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Predictors of Car Crashes in Minorities and High Risk Groups

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UTCA Theme: Management and Safety of Transportation Systems

Prepared by

UTCA

University Transportation Center for Alabama
The University of Alabama, The University of Alabama at Birmingham, and
The University of Alabama in Huntsville

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- Diversity – develop students, faculty and staff who reflect the growing diversity of the US workforce and are substantively involved in the undergraduate, graduate, and professional programs of UTCA;
- Research Selection – utilize an objective process for selecting and reviewing research that balances the multiple objectives of the program;
- Research Performance – conduct an ongoing program of basic and applied research, the products of which are judged by peers or other experts in the field to advance the body of knowledge in transportation; and
- Technology Transfer – ensure the availability of research results to potential users in a form that can be directly implemented, utilized or otherwise applied.

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16. Abstract

The objective of this case-control study was to identify select demographic, driving habits and risk factors associated witl involvement in car crashes among young drivers. The sample consisted of 712 drivers aged 15-25 years who resided in Jefferson County, Alabama. The case group (N=212) was characterized as drivers who reported ever being involved in a crash during their lifetime. The control group (N=485) consisted of students with no history of motor vehicle crashes (M Results revealed that of the 16 variables found to be significant at the univariate level, only academic grade level, driving frequency, event prompt seatbelt use, smoking, drug and alcohol use, and driving under the influence were associated wit crash risk during multivariate analyses. In conclusion, we found youthful risk behaviors to be associated with other unhe practices, thus suggesting that these behaviors should not be viewed as exclusive, but part of a larger syndrome, which tal into account adolescent lifestyle factors. In relation to seatbelt usage among this population, more research is needed to b under the factors that predispose young drivers to wear seat belts.

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Executive Summary

The objective of this case-control study was to identify select demographic, driving habits and risk factors associated with involvement in car crashes among young drivers. The sample consisted of 712 drivers aged 15-25 years who resided in Jefferson County, Alabama. Subjects were identified and recruited from four high schools and one university. Those who agreed to participate in the study completed a seven-page questionnaire based in part on the 1999 Youth Risk Behavior Survey. Subjects were informed that their participation in the study was voluntary.

The case group (N=212) was characterized as drivers who reported ever being involved in a car crash during their lifetime. The control group (N=485) consisted of students who were not involved in a car crash. To identify the independent predictors of motor vehicle crash (MVC) involvement, we examined the univariate relationship between MVC involvement and select demographic, driving habits, and risk behaviors. All variables that were significant were then included in a multivariate logistic regression model.

Results revealed that of the 16 variables found to be significant at the univariate level, only academic grade level, driving frequency, event prompt seatbelt use, and rates of smoking, drug and alcohol use, and driving under the influence were associated with crash risk during multivariate analyses. Specifically, seniors in high school and college undergraduates were 1.8 to 3.1-times more likely to be in a MVC, respectively (p for trend <0.0009), compared to controls. Cases were 2.1-times more likely (OR=2.1, 95% CI 1.0-3.1) to report driving a car everyday as compared to controls. Subjects indicating that an event prompted their seatbelt use were 1.9-times (95% CI 1.2-2.9) the risk of MVC involvement. Finally, levels related to smoking (p for trend <0.006), using drugs (p for trend <0.008) and alcohol (p for trend <0.02), and driving under the influence (p for trend <0.0001) were significantly associated with MVC involvement.

In conclusion, we found youthful risk behaviors to be associated with other unhealthy practices, thus suggesting that these behaviors should not be viewed as exclusive, but part of a larger syndrome which takes into account adolescent lifestyle factors. In relation to seatbelt usage among this population, more research is needed to better under the factors that predispose young drivers to wear seat belts.

Car Crashes Among Youth

1.0 Introduction

In the United States, motor vehicle crashes (MVCs) are the leading cause of death among youth aged 10-24 years (Chen et al., 2000; Lyznicki et al., 1998; U.S. Department of Health and Human Services 2000). In 1998, approximately 3,427 drivers between the ages of 15 and 20 years were killed, and an additional 348,000 were injured in MVCs (U.S. Department of Health and Human Services 2000). Findings from the Insurance Institute for Highway Safety (2000) revealed that young drivers were four times as likely to be involved in a MVC, and for every young person killed in crash, 100 nonfatal injuries occurred. The National Highway Transportation Safety Administration (1999) documented that young drivers were not only involved in more MVCs than other age groups; they also received a substantial number of citations for traffic violations.

Because MVCs pose a significant health problem for beginner drivers (Chen et al., 2000; Lyznicki et al., 1998; U.S. Department of Health and Human Services 2000), more research is needed to better understand the factors associated with MVCs among this population. Studies have attributed youthful involvement in car crashes to their lack of driving experience, immature judgment, and risk taking behaviors (Arnett et al., 1997; Kim et al., 1995; O'Malley & Johnston 1999; Jonah 1986; Jonah 1990). A study conducted by Everett, Lowry, Cohen, and Dellinger (1999) utilized data from the 1995 National College Health Risk Behavior Survey to examine the relationship between substance use and behaviors that increased the risk for MVCs and crash-related injuries among a representative sample of undergraduate college students in private and public colleges and universities. Their results revealed that students who were substance users were more likely to behave in a manner that increased their risk for MVCs and injuries. Specifically, Everett and associates discovered that smokers, heavy drinkers, and illegal substance users were more likely to drive after drinking alcohol and ride with a driver who had been drinking alcohol, thereby increasing their chances of being in a MVC.

