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Restricted licensing among older drivers in Iowa

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ABSTRACT

Objectives: To determine whether Iowa's license restriction program identifies older drivers who appear to be at greater crash risk and to assess compliance with license restrictions. *Methods:* A total of 522 drivers 70 and older who were attempting to renew their driver's licenses at licensing offices in Iowa participated in two telephone surveys: one shortly after renewal to discuss driving before renewal and another 6 months later to assess any changes. Surveys assessed driving behavior, crashes, and violations as well as self-reported visual impairments, prescription medications, and physical mobility limitations. *Results:* Of the 522 drivers, 232 renewed their licenses without having to take a road test (Group 1), and 290 were required to take a road test; of the drivers taking a road test, 191 renewed without restrictions (Group 2), 93 received restrictions (Group 3), and 6 had their licenses suspended (Group 4). The small number of drivers with suspensions precluded including this group in analyses. There were clear distinctions among drivers in the first three groups at the initial survey. Driver age increased across Groups 1-3, as did some visual impairments, number of prescription medications, and physical mobility limitations. Many drivers who received restrictions (Group 3) already were driving fewer miles than drivers in Groups 1-2, and were driving less often at night and on high-speed roads. Following license renewal, reported average weekly mileage decreased more among drivers with license restrictions (Group 3) (36 %) than among drivers without restrictions (Groups 1-2) (4 % each). For all license restriction types (headlight, geographic area, or speed), decreases in the likelihood of driving during these restricted conditions were greater for drivers with the relevant restrictions than without. Most drivers complied with restrictions. *Conclusions:* Iowa's license restriction program identifies drivers with more self-reported visual impairments, prescription medications, and physical mobility limitations. Driving exposure was reduced among drivers who received restrictions, though it appears in some cases the restrictions reinforced decisions already made by drivers. *Impact on industry:* License restrictions may be an effective alternative to premature driving cessation and provide some drivers additional time on the road and hence continued mobility and independence. However, overall safety benefits of license restrictions are yet unknown.

1. Introduction

The rapid growth in older driver populations in the United States and elsewhere has led to concerns about potential effects on traffic safety. A recent study examined historical crash rates for older drivers and projected that these drivers would become an increasing proportion of the overall crash problem, including fatal crashes (Lyman, Ferguson, Braver, & Williams, 2002). However, despite growing numbers of older drivers on the road, fewer people 70 and older died in crashes, and fewer were involved in fatal collisions during 1997-2006 than during prior years (Cheung, McCartt, & Braitman, 2008). A total of 4,268 people 70 and older died in motor-vehicle crashes in 2008. This is 27% fewer than in 1997, reversing an upward trend and occurring even as the population of people 70 and older rose 12% between 1997 and 2008. The fatality rate per capita for older people has decreased 40% since 1975 and is now at its lowest level.

Despite this positive trend, fatal crash rates per mile traveled start increasing for drivers 70 and older and increase markedly after age 80 (Insurance Institute for Highway Safety [IIHS], 2009). Decisions about whether older people should continue to drive may affect drivers' families as well as drivers. When people lose their licenses, they become dependent on others, often family members, for transportation. The concern is that older people may lose their mobility, and perhaps their independence, if they lack access to other transportation alternatives. Another concern is that they may continue to drive, unlicensed, until they experience a crash.

The goal for state licensing agencies is to allow people to drive for as long as they can safely do so, but states vary in how they attempt to achieve this goal. Driving abilities vary widely across all ages, so some

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states are hesitant to apply different licensing requirements based solely on age. California, Maryland, and Massachusetts prohibit reexamination based solely on age, but a growing number of states have imposed additional requirements for seniors renewing their licenses. The ages at which special requirements begin vary among states but typically begin as early as 65. About half of U.S. states have shorter renewal cycles or require in-person renewals after a specified age. Some states require reexamination through vision tests, driving knowledge tests, and/or on-road driving tests for drivers older than a specified age. The apparent goal of these special provisions is to identify potentially unsafe drivers for further evaluation.

