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Patterns of Traffic Offenses from Adolescent Licensure into Early Young Adulthood

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Abstract

Purpose—This article examines adolescent psychosocial and problem behavior characteristics as predictors of traffic offenses from licensure to early young adulthood.

Methods—Data for this study were from a school-based sample that was surveyed in 10th and 12th grades, and again in early young adulthood. In addition, state driver history records were obtained for each participant in the study and provided a complete traffic offense history.

Results—Models adjusted for driving exposure showed varying patterns of prediction for men and women across three types of ticketed moving violations (offenses): minor offenses, serious offenses, and alcohol offenses. Although which predictors were significant varied across gender and type of offense, results suggested that more positive psychosocial adjustment predicted lower numbers, greater decreases, and a lower likelihood of increases in offenses from licensure through the early 20s.

Conclusions—Based on this research, implications for intervention include providing parents with the tools and knowledge needed to effectively supervise their teens' driving during the first years of licensure. Also potentially important for their broad positive effects on problem behaviors, including problem driving, are programs that strengthen adolescents' bonds to conventional social institutions and increase their attachment to the people who represent those institutions. Future research should examine the longitudinal sequencing of associations among psychosocial and problem behavior variables, including problem driving. © 2006 Society for Adolescent Medicine. All rights reserved.

Keywords

Teen drivers; Traffic offenses; Gender differences; High-risk driving; Problem behavior; Problem driving

Drivers aged 15–20 years have higher rates of motor vehicle crashes (crashes) than adults, and crashes are the leading cause of mortality and morbidity in this age group. In 2003, 15–20-year-olds accounted for 6.8% (12.5 million) of all drivers in the United States, but were drivers in 18% of all police-reported crashes and 14% of all fatal crashes, resulting in 3657 deaths and 308,000 non-fatal injuries [1]. A greater understanding of factors contributing to crashes is essential to increased driving safety among teens; however, the relative infrequency of crashes makes them difficult to study, and the information obtained from studying crashes, although important, does not directly address events and behaviors that precede and contribute to crashes. Many of these events and behaviors are ticketable traffic offenses. Although recorded offenses are a sub-sample of all traffic offenses committed, official traffic offenses are one of

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the most reliable crash risk indicators. Offenses accurately identify factors contributing to crash occurrence, but occur more frequently than crashes [2,3], making them an excellent proxy measure of crash risk.

Relatively few longitudinal studies have examined offense patterns and their developmental precursors. Some evidence exists of a longitudinal association between problem behaviors and problem driving practices [4]. Using a developmental theoretical perspective, this study identified psychosocial and problem behavior predictors of offenses that occurred between licensure and early young adulthood.

Problem behavior theory and driving behavior

Problem Behavior Theory (PBT) provides a developmental framework for examining individual characteristics that predict high-risk driving behavior [5–9]. PBT classifies behavior into two categories: conventional behaviors, which are *prescribed/encouraged by society*, and problem behaviors, which are socially *proscribed/prohibited*. Individuals are typically simultaneously involved in several problem behaviors, resulting in a “problem behavior syndrome.” This syndrome is stable over time, with problem behavior involvement in adolescence continuing into young adulthood [4].

PBT categorizes psychosocial and behavioral characteristics into the *perceived environment*, *personality*, and *behavior systems*. The perceived environment and personality systems motivate involvement in, or avoidance of problem behaviors, and include the social and physical environment, parent and peer influences [10], connectedness to conventional social institutions (i.e., school, family, and religion), and individual feelings, perceptions, and attitudes that influence problem behavior [11,12]. *The behavior system* encompasses both conventional and problem behaviors.

PBT explains involvement in socially proscribed behavior, and has been used to study problem behavior in adolescence and young adulthood. Young adult problem driving is a problem behavior that shows continuity from adolescence into young adulthood and has been predicted by adolescent problem behavior [4,5,9,13–20]. Problem behaviors that are associated with high-risk driving include cigarette smoking, smokeless tobacco use, alcohol use, binge drinking, marijuana use [21], riding with drinking drivers [22], drink-driving, and elevated offense and crash rates [4–7,16,18].

