16 year old drivers. For example, the negative impact of 15-17 year old passengers have on 16 year old drivers is 3.9 times as strong as on 18-20 year old drivers. In contrast, the negative impact of 18-20 year old passengers have on 18-20 year old drivers is only 1.7 times as strong as on 16 year old drivers.

Again, if the fact that young drivers have higher risks than adult drivers when driving alone is taking into consideration, the above analysis of young driver crash risks should be even higher.

The degree of exposure may play an important role in the values of relative risk. For example, the low crash risk values associated with adult passengers may be due to fewer teens driving with adults as passengers than adults driving with adults as passengers. However, these low risk values can be erroneously interpreted as young drivers drive safer than adults when adults are present. Since crash records only record conditions prevailing at a crash, there is no way to determine behavior outside the crash environment. For this reason, the results of crash data must be interpreted correctly and within context. For example, universally, statistics show that most crashes occur close to home. This is because we are more likely to be found close to home than elsewhere, and not that the home environment is dangerous. Similarly, degree of exposure can affect relative risk but it tends to affect the magnitude rather than the incidence. For example, a low crash risk driver will have a low risk of having a crash close to home; however, the risk of having a crash will still be higher close to home than elsewhere. Similarly, the magnitude of the difference in relative risk in the figures may be affected by degree of exposure, but the existence of the trend is likely to remain.

Young Driver Crash Risk by Age and Gender of Young Passengers

Incorporating passenger age into the analysis made it possible to identify the positive effect of adult presence and the negative effect of young passengers, particularly the impact from the same age groups and cross age groups; not just simply the number of passengers. However, the analysis so far has not taken into account the effect of driver and passenger genders. This omission may also result in misleading conclusions. For example, the impact of a 16 year old female passenger may be very different from that of a 16 year old male passenger. It has been found that the latter has a strong negative impact on the crash risks of young drivers (*2*). Next, the impact of both age and gender of young passengers on the crash risks of young male and female drivers is explored.

In the following analysis, only crashes with passengers from one age group (either 15-17 or 18-20) are selected; crashes with passengers from cross age groups are excluded. The purpose is to better identify the crash risk impact of age and gender among young people. Drivers are divided into male and female, while passengers are divided into male only, female only, and both male and female, according to their age groups. Since young drivers driving alone and adult drivers are no longer included in the analysis, crash rate per 100,000 licensed drivers is used to represent crash risk instead of relative crash risk that has been used so far. Fatal rash rates for 16, 17, and 18-20 year old male and female drivers are presented in figure 6 along with the 95 percent confidence intervals given by solid lines. The following observations can be made:

1. In terms of driver age (charts a through f), 16 and 17 year old drivers have similar fatal crash rate patterns and total crash rates. However, they have very different and much higher risk patterns than 18-20 year old drivers.
2. In terms of driver gender (charts a through f), male drivers are associated with higher crash rates than female drivers. This is true when drivers are having same, opposite, and mixed gender passengers and with both age groups. However, as age progresses, the crash rate differences between male and female drivers becomes more and more prominent.
3. In terms of passenger age (from charts a through f), drivers with their peer age group passengers are associated with higher crash rates than with passengers from the other passenger age group.
4. In terms of passenger gender (charts a through f), 16 and 17 year old drivers are associated with the highest crash rates when passengers of the same gender from their peer age groups are present. However, this is not the case for 18-20 year old drivers, as will be discussed shortly. It is not clear from the police-report data whether this is due to high exposure or high crash risk. With opposite gender or mixed gender passengers, young drivers are in general associated with lower crash rates. This confirms the finding from Simons-Morton et al. (16) that the presence of a female teenage passenger resulted in low risk driving behavior among teen male drivers. However, the result contradicts the findings from Chen et al. (6) that the presence of male passengers greatly increases death rates for both male and female drivers since the crash rates for female drivers with male passengers are among the lowest for 16 and 17 year old drivers (charts b and d).
5. For 16 year old drivers (charts a and b), both male and female drivers are associated with the highest crash rates when their same gender and peer age group passengers are present, with male drivers having higher crash rates than female drivers (19.7 vs. 15.1). The crash rate for 16 year old male drivers with female peer age group passengers is much higher than 16 year old female drivers with male peer age group passengers (7.4 vs. 1.3). When both male and female peer age group passengers are present, 16 year old male and female drivers have similar crash rates (3.7 vs. 3.8). For 16 year old male drivers, having both male and female peer age passengers is associated with a substantially decreased crash rate from when only their male peer age passengers are presnt (from 19.7 to 3.7). In contrast, for 16 year old female drivers, this is associated with a substantially increased crash rate from when only their male peer passengers are present (from 1.3 to 3.8). 18-20 year old passengers are associated with low crash rates. This is probably because it is not common for 16 year old drivers having 18-20 year old passengers.
6. For 17 year old drivers (charts c and d), their crash rates with 15-17 year old passengers are much smaller than 16 year old drivers, while the crash rates with 18-20 year old passengers increase. This is probably because 17 year old drivers are more likely to have 18-20 year old passengers than 16 year old drivers do. However, in terms of total fatal crash rate for both age groups passengers as a whole, 17 year old male driver crash rate is higher than that of 16 year old male drivers (37.4 vs. 34.5) with an increase of 8.4 percent, while 17 year old female driver crash rate is lower than 16 year old female drivers (18.1 vs. 21.3) with a decrease of 15.0 percent. This indicates that when young passengers are present, 17 year old females are safer drivers than their 16 year old countpart, while 17 year old males drive more dangerously than their 16 year old counterpart. Furthermore, crash rate for 17 year old male drivers with both male and female peer age passengers are more than doubled that for 16 year old drivers (from 3.7 to 8.9), while crash rates for 17 year old female drivers with both male and female peer age group passengers