Similarly, a study examining the risky driving behaviors of teenagers aged 16-19 years in Gwinnett County, Georgia revealed that 63% of youth reported tailgating, 80% reported driving 20 miles per hour over the speed limit, and 91% reported entering an intersection when the light was about to turn red. Twenty-six percent of students surveyed reported passing in a no-passing zone, and 21% reported passing two cars at once on a two-lane road. Three behaviors appeared to be associated with risk for motor vehicle crashes: driving 20 miles per hour over the speed limit, passing a car in a no-passing zone, and taking risks while driving in traffic because it makes driving more fun. For these behaviors, differences were greatest among students who engaged in these behaviors six or more times during the three months preceding the survey (Gwinnett County Teen Traffic Tragedies Task Force 1994).

Clearly, the predictors of MVCs among youth warrant further attention. The aim of this paper is to explore the relationship between selected demographic factors, driving habits, and risk behaviors associated with MVCs among a sample of young drivers. It is our hope that the findings from this study will enrich the body of literature that is devoted to decreasing MVCs

among youth, and enable program planners and researchers to develop culturally-sensitive, age-appropriate, tailored interventions that will lower motor vehicle injury and death rates among beginner drivers.

2.0 Background

Road safety is largely dependent upon the way in which road users behave while operating their vehicles. Despite the fact that there is an overwhelming availability of traffic safety information and resources available to the public, motor vehicle crashes are the fifth leading cause of death in the United States (U.S.). Each year in the U.S., approximately 46,000 people die and 3,500,000 people are injured due to motor vehicle crashes (U.S. Department of Health and Human Services 1992). In the state of Alabama, traffic injuries account for more than 50% of injury-related deaths (Alabama Department of Public Health 1991). For example, in 1997, 1,190 Alabamians were killed in 1,047 fatal accidents, and among 197 automobile fatalities, 81.4% of Alabama drivers were not wearing seat belts. Moreover, one person is injured in a traffic crash every 10 minutes and 40 seconds, and a typical Alabama road user has a 38% probability of being injured or killed while driving an automobile during their lifetime (Alabama Departments of Public Safety, Education, Transportation, Economic and Community Affairs 1997). The field of transportation cannot be expected to combat this state and nation-wide problem alone because of the numerous extraneous factors involved in assessing road users' behaviors. However, greater road and safety improvements will occur when fields (i.e., education, medicine, psychology, sociology, etc) that are external to transportation become catalysts for change through collaboration and participation in innovative population-specific road safety programs.

2.1 African American Drivers

Motor vehicle related injuries continue to be of paramount importance to people between the ages of one and 19 years. During 1996, there were 6,323 U.S. occupant deaths among this age group alone. Up until now, traffic-related injuries and fatalities have been primarily reported and stratified by age and gender (Baker et al., 1998) and there has been little definitive research differentiating motor vehicle accidents by race. According to Baker, Braver, Chen, Pantula, and Massie (1998), not assessing racial and ethnic differences in amount of car travel and car ownership can possibly "obscure important differences in death rates per unit of travel" (p. 1209) because certain segments of the population may travel less frequently on the roadways, but they are at increased risk for car injuries when they do travel. For example, results of a study comparing 1989 with 1993 motor vehicle occupant death rates of teenagers and children by race, ethnicity, and sex revealed that occupant death rates per billion vehicle miles of travel were the following: 1) 14 for blacks and five for whites among children five to 12 years of age; and 2) 34 for blacks and 30 for whites among teenagers aged 13 to 19 years. Overall, black teenage males had the highest death rates [66] per billion vehicle miles of travel according to Baker et al., (1998). Moreover, it has been reported that blacks and males with limited education and income were at increased risk for both overall and injury specific youth mortality (Goldbaum et al., 1986). Various researchers (Goldbaum et al., 1986; Schichor et al., 1990) have found lower rates of seat belt and child restraint usage among black children and teenagers. Therefore, further research is needed to better understand the factors that contribute to elevated motor vehicle deaths rates among African Americans.

2.2 Teenage Drivers

Teenagers account for 10% of the U.S. population, 5% of all licensed drivers, and 3% of all vehicle miles traveled, yet this age group is involved in 15% of motor vehicle accidents (Insurance Institute for Highway Safety 1997). According to the literature (Insurance Institute for Highway Safety 1997), teenagers are four times as likely to be involved in a car crash than older drivers and for every young person killed in a crash, 100 nonfatal injuries occurred. For example, in 1997, there were 5,697 fatalities among teen drivers in the U.S. In Alabama, 36,185 teenage road users were involved in car crashes and 199 in fatal motor vehicle crashes (Alabama Departments of Public Safety, Education, Transportation, Economic and Community Affairs 1997; Insurance Institute for Highway Safety 1997). It has been reported that car injuries and deaths are common among this age group because of their lack of driving experience, willingness to engage in risk taking behaviors, and low rate of seat belt use (Baker et al., 1998; Jessor & Jessor 1977; Nelson et al., 1998; Oleckno & Blacconiere 1990; Carroll 1993). Although numerous educational programs and campaigns have targeted this segment of drivers, motor vehicle related crashes and injuries continue to increase. Therefore, more research is warranted in this area.