Although high-risk driving has been predicted by various adolescent problem behaviors and psychosocial characteristics [4,5,16], the association between traffic offense rates in the first years of licensure and psychosocial and non-driving problem behaviors has not been studied. Traffic offense patterns that are socially proscribed include low offense rates from licensure forward, and decreasing offense rates [23–25]. Socially proscribed offense patterns include persistent high and increasing rates. Research identifying psychosocial and problem behavior characteristics of young drivers at high risk of experiencing and/or causing vehicle-related injuries will enhance the effectiveness of interventions to reduce crash injury.

Study objective

This study examined adolescent psychosocial and problem behavior factors that predict traffic offense patterns from licensure to young adulthood. Based on PBT, it was hypothesized that weaker social-environmental controls (i.e., less parental monitoring, more parental permissiveness), poorer psychosocial adjustment (i.e., more tolerance of deviance, more peer vs. parent-orientedness, and lower marks in school), and more problem behavior (cigarette smoking, alcohol misuse, and marijuana use) would predict higher offense rates. Based on prior research, gender moderation effects were also tested [18,22,26,27].

Methods

Sample

The study data were from surveys of 10th grade (spring of 1988 and 1989; average age = 15.7 years) and 12th grade (spring of 1991 and 1992) participants in a school-based Alcohol Misuse Prevention Study (AMPS [26,27]) who were followed up in young adulthood using a telephone survey (average age = 24.4 years). AMPS participants who had a current Michigan driver license ($n = 5043$) were eligible for the young adult assessment. They were tracked using addresses from the driver records in combination with extensive directory and database searches. Once contacted, only 6% refused the interview, but difficulty locating participants resulted in a final response rate of 49.6%. Respondents and non-respondents were compared on their driver history records and the 10th and 12th grade surveys. Some significant differences were found, but effects were very small ranging from $d = -.009$ for alcohol availability in 12th grade to $d = .370$ for marks in school in 10th grade. Small significant effects [28] were found for age ($d = .267$), 10th grade marks ($d = .370$) and 12th grade family configuration ($d = -.203$). Core items for this study—alcohol misuse, cigarette use, marijuana use and driving behavior—did not show signs of attrition bias.

Driver history records obtained from the Michigan Department of State identified every traffic violation occurring in Michigan that involved study participants. Telephone survey participants had been licensed to drive for an average of 8.1 years ($SD = 1.1$ years, range = 2–12). The study sample was 47.6% male, 85.3% white, 1.9% black, 12.8% other races. AMPS participants in this study had a Michigan driver license (so that official driving records were available), and had completed the young adult telephone follow-up interview and at least one high school survey ($n = 1956$). Study procedures were approved by the University of Michigan Institutional Review Board and all adolescent participants had parental consent and provided assent.

Measures

Composite high school measures were calculated by averaging 10th and 12th grade data to provide an overall representation of these measures during adolescence, simplify the analyses, and allow inclusion of participants missing one of the two high school surveys (i.e., the single available survey was used in lieu of an average across two surveys). Stability estimates for variables in this study ranged from .46 (alcohol misuse) to .65 (marks in school).

Psychosocial measures

Perceived environment—The adolescent Perceived Environment System included measures of parental monitoring and permissiveness. Parental monitoring [29], a four-item scale, asked how knowledgeable parents were of the participants' activities. Three items were scored on a four-point scale (0 = Never, 1 = Rarely, 2 = Sometimes, 3 = Always) and one item was scored 0 = no and 1 = yes. An item from this scale is "How often do your parents know where you are when you are not in school?" The measure was scored by summing the item responses ($\alpha = .63$).

Parental permissiveness was measured using a four-item scale regarding parenting behaviors [30], with responses of 0 = Never, 1 = Rarely, 2 = Sometimes, and 3 = Always. An example item is "How often do your parents allow you to get away without doing work you have been told to do?" ($\alpha = .54$). Both measures have predicted adolescent and young adult behavioral outcomes in previous research [4], have shown evidence of construct and convergent validity, and have adequate internal consistency [31].