decreases by almost half (from 3.8 to 1.7). This seems to indicate the increased risk for 17 year old male drivers with mixed gender peer age passengers and reduced risk for 17 year old female drivers with mixed gender peer age passengers.

7. For 18-20 year old drivers (charts e and f), their crash rates are much smaller and crash rates with their peer age group are higher than with the other age group. Another noticeable change is the large crash rate difference between male and female drivers. Total crash rates with all young passengers are 25.5 for male drivers and 4.1 for female drivers, a ratio of 6.2 times, while for 16 and 17 years old drivers, the ratios are only 1.6 and 2.1 respective. The large crash rate difference between 18-20 year old male and female drivers is probably due to the aggressive driving behavior of 18-20 year old male drivers, while, in contrast, the similar crash rates between 16 and 17 year old male and female drivers is probably because both male and female drivers of this age lack driving experiences.

CONCLUSIONS

This paper studied the effect of passenger age and gender on young driver fatal crash risk using police-reported crash data in Louisiana from 1999 to 2004. A series of analyses of young drivers and young passengers were conducted to analyze their risks of being involved in fatal crashes when driver and passenger age and gender were taken into account. Young drivers were divided into three age groups: 16, 17, and 18-20 by gender. Passengers were first divided into 15-17 and 18-20 age groups and then further divided into male only, female only, and both male and female according to the age groups. To reduce the impact of driver exposure difference, relative risks are obtained by comparing the crash rates to when driving alone and to those of adult drivers. The relative crash risks for the different driver and passenger combinations were analyzed. The analyses followed step by step disaggregation of driver/passenger characteristics. Each step added a new dimension, such as age and gender. Each additional disaggregation enabled us to gain insights on the young driver crash risks that would not otherwise be available. Major findings from this study are summarized as follows:

1. Using relative crash risks based on the number of passengers alone may result in misleading conclusions. It is not the number of passengers, but who the drivers and passengers are that impacts young driver crash risks. Nonetheless, the analyses show that as the number of passengers who are primarily of the same age increases, crash risks increases, especially for 16 and 17 year old drivers; when adults are present, young drivers are associated with the lowest crash risks, especially for 16 year old drivers.
2. With respect to the impact of passenger age and gender, 16 and 17 year old drivers have similar crash risk patterns, with 17 year old drivers having higher overall crash risks than 16 year old drivers. However, 16 and 17 year old drivers have very different risk patterns and significantly higher crash risks than 18-20 year old drivers.
3. 16 and 17 year old drivers are associated with the highest crash risks when driving with their same gender peer age groups. Moreover, male to male driver-passenger combinations have higher crash risks than female to female driver-passenger combinations. These high risk combinations indicate the potential benefit of passenger restrictions on 16 and 17 year old drivers.
4. Young drivers are negatively impacted by young passengers, especially passengers from their peer age group. Cross age group impact is much smaller and non-symmetric. Passengers 15-17 years of age have a stronger negative impact on drivers 18-20 years of age than passengers 18-20 years of age on 16 and 17 year old drivers.

5. Young driver crash risk differences between male and female vary greatly as driver age changes. The gender differences are smallest for 16 year olds and largest for 18-20 year olds, with 17 year olds in transition between them. As age progresses, crash risks for female drivers continue to decrease, while crash risks for male drivers increase slightly as age progresses from 16 to 17, and then decreases sharply to 18-20 years of age.