2.3 Risk Behaviors

Promoting responsible driving behavior is a challenge because road use behaviors are influenced by numerous variables. As a result, there is a need to assess the interrelatedness of factors that predispose individuals to engage in unsafe behaviors. Jessor and Jessor (1977) developed problem behavior theory to examine such issues. According to Caroll (1993), this theory has proven to be a useful framework when studying the co-occurrence of factors associated with adolescents involvement in drinking and driving, drug use, cigarette smoking, and other deviant acts. For example, Jessor and Jessor (1977) examined the applicability of this theory to the problem behaviors of young road users in traffic. Results revealed that driving intoxicated, taking risks for fun, smoking marijuana, and not wearing seat belts were associated with other problem behaviors (i.e., drug use and participation in delinquent acts). Similarly, Oleckno and Blacconiere (1990) discovered an inverse relationship between seat belt use and risk taking behaviors (i.e., drinking and driving, driving reckless, drug use, and cigarette smoking) in a cross sectional study of 1,077 university students. However, health-promoting behaviors were positively associated with seat belt usage. Based upon this information, there is a need to investigate the co-occurrence of problem behaviors and involvement in car accidents among minorities and other high-risk groups.

3.0 Methodology

3.1 Research Design

The sample was assembled for the purposes of a case-control study whose objective was to predict factors associated with MVCs among young drivers. The source for the sample consisted of self-reported young drivers in Jefferson County, Alabama. For the purposes of this study, we defined cases (N=212) as drivers who reported being involved in a car crash during their lifetime. Controls (N=485) were identified as those drivers never involved in a car crash during the same period. This study was approved by the Institutional Review Board for Human Use of the University of Alabama at Birmingham.

3.2 Research Procedure

The study employed a convenience sampling procedure to recruit young drivers in Jefferson County, Alabama. To accomplish this goal, a highly skilled community outreach coordinator contacted principals and university officials to explain the purpose of the study and secure permission to distribute the questionnaires at designated times and places. Students who chose to complete the surveys were informed orally and in writing that their participation was voluntary and anonymous. Our goal was to recruit and survey 600 youth in a five-month period beginning in November 1999 through March 2000. We succeeded in screening a total of 1,377 students and enrolling 712 subjects. Six hundred and sixty-five subjects were excluded from analysis because they did not complete the surveys.

3.3 Research Instrument and Variables

The seven-page survey that was distributed to the students was based in part on the 1999 Youth Risk Behavior Survey (Kann et al., 2000) and assessed the following demographic, driving habits, and risk factors in relation to MVC involvement. Demographic Factors – Eight questions elicited information pertaining to the respondent's age, race, gender, academic grade level, grade point average, employment status, place of residence, and intentions to further their education. Except for dichotomous inquiries, each item provided a range of possible responses relevant to the question at hand.

Driving Habits - Five questions were used to measure driving habits. The first two items assessed the frequency of their driving ("How often do you drive?" and "How many miles do you drive?"). The third question examined their seat belt usage ("How often do you wear your seat belt?"). The fourth item solicited information concerning car ownership ("Who owns the car you drive?"). Finally, students were asked to recall the total number of tickets they received during 1998-1999 ("How many tickets did you receive between 1998-1999?"). Additionally, driving habits were measured using responses from four dichotomous questions ("Have you ever: taken a driver education course, used a cellular phone while driving, received a ticket, and has an event prompted you to wear seat belts?"). One dichotomous question assessed motor vehicle crash involvement: "As a driver, have you ever been involved in a car crash?"

Risk Behaviors – Nine questions, anchored by the headings low (0-2), medium (3-19), and high (20+) assessed the level of students' involvement in risk behaviors. Specifically, students were asked, "During your life, how many times have you smoked cigarettes, used drugs, had at least one drink of alcohol, practiced unsafe sex, carried a weapon, gotten into fights, driven a car under the influence, drove or rode in a car without wearing seat belts, and rode a bike/motorcycle without a helmet?"

4.0 Project Findings or Results

4.1 Data Analyses

In order to examine the association between self-reported involvement in MVCs and selected demographic, driving habits, and risk behaviors, we estimated odds ratios (ORs) and 95% confidence intervals (CIs) using logistic regression analysis. As previously noted, cases (N=212) were characterized as drivers who reported ever being involved in a car crash during their lifetime. The control group (N=485) consisted of students who were not involved in a car crash. To identify independent predictors of MVC involvement, we first examined the univariate relationship between MVC involvement and selected demographic, driving habits, and risk behaviors. All variables that were significant at the α=0.05 level were then included in a multivariate logistic regression model. A test for linear trend was performed by entering a continuous value for the levels of the categorical variables in the logistic regression model. The significance values were based on Wald chi-square test statistics. All significance tests were two-tailed and statistical analyses were conducted using the SAS software.

4.2 Descriptive Results

Of the 712 drivers in this study, 56% were female and 44% were male. The mean age was 17 years. By class level, 0.7% were freshmen, 17.6% were sophomores, 40.7% were juniors, 34.6% were seniors, and 5.5% were college students. The racial and ethnic backgrounds of the respondents were as follows: 9.2% Caucasian, 86.9% African American, 2.5% Asian or Pacific Islander, Hispanic 0.9%, and 0.6% American Indian. A majority (92.5%) of respondents lived with their parents and 95.1% of participants had intentions to further their academic education. Forty-five percent of respondents had a grade point average of 2.0 to 2.9 on a 4.0 grading scale, 41.4% of participants were employed, and over half (52%) had taken a driver education course.

Sixty-nine percent of subjects indicated no history of an MVC, while 30% reported involvement in a car crash. Among drivers ever involved in a crash during the previous five years (N=149), 73% reported one car crash, 22 indicated having two-four crashes, and 5% had five or more car crashes. A majority (59%) of students reported driving everyday and 57% indicated that they used a cellular phone while driving. Although 65% regularly wore seat belts, 30% of students indicated that an event had prompted their seat belt use. Upon further inquiry concerning the nature of the event that prompted seat belt use, the main subjective responses among the sample (N=169) were personal involvement in car crash (53%), the new seat belt law (24%), death of a family or friend in a car crash (9%), and education (8%).