Personality system—The personality system was assessed by three measures of participants' connectedness to family, school, and societal behavioral norms [11]: parent-

orientedness, marks in school, and tolerance of deviance. Three items assessed parent-orientedness. An example item is “Who do you usually go to for help when you have a problem?” 1 = usually my parents, 2 = usually someone else, 3 = my parents and someone else, and 4 = neither my parents nor someone else. Responses were recoded and averaged so that higher scores corresponded with greater parent orientation ($\alpha = .72$).

A single item measured participants’ marks in school. Responses were coded as 1 = mostly Fs, 2 = mostly Ds and Fs, 3 = mostly Ds, 4 = mostly Cs and Ds, 5 = mostly Cs, 6 = mostly Bs and Cs, 7 = mostly Bs, 8 = mostly As and Bs, and 9 = mostly As.

Tolerance of deviance was a modified five-item version of a measure developed by Rachal and associates [32] that asked participants to rate the moral wrongness of specific behaviors. An example is, “How wrong do you think it is to drink alcohol before you are 21 years old?” (1 = not wrong, 2 = a little bit wrong, 3 = wrong, 4 = very wrong) ($\alpha = .80$).

Adolescent problem behaviors—Substance use was the problem behavior of primary interest in this study. The 12-month frequency of cigarette smoking and marijuana use was measured on a four-point scale (0 = never, 1 = a few times a year or less, 2 = about once a month, 3 = about once a week, 4 = three or four days a week, 5 = every day). A 10-item misuse scale measured overindulgence (e.g., drink more than planned), trouble (e.g., trouble in school), and complaints from others (e.g., friends) that resulted from alcohol use during the previous year ($\alpha = .82$) [33].

Due to colinearity, variables assessing cigarette smoking, marijuana use, and alcohol misuse were reduced to a single hierarchically coded measure. The three substances were ranked by their relative seriousness [4], and cigarette smoking was coded 0 for none and 1 for any smoking, alcohol misuse was coded 0 for none and 2 for any misuse, and marijuana was coded as 0 for none and 4 for any use. The summed items yielding a progressive total score that identified unique combinations of substances ranked in order of seriousness: 0 = no substance use, 1 = cigarette smoking only, 2 = alcohol misuse only, 3 = cigarette smoking and alcohol misuse, 4 = marijuana use only, 5 = cigarette smoking and marijuana use, 6 = alcohol misuse and marijuana use, and 7 = cigarette smoking, alcohol misuse, and marijuana use.

The validity of self-reported measures of socially proscribed or frankly illegal behaviors is often suspected. However, substantial published evidence supports the validity of these measures when confidentiality is assured, as in this research [34–36].

Driving exposure

Age at licensure from the driver history was used to adjust for variation in maturity at licensure (i.e., age of licensure), experience (i.e., total length of licensure), and exposure (odds of receiving an offense increases with driving time). The total miles driven in the last year of the study interval (the only item from the young adult survey in this study) measured variation in the amount of driving near the end of the study interval.

Outcome measures

The offense measures were based on ticketed moving violations recorded in the driver records during two intervals. The first interval was from the participant’s licensure through age 19, and the second was from age 20 to approximately age 24. The division between ages 19 and 20 was chosen because it split the study into two intervals of approximately equal length. This held exposure time constant, making variables calculated in the two intervals comparable. Although driver records are imperfect measures and can be difficult to use, they are useful tools in understanding driving behavior. For this study, ticketed (not convicted) offenses were

used to avoid a downward bias that can result from offenses being waived or changed during adjudication.

Offense outcomes were calculated separately for serious offenses (i.e., exceeding the speed limit by at least 15 miles per hour, reckless driving, vehicular homicide, and other major offenses), alcohol offenses (i.e., all offenses that included alcohol), and minor offenses (i.e., all other offenses). Two outcomes were counts of offenses (minor, serious and alcohol) in the first and second intervals, and ranged from 0–15 (interval 1) and 0–17 (interval 2) for minor offenses, 0–5 for serious offenses in both intervals, and 0–3 for alcohol offenses in both intervals.