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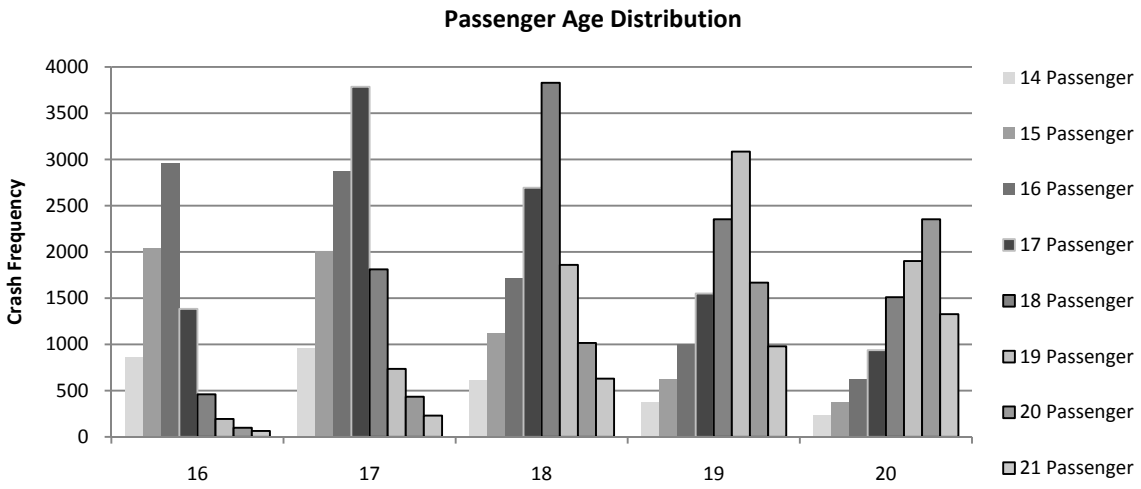