4.3 Univariate Findings

Table 1 shows the results of the univariate analyses for demographic variables and risk for MVC involvement. Results revealed that the probability of being involved in a car crash was substantially higher among college students and seniors in high school as compared to those in grades nine-ten combined. Moreover, the odds ratio of MVC involvement was 1.7-times higher among subjects who were employed as opposed to those unemployed. Students who had taken a

driver education course had 1.5-times the risk of being involved in a MVC as compared to students who had not taken a driver education course. There was a significantly lower probability of involvement in car crashes among students who lived with their parents as opposed to those living away from home. The variables race, gender, chronological age, grade point average, and intentions to further education were not significantly associated with involvement in car crashes.

Table 1. Demographic Univariate Odds Ratios

Variables	Modeling Probability of Crash Ever		
	OR	CI	p-value
Race White vs. Other	1.521	0.897 – 2.578	0.12
Male vs. Female	1.001	0.724 – 1.385	0.99
Age	1.015	0.984 – 1.046	0.34
11th vs. 9-10th	0.971	0.593 – 1.590	0.91
12th vs. 9-10th	**1.852**	**1.140 – 3.010**	**0.0128 ****
College vs. 9-10th	**5.657**	**2.605 – 12.285**	**<0.0001 ****
Living with Parents vs. living with Others	**0.519**	**0.313 – 0.860**	**0.0110 ****
GPA 4-3.0 vs. 1.9 or lower, including Don't know and refused	1.230	0.710 – 2.130	0.46
GPA 2.9 – 2.0 vs. 1.9 or lower, including Don't know and refused	1.180	0.674 – 2.065	0.56
Planning to further education vs. not planning to further education and not sure	1.200	0.550 – 2.616	0.65
Employed vs. unemployed	**1.755**	**1.268 – 2.430**	**0.0007 ****
Drivers Education vs. No driver education	**1.502**	**1.085 – 2.080**	**0.0143 ****

Note. ** p<.01 * p<.05

As shown in Table 2, a young person's risk of having a car crash increased based upon the number of miles they drove per week and their frequency of driving. Students who reported driving everyday were 1.8-times more likely to be in a MVC than those who were infrequent drivers. Additionally, for every ticket received, students had 1.4-times higher odds of being in a crash. Students who reported using a cellular phone while operating a vehicle had elevated odds ratios for involvement in MVCs. Also, students who indicated that a recent event prompted their seat belt use were 1.9-times more likely to be involved in a car crash. We found significantly lower risks of car crashes among students who drove their parents' cars as opposed to their own cars. There were no significant associations found between self-reported frequency of seat belt use and MVC involvement.

Table 2. Driving Habit Univariate Odds Ratios

Variables	OR	CI	p-value
Drive everyday vs. rarely	**1.820**	**1.068 – 3.104**	**0.0278 ***
Drive moderate amount vs. rarely	0.574	0.311 – 1.060	0.08
Car belongs to parent vs. you	**0.604**	**0.431 – 0.849**	**0.0036 ****
Car belongs to friend or relative vs. you	0.538	0.280 – 1.034	0.06
Ever had a ticket	**3.418**	**2.252 – 5.189**	**<0.0001 ****
Always wear seat belts vs. inconsistent use	0.858	0.610 – 1.205	0.38
Event prompt seat belt use	**1.929**	**1.364 – 2.729**	**0.0002 ****
Used cell phone while driving	**1.768**	**1.257 – 2.485**	**0.0011 ****
Number of tickets between 98 & 99	**1.404**	**1.107 – 1.782**	**0.0052 ****

Note. ** p<.01 * p<.05

The following five risk behaviors were shown to be significantly associated with involvement in car crashes among young drivers: cigarette smoking, drug and alcohol use, participating in fights, and driving under the influence. Students who reported engaging in these behaviors 20 or more times in their life were more at risk for MVCs than those who participated in them on less than two occasions. Unsafe sexual practices, weapon carrying, and seat belt and helmet use were not significantly associated with the probability of having a car crash.

Table 3. Risk Factor Univariate Odds Ratios

Variables	Modeling Probability of Crash Ever		
	OR	CI	p-value
High vs. Low Smoking	**1.950**	**1.164 – 3.267**	**0.0111 ****
Med vs. Low Smoking	1.399	0.876 – 2.234	0.16
High vs. Low Drugs	**2.209**	**1.290 – 3.781**	**0.0039 ****
Med vs. Low Drugs	1.035	0.563 – 1.903	0.91
High vs. Low Alcohol	**1.822**	**1.161 – 2.861**	**0.0091 ****
Med vs. Low Alcohol	1.099	0.747 – 1.618	0.63
High vs. Low Risky contraceptives	2.478	0.969 – 6.340	0.06
Med vs. Low Risky Contraceptives	1.859	0.932 – 3.709	0.08
High vs. low weapon carrying	1.324	0.714 – 2.457	0.37
Med vs. Low weapon carrying	1.137	0.678 – 1.906	0.63
High vs. low fight involvement	**2.050**	**1.093 – 3.845**	**0.0252 ***
Med vs. low fight involvement	0.833	0.556 – 1.248	0.38
High vs. low driving under the influence	**9.003**	**3.273 – 24.764**	**<0.0001 ****
Med vs. low driving under the influence	**2.648**	**1.297 – 5.408**	**0.0075 ****
High vs. low drive or ride without seat belts	1.420	0.963 – 2.094	0.08
Med vs. low drive or ride without seat belts	1.249	0.845 – 1.846	0.26
High vs. low ride motorcycle w/o helmet	1.282	0.889 – 1.848	0.18
Med vs. low ride cycle w/o helmet	1.010	0.597 – 1.711	0.97

Note. ** p<.01 * p<.05
Participating in the risk factor 0-2 times was considered LOW, 3-19 was considered MEDIUM, and 20-40+ was considered HIGH.