A second outcome was a change score calculated by subtracting the number of offenses in the first interval from those in the second. Changes in offense counts ranged from –8 to 17 minor offenses, –4 to 5 serious offenses, and –2 to 3 alcohol offenses.

Plan of analysis

First, univariate and bivariate descriptive statistics were calculated. Next, regression modeling adjusted for driving exposure was used to test the hypotheses using the psychosocial and problem behavior measures as predictors, and the offense measures as outcome. Poisson regression tested models predicting the number of minor, serious, and alcohol offenses in the first and second intervals. Normal regression tested models predicting the change in number of minor, serious, and alcohol offenses from interval one to interval two. Finally, logistic regression models were constructed to predict the odds of having more offenses in the second interval than in the first. Offenses in the second interval were the events, and the total numbers of offenses across both intervals were the trials in these analyses. These models were tested for minor, serious, and alcohol offenses, and were adjusted for driving exposure. All the regression models were constructed using backward elimination, and all models were tested separately by gender.

Results

Descriptive analyses

Means and standard deviations for all variables used in this study are shown in Table 1. Generally, men had greater numbers of offenses than women, overall and in both intervals. Men also reported greater changes in the number of crashes from the first to second interval, but men and women reported similar proportions of total offenses in the second interval. Also of note, for men and women, the number of serious offenses decreased across the two intervals, whereas the number of minor and alcohol offenses increased. Men also generally received their driver licenses at younger ages, drove more miles, had lower parental monitoring and greater parental permissiveness, were less parent-oriented, received lower marks in school, and had more substance use than women, but men and women scored nearly the same on tolerance of deviance. Bivariate correlations between the covariates and outcomes are shown in Table 2.

Predictors of offense counts

Table 3 shows the results of Poisson regression analysis predicting offense counts in the two intervals. All models predicting offense counts were adjusted for exposure. Generally, greater exposure was related to more offenses. For men, while adjusting for exposure, lower marks in school and greater substance use predicted more minor offenses in the first interval. In the second interval, more minor offenses were predicted by lower marks in school, more substance use, lower parent orientation, and lower parental permissiveness. For women, more minor offenses in the first interval were predicted by poorer marks in school, greater tolerance of

deviance, and more substance use, and more second interval offenses were predicted by lower marks in school.

Serious offenses were greater in the first interval for men with less parental monitoring, lower marks in school, and greater substance use, and in the second interval for men with lower marks in school, and greater substance use. For women, more serious offenses were predicted by less parental monitoring and lower marks in school in the first interval, and by lower parental orientation in the second interval. All models predicting serious offenses were adjusted for exposure.

More first-interval alcohol offenses were predicted for men by more substance use and in the second interval by less parental monitoring, lower marks in school, and more substance use. For women, more alcohol offenses were predicted in both intervals by more substance use. All models were adjusted for exposure.

Predictors of change in offenses

The models predicting changes in numbers of offenses from the first to second interval were all adjusted for exposure and by the number of same-type offenses in the first interval. As expected, fewer first-interval offenses predicted a greater increase. This is due to a ceiling effect, and is the reason why the models were adjusted for first-interval offense counts. Results showed that an increase in minor offenses was predicted by lower parental permissiveness, less parent orientation, and lower marks in school for men (Table 4). For women, an increase in minor offenses was predicted by lower marks in school. Increases in serious offenses were predicted by lower marks in school for both men and women. Finally, increased alcohol offenses were predicted by lower parental orientation and more substance use for men, and by more substance use among women.

Greater second interval offenses

Models testing predictors of the likelihood that participants would have more offenses in the second than in the first interval indicated that men with higher tolerance of deviance are 14% more likely to have more minor offenses in the second interval (Table 5). Women with greater substance use are 6% more likely to have more offenses in the second interval. For both men and women, a higher proportion of crashes occurring in the second interval were predicted by lower marks in school. Alcohol offenses were small in number, and in these analyses, none of the predictors were significant for either men or women.