Figure 1 Passenger Age Distribution by Driver Age

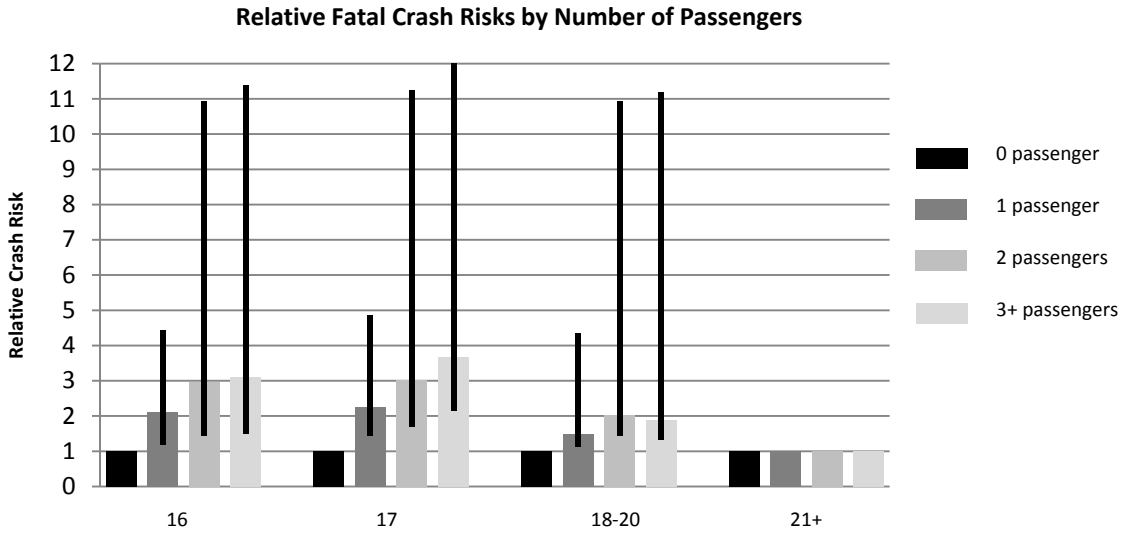

Figure 2 Young Driver Relative Fatal Crash Risks by Number of Passengers

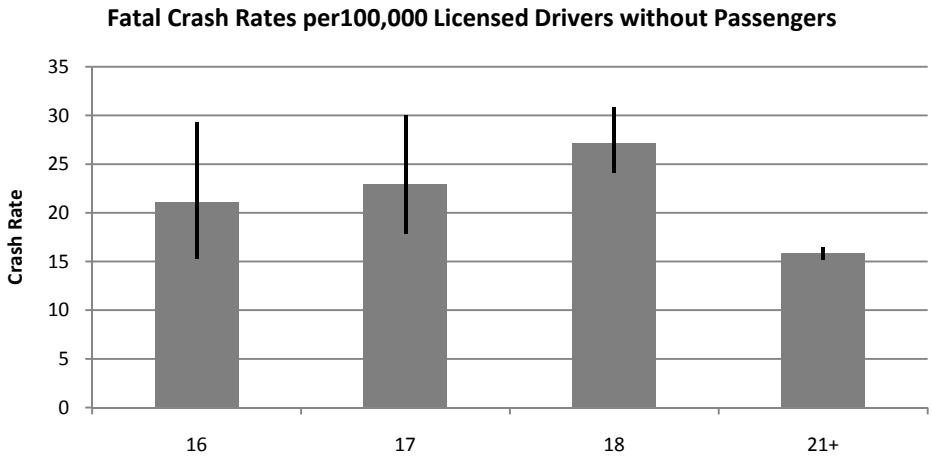

Figure 3 Fatal Crash Rates without Passengers by Driver Age

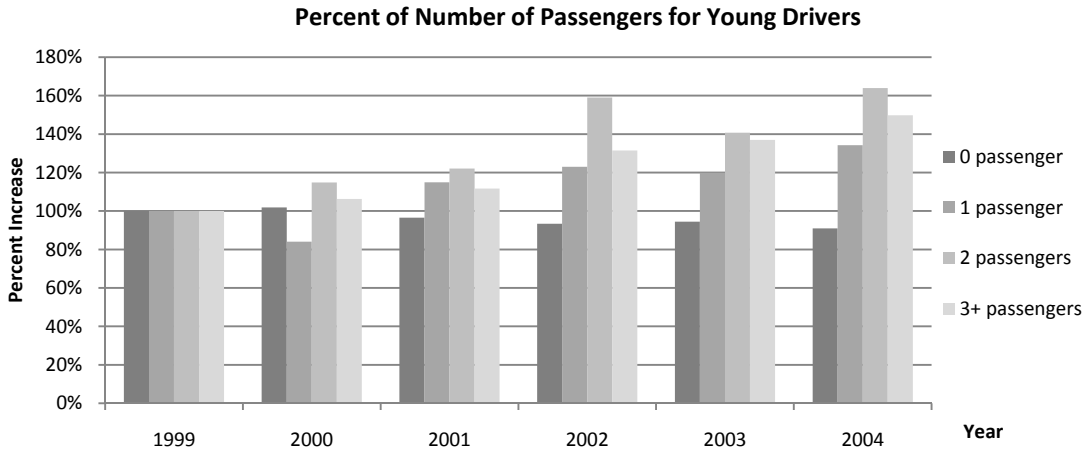