Variables demonstrating significance at the univariate level were selected as predictor variables in multivariate analyses. The following demographic, driving habits, and risk behaviors were included in the analyses: academic grade level, living arrangement, employment status, driver education, number of miles driven per week, driving frequency, car ownership, ever received tickets, number of tickets received during 1998-1999, event prompt seat belt use, cellular phone use while driving, along with levels of smoking, drug and alcohol use, fight involvement, and driving under the influence.

4.4 Multivariate Findings

Table 4 shows the results of the multivariate analyses for demographic variables, driving habits, and risk behaviors. Of the 16 variables found to be significant at the univariate level, only academic grade level, driving frequency, event prompt seat belt use, smoking, drug and alcohol use, and driving under the influence levels were significantly associated with crash risk during multivariate analyses. Seniors in high school and college undergraduates were 1.8 to 3.1-times more likely to be in a MVC, respectively (p for trend <0.0009), compared to controls. Cases were 2.1-times more likely (OR=2.1, 95% CI 1.0-3.1) to report driving a car everyday as compared to controls. Subjects indicating that an event prompted their seat belt use were associated with 1.9-times (95% CI 1.2-2.9) the risk of MVC involvement. Finally, levels of smoking (p for trend <0.006), drug (p for trend <0.008) and alcohol use (p for trend <0.02), and

driving under the influence (p for trend <0.0001) were significantly associated with MVC involvement.

Table 4. Multivariate Analyses of Youth Drivers Involved in Crashes or no Crashes Ever

Characteristics	Crashes (N=212) %	OR	(95% CI)	Non-crash (N=485) %
Grade				
9-10th	14.6	1.0	(Referent)	2.9
11th	31.5	--	--	45.2
12th	42.2	1.8	(1.1 – 2.8)	31.7
College	11.7	3.1	(1.0 – 9.7)	20.2
P for trend			0.0009	
Living Arrangements				
Others	14.2	1.0	(Referent)	7.9
Parents	85.8	0.8	(0.3 – 2.2)	92.1
Employment Status				
Unemployed	49.1	1.0	(Referent)	62.8
Employed	51.9	1.0	(0.6 – 1.5)	37.2
Driver's Education				
No	41.0	1.0	(Referent)	51.1
Yes	59.0	1.4	(0.9 – 2.1)	48.9
Driving Habits				
Miles per week	--	1.0	(1.0 – 1.0)	--
Driving Frequency				
Rarely	9.9	1.0	(Referent)	12.5
1-3 times / week	16.5	--	--	36.4
Everyday	73.6	2.1	(1.3 – 3.5)	51.1
Car Ownership				
Belongs to You	44.3	1.0	(Referent)	32.2
Belongs to Parent	49.1	1.2	(0.8 – 1.9)	58.9
Belongs to Other	6.6	--	--	8.9
Ever Had a Ticket				
No	71.1	1.0	(Referent)	89.4
Yes	28.9	1.7	(1.0 – 3.1)	10.6
Recent Event Prompted Seat belt Use				
No	59.4	1.0	(Referent)	73.9
Yes	40.6	1.9	(1.2 – 2.9)	26.1
Cell Phone Use While Driving				
No	32.9	1.0	(Referent)	46.4
Yes	67.1	1.2	(0.8 – 1.9)	53.6
Tickets				
Number of tickets Between 98 & 99	--	1.0	(0.9 – 1.1)	--
Smoking				
Low	71.2	1.0	(Referent)	80.0
Medium	15.1	--	--	12.1
High	13.7	0.8	(0.3 – 1.8)	7.9
P for trend			0.006	
Drugs Use				
Low	79.3	1.0	(Referent)	85.7
Medium	7.5	--	--	7.9
High	13.2	0.5	(0.2 – 1.2)	6.5
P for trend			0.008	

Alcohol Use				
Low	56.1	1.0	(Referent)	63.0
Medium	24.5	--	--	25.1
		0.8		
High	19.3		(0.4 – 1.6)	11.9
P for trend			0.02	
Risky Contraceptive Use				
Low	88.7	1.0	(Referent)	94.1
Medium	7.1	1.5	(0.6 – 3.6)	4.0
High	4.2	--	--	1.8
P for trend			0.01	
Fight Involvement				
Low	71.2	1.0	(Referent)	71.9
Medium	19.3	--	--	23.4
High	9.4	1.7	(0.7 – 4.1)	4.7
P for trend			0.26	
Driving under the influence				
Low	84.4	1.0	(Referent)	95.8
Medium	7.6	3.2	(1.1 – 9.2)	3.2
High	8.0	7.5	(1.9 – 30.2)	1.0
P for trend			<0.0001	
Religious Involvement				
Low	57.5	1.0	(Referent)	47.9
Medium	20.8	0.8	(0.5 – 1.2)	28.1
High	21.7	--	--	24.0
P for trend			0.07	

5.0 Project Conclusions and Recommendations

This study examined the relationship between select demographic factors, driving habits, and risk behaviors associated with self-reported MVC involvement among a sample of young drivers. Although the identified associations do not imply casual links, they do support the assertion that a young person's involvement in car crashes is predicated upon their driving frequency, having an event prompt seat belt use, and engagement in risk behaviors (e.g., smoking drug and alcohol use, and driving under the influence). Given the fact that teenagers and youth in their twenties have substantially higher crash involvement rates than any other age group, there continues to be increased interest in the exploration of factors associated with MVC involvement among this population (Jessor 1987; Jessor 1993; Hovarth & Zuckerman 1993).