Discussion

As in previous research, these results support PBT by demonstrating developmental continuity from adolescence into early young adulthood in psychosocial development and problem behavior [37], and demonstrate the syndromal nature of problem behaviors. Not only adolescent problem behaviors show continuity into early young adulthood. As predicted by PBT, psychosocial factors relating to parental influences also significantly predicted young adult driving outcomes. Some unexpected effects of parental permissiveness were found for men, with less permissiveness predicting more minor offenses. This association was seen in bivariate as well as multivariate models. This result suggests that excessively strict parenting styles may result in less positive driving outcomes than more democratic parenting styles [38].

Evidence of the lasting effect of parents' influences on their children's behavior suggests a potential intervention target. Many parents lack the ability to address adolescent problem behaviors with their children. Simple guidelines to help parents monitor activities, set effective

limits, reinforce good behavior, and communicate with their children would be welcomed by many parents who feel lost when facing the challenges of being a parent. Programmatic interventions that help parents understand the importance of their role as primary socializers and that provide tools for effective parenting, reduce various problem behaviors. Monitoring is a concrete skill that interventions could teach to parents, and interventions that increase parents' appreciation of the influence their attitudes have on their children could also prove useful.

Interventions that include parents are especially germane to young driver training. In many states, parents are required to supervise their teenage children during 30–50 hours of practice driving. Additionally, graduated driver licensing programs rely on parents to supervise and monitor their teenage children's adherence to Graduated Driver Licensing (GDL) laws. Evidence suggests that parents benefit from guidelines that help them structure their children's practice driving in a manner that helps teens become safe drivers [39,40].

Patterns of prediction also suggest that elements of the social environment influence personality factors, and that factors within both of these systems influence driving behaviors differently in adolescence and young adulthood. The significant influence of social environmental and personality factors further suggests interventions that could be applied to reduce problem behavior outcomes. One has already been mentioned, that of interventions with parents. Other interventions may beneficially target elements of the personality system to increase personal achievement in prosocial activities and individual connection with conventional social institutions. These connections may be especially important for adolescents with disrupted connections with family, education, religion, and other aspects of mainstream society. Interventions may also focus on helping adolescents avoid dangers while facing developmental challenges. For example, Graduated Driver Licensing is intended to keep young drivers safer while they are learning to drive by enlisting parents in monitoring their children's driving and compliance with restrictions on independent driving. GDL is showing effectiveness [40].

The regression analyses were adjusted for the effects of exposure using age at licensure and total miles driven. Generally, earlier licensure and driving more total miles predicted higher levels and increasing patterns of offenses. However, this was not true of minor and serious offenses for women in this study. For these women, later licensure followed by driving more total miles predicted a positive change in the number of offenses across the two intervals. This association may be partly due to later licensure increasing the odds of having more offenses after than before age 20. However, it may also result from a combination of inexperience early in licensure, due to driving very little or delayed licensure, followed by a sudden increase in mileage. This may result from several factors, such as growing up where driving is less essential, followed by transitions to college or to work that require commuting. Under these circumstances, inexperience could combine with high exposure to result in more traffic offenses and greater driving risk.

Future research should continue to examine the co-occurrence of problem behavior, psychosocial factors, and other correlates of problematic driving behavior, and should address some of the limitations of this study. This study was based on a non-representative sample from a restricted region of the country. Thus, generalization of these results must be made with caution. Outcomes for this research relied on driver records, which can be difficult to use, and are subject to uncontrollable sources of unreliability; nevertheless, official records are the best source of traffic offenses available. Although there are limitations related to the use of police records in research, those records remain one of the best sources of driving outcomes that are available, currently. Research addressing these limitations would further enhance the understanding that is essential for the development of interventions that are specific to the factors having the greatest effect on high-risk driving.