Figure 4 A Trend Analysis of Number of Passengers for Young Drivers 1999-2004

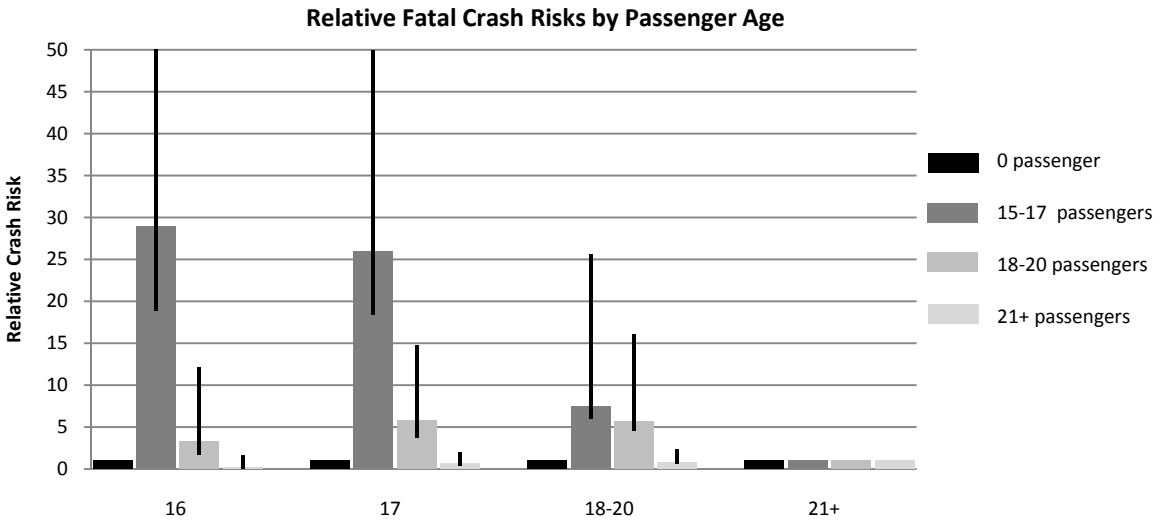

Figure 5 Relative Crash Risks by Passenger Age

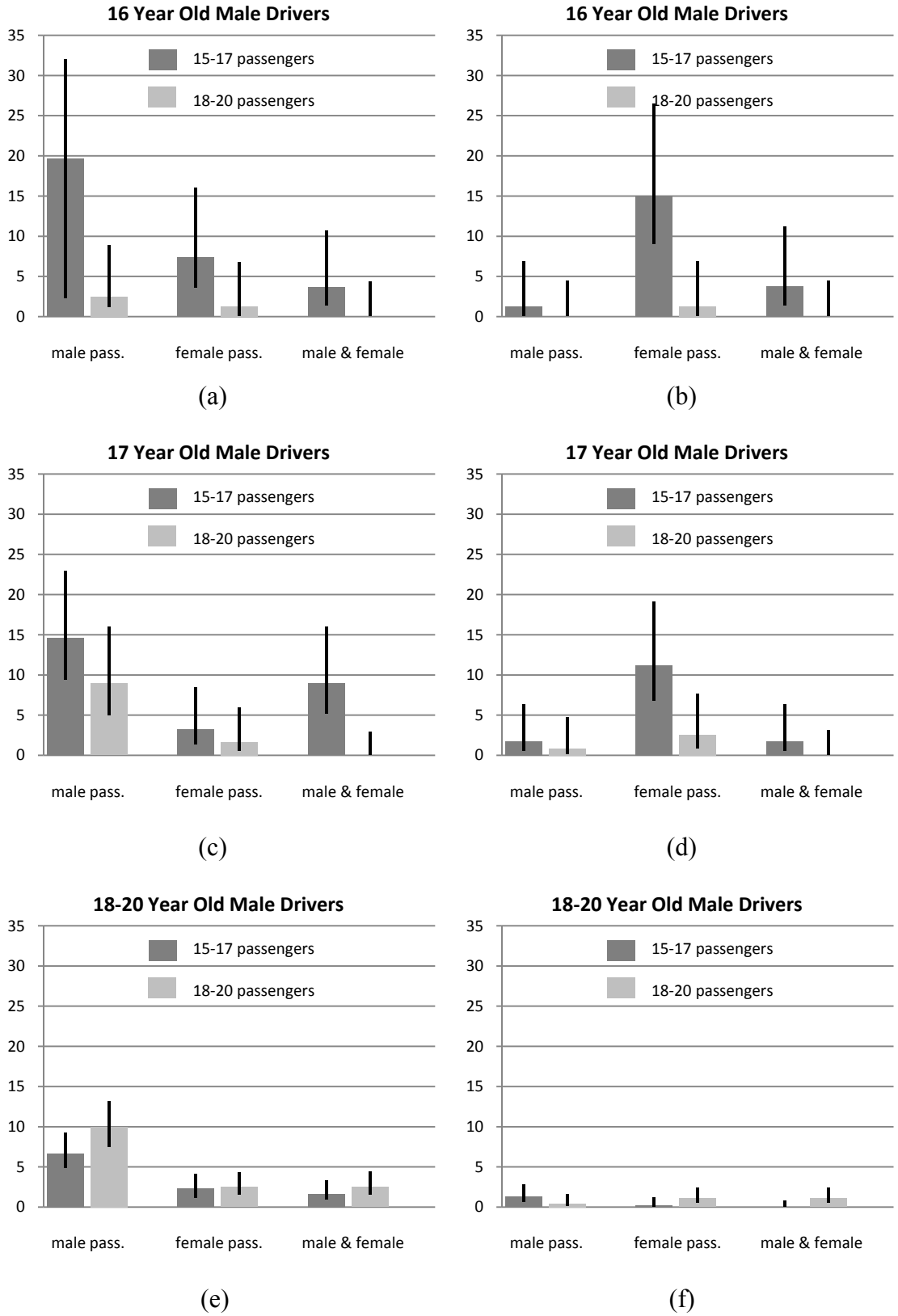

Figure 6 Fatal Crash Rates per 100,000 Licensed Drivers by Passenger Age and Gender