In our study, we found that youth who drove everyday were more likely to be involved in a car crash than infrequent drivers were. Reports have shown that immaturity, lack of driving experience, and the propensity to engage in risk-taking behaviors are major contributors to elevated crash rates among this population (Arnett et al., 1997; Kim et al., 1995; O'Malley & Johnston 1999; Jonah 1986; Jonah 1990). As novice drivers, young people often lack the skills needed to perform ordinary driving tasks and respond to complex driving situations. As a result, they experience difficulty detecting hazards, controlling their vehicle, and integrating speed (Jonah 1990; Everett 1999;Gwinnett County Teen Traffic Tragedies Task Force 1994). Although these deficiencies tend to gradually dissipate with driving experience and age, years of on-the-road experience are necessary (Warren & Simpson 1976).

Consistent with the findings of previous studies (Everett et al., 1999; Beirness & Simpson 1988; Jessor 1987; Hovarth & Zuckerman 1993), we found smoking (p for trend <0.006), using drugs (p for trend <0.008) and alcohol (p for trend <0.02), and driving under the influence (p for trend <0.0001) were significantly associated with MVC involvement. There is compelling evidence that unhealthy behaviors exhibited among youth are usually interrelated and tend to co-occur with involvement in other problem behaviors (Jessor 1993). In a study examining the psychosocial and behavioral factors associated with crash involvement among young drivers, Beirness and Simpson (1988) reported that young people involved in car crashes were more likely than those with no history of MVC involvement to smoke cigarettes, use drugs, drink alcohol, refrain from using seat belts, and ride with intoxicated drivers. Furthermore, a study exploring engagement in problem behaviors among high school juniors and seniors discovered that risky driving was associated with alcohol and drug use among males (Donovan & Jessor 1978).

Although youth engage in problem behaviors for a variety of reasons (e.g., to affirm independence, need for stimulation and sensation, experimentation), research suggests that behaviors such as risky driving, smoking, and substance use may be an aspect of a larger adolescent lifestyle (Jessor 1987). As a result, Beirness and Simpson (1988) concluded that lifestyle factors were related to all types of MVCs, irrespective of whether the youth was driving the car or not. The present findings are consistent with the premise of Problem Behavior Theory (Jessor, 1987) in that adolescents who engaged in one problem behavior were more likely to engage in others as well. Thus, it may be appropriate to examine risk of car crash involvement

within the confounds of an adolescent's overall lifestyle, rather than as a unique or exclusive behavior.

The issues related to seat belt safety and utilization continue to receive attention from researchers and professionals interested in preventing traffic injuries and fatalities (Seat belt Saves Lives 2000). This study attempted to expand our knowledge surrounding this topic by not only assessing youths' self-reported frequency of seat belt use, but if an event had prompted them to use seat belts, and if so, the subjective nature of that event. Despite the fact that self-reported seat belt use was not associated with MVC involvement, we found that students who had an event prompt their seat belt use were 1.9-times more likely to be in a car crash than controls.

Upon further inquiry concerning the events that influenced seat belt use, the main responses generated among youth (N=169) were personal involvement in car crash (N=92), enforcement of the new seat belt law (N=42), death of a family member or friend (N=15), education (N=14), and other (N=6). Given these subjective responses, young drivers in this study learned from personal crash involvement the necessity of seat belt usage. Due to the fact that youth tend to learn by first-hand experience, it is hard to change their behavior with education alone. To prevent unnecessary injuries and subsequent fatalities caused by failure to wear seat belts among this population, it may be beneficial to design programmatic activities that encompass youths' personal experiences and social influences, enforce seat belt laws, and provide appropriate educational training that will impact their knowledge, attitudes, and beliefs in relation to seat belt usage.

While the findings of our study are limited by the fact that they represent self-reported data, there appears to be consensus in the literature that youth involvement in car crashes is associated with their risk taking behaviors and driving habits. Based on our use of a convenience sample of high school and college students, the results of this study can only be generalized to a subset of youth residing in the South. In spite of these shortcomings, the outcomes of this study have important implications for health care providers and researchers interested in decreasing motor vehicle injuries and deaths among young people.

Because MVCs are prevalent among young drivers, health providers and researchers should recognize that youth involvement in a single problem behavior (e.g., smoking, drug use, reckless driving) might serve as a warning sign to potential involvement in other behaviors, which may compromise their health and well-being. Therefore, providers and researchers are encouraged to not only address the issues adolescents present with in the hospital or clinic, but to examine the underlying factors associated with their participation in risky conduct, and determine whether they are involved in other problem behaviors. Lastly, more research is needed to better understand the factors that predispose youth to use seat belts.

6.0 References

Alabama Department of Public Health. Healthy Alabama 2000 (ADPH-P-182-10/91). Montgomery, AL: Author, 1991.

Alabama Departments of Public Safety, Education, Transportation, & Economic and Community Affairs. Alabama Traffic Accident Facts. Montgomery, AL: Author, 1997.

Arnett JJ, Offer D, Fine MA. Reckless driving in adolescence: 'state' and 'trait' factors. Accident Analysis & Prevention. 29(1):57-63, 1997.

Baker SP, Braver ER, Chen LH, Pantula JF, Massie D. Motor vehicle occupant deaths among Hispanic and black children and teenagers. Archives of Pediatric Adolescent Medicine, 152, 1209-1212, 1998.