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Table 1
Gender differences, means and standard deviations

Variables	Men n = 931 mean (STD)	Women n = 1025 mean (STD)	χ^2
Outcome measures			
Minor offenses in interval 1	1.18 (1.51)	.66 (1.00)	144.83***
Minor offenses in interval 2	1.75 (2.16)	1.03 (1.45)	181.94***
Serious offenses in interval 1	.53 (.83)	.24 (.55)	109.34***
Serious offenses in interval 2	.45 (.78)	.21 (.52)	92.92***
Alcohol offenses in interval 1	.04 (.24)	.01 (.10)	17.39***
Alcohol offenses in interval 2	.11 (.39)	.04 (.20)	36.56***
Change in minor offenses	.57 (2.23)	.37 (1.57)	5.03*
Change in serious offenses	-.07 (1.05)	-.03 (.69)	.00
Change in alcohol offenses	.07 (.41)	.03 (.22)	8.79**
Covariates			
Total miles ^a	1.73 (1.40)	1.32 (1.07)	49.96***
Age at licensure	16.14 (.52)	16.25 (.44)	29.40***
Parental monitoring	9.26 (2.24)	9.79 (2.11)	28.25***
Parental permissiveness	8.63 (1.70)	8.74 (1.69)	2.02
Parent orientation	4.96 (1.34)	5.00 (1.42)	.28
Tolerance of deviance	2.32 (.68)	2.31 (.61)	.09
Marks in school	6.93 (1.46)	7.23 (1.28)	21.25***
Substance use	2.42 (2.65)	2.72 (2.72)	5.82*

* $p < .05$;

** $p \leq .01$;

*** $p \leq .001$.

^aTens of thousands of miles.

Table 2

Correlations among covariates and outcomes by gender

	Total miles	License age	Parental monitoring	Parental permissiveness	Parent orientation	Tolerance of deviance	Marks in school	Substance use
Men								
First interval offenses								
Minor	.07*	-.05	-.06	.02	-.11**	.09**	-.14***	.11**
Serious	.03	-.03	-.13**	.03	-.10**	.12***	-.15***	.15***
Alcohol	.02	.01	-.07*	.05	-.01	.08*	-.06	.12***
Second interval offenses								
Minor	.13***	.12***	-.08*	-.08*	-.12***	.01	-.19***	.11**
Serious	.11***	.10**	-.02	-.02	-.06	-.02	-.14***	.07*
Alcohol	-.05	-.07*	-.12***	.06	-.11***	.11***	-.11**	.19***
Change in offenses								
Minor	.08*	.15***	-.03**	-.09**	-.04	-.05**	-.08*	.03
Serious	.06	.10***	.09**	-.04	.03	-.11***	.01	-.05
Alcohol	-.06	-.07*	-.08*	.02	-.10**	.06	-.07	.11***
Women								
First interval offenses								
Minor	.09***	-.06	-.12***	.08*	-.10***	.13***	-.14***	.16***
Serious	.05	-.03	-.13***	-.01	-.10**	.11***	-.12***	.08**
Alcohol	.00	-.02	-.02	.02	-.01	.05	-.02	.06*
Second interval offenses								
Minor	.18***	.07*	-.10**	.00	-.04	.05	-.25***	.09**
Serious	.04	.06	-.06*	.02	-.05	.03	-.15***	.05
Alcohol	-.03	-.01	-.08**	.05	-.04	.08*	-.06	.13***
Change in offenses								
Minor	.11***	.11***	-.01	-.05	.03	-.04	-.15***	-.02
Serious	-.01	.07*	.05	.02	.04	-.07*	-.02	-.02
Alcohol	-.03	.00	-.07*	.04	-.03	.05	-.04	.09**

* $p < .05$;

** $p \leq .01$;

*** $p \leq .001$.

Table 3
Poisson regression predicting offense counts for intervals 1 and 2, by gender and type of offense

Variable	Licensure through Age 19			20-24 Years		
	Estimate	95% CI		Estimate	95% CI	
		Low	High		Low	High
Minor offenses						
Men						
Total miles ^a	.05	.01	.09	.10	.07	.13
Age at licensure	-.18	-.30	-.06	.22	.13	.32
Parental permissiveness	ns	ns	ns	-.05	-.09	-.02
Parent orientation	ns	ns	ns	-.09	ns	-.05
Marks in school	-.12	-.16	-.08	-.09	-.13	-.06
Substance use	.04	.01	.06	.03	.01	.05
Women						
Total miles	.10	.04	.16	.16	.13	.20
Age at licensure	-.28	-.48	-.08	.12	-.01	.25
Marks in school	-.13	-.19	-.06	-.25	-.29	-.21
Tolerance of deviance	.17	.03	.31	ns	ns	ns
Substance use	.05	.01	.08	ns	ns	ns
Serious offenses						
Men						
Total miles	.01	-.05	.08	.11	.06	.17
Age at licensure	-.11	-.29	.07	.26	.07	.45
Parental monitoring	-.04	-.08	<.00	ns	ns	ns
Marks in school	-.12	-.19	-.06	-.13	-.20	-.06
Substance use	.05	.01	.08	.05	.01	.09
Women						
Total miles	.09	<.00	.19	.09	-.01	.20
Age at licensure	-.23	-.56	.08	.36	.08	.64
Parental monitoring	-.09	-.14	-.03	ns	ns	ns
Parent orientation	ns	ns	ns	-.09	-.19	<.00
Marks in school	-.16	-.26	-.07	ns	ns	ns
Alcohol offenses						
Men						
Total miles	.08	-.13	.29	-.16	-.35	.02
Age at licensure	.10	-.56	.76	-.37	-.75	<.00
Parental monitoring	ns	ns	ns	-.10	-.19	-.01
Marks in school	ns	ns	ns	-.14	-.28	<.00
Substance use	.24	.11	.37	.17	.09	.25
Women						
Total miles	-.06	-.67	.55	-.25	-.62	.13
Age at licensure	-.52	-.27	1.12	-.07	-.81	.68
Substance use	.21	-.01	.44	.24	.12	.36

^aTens of thousands of miles.

Table 4
Regression predicting change in offenses from interval 1 to interval 2, by gender and type of offense

Variable	Standardized estimate	95% CI	
		Low	High
Minor offenses			
Men			
Minor offenses in interval 1	-.40	-.69	-.51
Total miles ^a	.11	.08	.27
Age at licensure	.12	.26	.78
Parental permissiveness	-.07	-.17	-.01
Parent orientation	-.07	-.22	-.02
Marks in school	-.09	-.24	-.05
Women			
Minor offenses in interval 1	-.47	-.82	-.65
Total miles	.17	.16	.32
Age at licensure	.06	< .00	.41
Marks in school	-.21	-.32	-.19
Serious offenses			
Men			
Serious offenses in interval 1	-.68	-.93	-.81
Total miles	.09	.03	.10
Age at licensure	.07	.05	.24
Marks in school	-.07	-.09	-.02
Women			
Serious offenses in interval 1	-.68	-.91	-.80
Total miles	.03	-.01	.01
Age at licensure	.04	-.02	.13
Marks in school	-.10	-.08	-.03
Alcohol offenses			
Men			
Alcohol offenses in interval 1	-.40	-.82	-.61
Total miles	-.05	-.03	< .00
Age at licensure	-.05	-.09	.01
Parent orientation	-.07	-.04	< .00
Substance use	.14	.01	.03
Women			
Alcohol offenses in interval 1	-.42	-1.08	-.83
Total miles	-.04	-.02	< .00
Age at licensure	< .00	-.03	.03
Substance use	.12	< .00	.01

^aTens of thousands of miles.

Table 5

Logistic regression predicting the likelihood of greater proportions of crashes in the second interval than in the first, by gender and offense type

Variable	Odds ratio	95% CI	
		Low	High
Minor offenses			
Men			
Total miles	.99	.96	1.06
Age at licensure	.78	1.13	1.47
Tolerance of deviance	1.14	.79	.98
Women			
Total miles	1.00	.93	1.08
Age at licensure	.69	1.16	1.80
Substance use	1.06	.91	.97
Serious offenses			
Men			
Total miles	.97	.95	1.11
Age at licensure	.79	1.03	1.57
Marks in school	.89	1.04	1.20
Women			
Total miles	1.06	.84	1.05
Age at licensure	.76	.93	1.84
Marks in school	.85	1.06	1.31