Beirness DS, Simpson HM. Lifestyle correlates of risky driving and accident involvement among youth. Alcohol, Drugs, and Driving. 4(3-4):193-204, 1988.

Carroll CR. Drugs in modern society (3rd ed.). Madison, WI: Brown and Benchmark, 1993.

Chen L, Baker SP, Brauer ER, Li G. Carrying passengers as a risk factor for crashes fatal to 16- and 17-year-old drivers. JAMA. 283(12):1578-82, 2000.

Donovan JE, Jessor R. Adolescent problem drinking: Psychosocial correlates in a national sample study. Journal of Studies on Alcohol. 39(9):1506-1523, 1978.

Everett SA, Lowry R, Cohen LR, Dellinger AM. Unsafe motor vehicle practices among substance-using college students. Accident Analysis & Prevention. 31(6):667-73, 1999.

Goldbaum GM, Remington PL, Powell KE, Hogelin GC, Gentry EM. Failure to wear seat belts in the United States: The 1981-1983 behavioral risk factor surveys. JAMA. 255(18), 2459-2462, 1986.

Gwinnett County Teen Traffic Tragedies Task Force. Risky driving behaviors among teenagers-Gwinnett County, Georgia, 1993. MMWR Weekly. 43(22):405-409, 1994.

Hovarth P, Zuckerman M. Sensation seeking, risk approval and risky behavior. Personality Individual Differences. 14:41-52, 1993.

Insurance Institute for Highway Safety. Beginning drivers: Helping them make it home. [On-Line]. Available: http://www.highwaysafety.org/drivers/bgdri.htm, 1997.

Insurance Institute for Highway Safety. Fatality facts: Teenagers. [On-Line]. Available: http://www.highwaysafety.org/facts/teens.htm, 1997.

Insurance Institute for Highway Safety. Highway Loss Data Institute. [On-Line]. Available: www.hwysafety.org/safety_facts/teens/teenager.htm. Last modified August 17, 2000.

Jessor R. Successful adolescent development among youth in high-risk settings. American Psychologist. 48(2):117-126, 1993.

Jessor R. Risky driving and adolescent problem behavior: An extension of problem- behavior theory. Alcohol, Drugs, and Driving. 3(3-4):1-11, 1987.

Jessor R, Jessor SL. Problem behavior and psychological development: A longitudinal study of youth. New York: Academic, 1977.

Jonah B. Accident risk and risk-taking behavior among young drivers. Accident Analysis and Prevention. 18(4):255-271, 1986.

Jonah B. Age differences in risky driving. Health Education Research. 5(2):139-149, 1990.

Kann L, Kinchen SA, Williams BI, Ross JG, Lowry R, Grunaum J, Kolbe LJ. Youth Risk Behavior Surveillance-United States, 1999. MMWR Surveillance Summaries. 49(SS05): 1-96, 2000.

Kim K, Nitz L, Richardson J, Li L. Personal and behavioral predictors of automobile crash and injury severity. Accident Analysis & Prevention. 27(4):469-81, 1995.

Lyznicki JM, Doege TC, Davis RM, Williams MA. Sleepiness, driving, and motor vehicle crashes. Council on Scientific Affairs, American Medical Association. JAMA. 279(23):1908-13, 1998.

National Highway Transportation Safety Administration. Addressing the safety issues related to younger and older drivers summary. [On-Line]. Available: www.nhtsa.dot.gov/people/injury/olddrive/pub/Chapter1.html. Last updated November 2, 1999.

Nelson TF, Kennedy BP, Issac NE, Graham JD. Correlates of drinking-driving men at risk for impaired driving crashes. American Journal of Health Behavior. 22(2):151-158, 1998.

Oleckno WA, Blacconiere MJ. Risk-taking behaviors and other correlates of seat belt use among university students. Public Health. 104(3):155-164, 1990.

O'Malley PM, Johnston LD. Drinking and driving among U.S. high school seniors, 1984-1997. American Journal of Public Health. 89(5):678-84, 1999.

Schichor A, Beck A, Bernstein B, Crabtree B. Seat belt use and stress in adolescents. Adolescence. 25(100):773-779, 1990.

Seat Belts Save Lives. The Facts: The Economic cost of non-belt use. [On-Line]. Available: http://www.nhtsa.gov/people/injury/airbags/seatbelt/poin-cou.htm. Accessed December 2000.

Warren RA, Simpson HM. The young driver paradox. Ottawa: Traffic Injury Foundation of Canada, 1976.

U.S. Department of Health and Human Services. Healthy people 2000: Summary report (PHS 96-1256). Hyattsville, MD: Author, 1992.

U.S. Department of Health and Human Services. Healthy People 2010: Understanding and Improving Health - Explains the background, context, goals, and leading health indicators for Healthy People 2010. U.S. Government Printing Office, Pittsburgh, PA (Stock Number 017-001-00543-6), 2000.

Appendix A

Survey Instrument

1999
Modified Youth Risk Behavior Survey

This survey is about health behavior. It has been developed so you can tell us what you do that may affect your health. The information you give will be used to develop better health education for young people like yourself.

DO NOT write your name on this survey. The answers you give will be kept private. No one will know what you write. Answer the questions based on what you really do.

Completing the survey is voluntary. Whether or not you answer the questions will not affect you in any way.

The questions that ask about your background will be used only to describe the types of students completing this survey. The information will not be used to find out your name. No names will ever be reported.

Make sure to read every question. When you are finished, follow the instructions of the person giving you the survey. Thank you very much for your help.

I would like to start off by asking you a few questions about yourself.

1. How old are you? _____

2. What is your date of birth? MM/DD/YY

3. What is your sex?
   A. Female
   B. Male

4. What grade are you in?

   A. 9th grade
   B. 10th grade
   C. 11th grade
   D. 12th grade
   E. College Undergraduate
   F. Not in school
   G. Other_____

5. How do you describe yourself? (Select one or more responses.)
   A. American Indian or Alaska Native
   B. Asian
   C. Black or African American

D. Hispanic or Latino
E. Native Hawaiian or Other Pacific Islander
F. Caucasian or White

6. Do you live with:
A. Parents
B. Relatives
C. Friends
D. Or do you live by yourself
E. Other____

7. What is your overall grade point average in school (based on a 4.0 scale)?
A. A (4.0 or above)
B. B (3.0-3.9)
C. C (2.0-2.9)
D. D (1.0-1.9)
F. F (Less than 1.0)
G. Don't know
H. Refused

8. Do you have plans to further your education (e.g. go to college, vocational trade, graduate school)?
A. Yes
B. No
C. Don't Know
D. Refused

9. Do you have a job?
A. Yes
B. No
C. Don't Know
D. Refused

10. Have you ever taken a driver's education class/course?
A. Yes
B. No
C. Don't Know
D. Refused

Now, I would like to ask you questions about your driving habits.

11. Do you drive?

A. Yes ≡ If yes, continue with the survey, go to Q 12

B. No ≡ If no, Those are the only questions we have for you today. Thank you for your time. End of interview.

12. Have you ever been involved in a car accident?

A. Yes	≡	If yes, go to Q 13
B. No	≡	If no, skip to Q 15
C. Don't know	≡	If no, skip to Q 15
D. Refused	≡	If no, skip to Q 15

13. Between January 1, 1994 and January 1, 1999, how many car accidents were you involved in when you were the driver? Please tell us the number of crashes, whether or not they were your fault.

____ ____ crashes

B. Don't know

C. Refused

14. If yes, how many of these accidents happened during 1998-1999?

_____

B. Don't know

C. Refused

15. On average, approximately how many miles per week do you drive?

_____miles

B. Don't know

C. Refused

16. On average, how often do you drive?

A. Every day
B. Every 2-3 days
C. Once a week
D. Once every few weeks
E. Once a month
F. Less than a month
G. Don't Know
H. Refused

17. What kind of vehicle do you drive? (Give year, make and model) For example:

98 Honda Accord

_____year, _____make,_____ model

18. The car you mostly drive belongs to:

A. Parents
B. Relative
C. Friend
D. You
E. Rental
F. Other_____

19. Between January 1, 1994 and January 1, 1999, have you received any traffic tickets?

A. Yes	≡	If yes, go to Q 20
B. No	≡	If no, skip to Q 22
C. Don't know	≡	If no, skip to Q 22
D. Refused	≡	If no, skip to Q 22

20. If yes, what were they for (e.g. speeding, U-turns, DUI, etc)?

_____

B. Don't know
C. Refused

21. If yes, how many of these tickets did you receive during 1998-1999?

_____

B. Don't know
C. Refuse

22. On average, between January 1, 1994 and January 1, 1999, how often did you wear seat belts?

A. Always or almost always
B. Sometimes
C. Never or almost never
D. Don't know
E. Refused

23. Has a past or recent event prompted you to wear seat belts?

A. Yes	≡	If yes, go to Q 24
B. No	≡	If no, skip to Q 25
C. Don't know	≡	If no, skip to Q 25
D. Refused	≡	If no, skip to Q 25

24. If yes, what was the nature of that event?_____and when did it happen____/_____/____?

25. Have you ever used a cellular phone while driving?

A. Yes	≡	If yes, go to Q 26
B. No	≡	If no, skip to Q 27
C. Don't know	≡	If no, skip to Q 27
D. Refused	≡	If no, skip to Q 27

26. If so, did you use your cellular phone for:

A. Business/ work-related matters

G. Other_____

B. Recreational/social
C. Emergency use
D. Family issues
E. Don't know
F. Refused

Next, I would like to ask you questions about behaviors you may or may not have engaged in over the course of your lifetime.

27. During your life, how many times have you:

	0 times	1-2 times	3-9 times	10-19 times	20-39 times	40+ times
Smoked cigarettes or cigars						
Used chewing tobacco						
Used drugs (such as marijuana, cocaine, heroin, etc.)						
Had at least one drink of alcohol (e.g., rum, gin, beer, whiskey)						
Had sex with multiple partners without using contraceptives (e.g., condom)						
Carried a weapon (e.g., gun, knife, club)						
Gotten into physical fights						
Driven a car while under the influence of drugs/alcohol						
Driven/rode in a car without wearing seat belts						
Ridden a motorcycle or bicycle without a helmet						

28. During the past 7 days, how many times have you	0 times	1-2 times	3-9 times	10-19 times	20-39 times	40+ times
Participated in physical education (PE) or Gym classes						
Exercised for at least 20 minutes (aerobics, jogging, tennis)						
Participated in extracurricular activities (band, sports, club)						
Attended religious services (church, synagogue, temple, etc.)						
Eaten vegetables (spinach, carrots, celery, broccoli, beets)						
Eaten fast food from McDonald's, Wendy's, Burger King, etc.						
Eaten junk food (candy, cookies, potato chips, etc.)						
Drank eight glasses of water						
Drank carbonated sodas (Pepsi, Coke, Sprite, 7-Up, etc.)						
Watched television						

That concludes the survey.
Thank you very much for answering these questions.

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