A program in Iowa identifies drivers of any age who appear potentially unfit to drive. All drivers must renew their licenses in person. Drivers younger than 70 are required to renew every 5 years, and drivers 70 and older must renew every 2 years. Vision tests are administered by Department of Transportation (DOT) staff each time a licensed driver appears for renewal, and staff may require a driver to schedule a written or road test whenever someone's ability to understand traffic laws or drive safely is questioned, based on behavior observed during the renewal process. DOT staff are instructed to be proactive in identifying drivers who potentially are unfit to drive and who should be evaluated through a road test. Another way that drivers enter the reexamination process is through referrals to DOT, typically by a family member, physician, or law enforcement officer. DOT also may require a reexamination when a driver of any age is involved in a fatal crash and the investigating officer deems the driver contributed to the crash. State regulation also gives DOT the authority to reexamine drivers 65 and older who have been in a crash if the police officer's report or driver's own report of the crash indicates a need for reexamination. In practice, however, this authority is invoked only when a driver 80 or older is involved in a crash (Mary Schaer, Iowa DOT, Sep 14 2009, personal communication).

Drivers who are identified for reexamination and required to take a road test may choose to do so at licensing offices or other locations near their homes. Road tests have three possible outcomes: Drivers may pass and renew their licenses, they may pass but have restrictions placed on their licenses, or they may fail and face the loss of their licenses. Restrictions common among older drivers include no driving when headlights are required (such as at night or during inclement weather); no driving outside certain geographic areas (such as city limits or a certain radius from the driver's home); and speed restrictions (such as no driving on freeways, interstates, or roads with certain maximum speed limits, e.g, 35 mph). If drivers request a road test near their homes, they always receive some kind of geographic restriction. If drivers fail the road test, the examiner will discuss deficiencies and the driver may retake the test two times. If a driver declines or fails the additional reexaminations, driving privileges are suspended, although the suspension can be appealed by law.

All U.S. state licensing departments grant restricted licenses. Iowa is particularly active in having DOT staff be cognizant of drivers, particularly older drivers, who may be candidates for further evaluation (like a road test) prior to renewal. This afforded the opportunity to study the characteristics of older drivers who had different licensing outcomes and to examine compliance with license restrictions. Because the goal of license restrictions is allowing people to continue to drive safely by limiting driving to lower risk situations, it is important to understand how driving patterns change as a result of the restrictions.

The current study compared the characteristics of older drivers with different licensing outcomes in terms of driver age, gender, driving patterns, and self-reported visual impairments, prescription medications, and physical mobility limitations, prior to renewal. Also examined were changes in driving exposure (e.g., weekly mileage and weekly numbers of days driven) after restrictions were imposed and compliance with restrictions. Telephone interviews were conducted with drivers soon after license renewal and again 6 months later. The surveys involved detailed questions about driving behavior, crashes, and violations as well as driver self-reports about vision, medications, and physical mobility.

2. Method

Between July 2006 and July 2008, 522 people 70 and older who were attempting to renew their drivers licenses at any of Iowa's 18 state licensing offices were recruited for study. Recruitment was not conducted at county licensing offices. Drivers who already had one of the relevant license restrictions (headlight, geographic area, speed) were not recruited. Drivers were offered $10 compensation for their participation. Drivers who were not required to take a road test were recruited by local residents hired and trained by the study authors. Drivers who were required to take a road test were recruited by DOT staff administering the test. The staff were instructed to recruit drivers following completion of the road test regardless of outcome. Supervisors periodically reminded staff to recruit all drivers regardless of test outcome, but it is not known how well staff adhered to these instructions. Participants were placed in one of four study groups: Group 1: drivers who renewed their licenses without a road test and received no restrictions; Group 2: drivers who took the road test and received no restrictions; Group 3: drivers who took the road test and received one or more relevant restrictions; and Group 4: drivers who failed the road test and whose licenses were suspended.

Initially, the desired sample sizes were 200 drivers for Group 1 and 125 drivers each for Groups 2-4. Recruitment for Group 1 went more quickly than for the other groups. Although the DOT staff administering the road tests was instructed to recruit all drivers taking the test regardless of outcome, it became apparent that drivers were not being recruited consistently. Thus recruitment for Groups 2-4, especially Groups 3-4, was slower than for Group 1. Recruitment for Group 1 concluded earlier than for the other groups, and recruitment for all groups concluded once satisfactory sample sizes were obtained. It was not feasible to continue recruitment until all groups reached planned sample sizes.

Participants provided their telephone numbers and were interviewed by telephone within 1 month of recruitment and again approximately 6 months later. In the initial survey, participants were asked to describe their driving habits prior to license renewal; during the follow-up survey, they were asked to describe their driving since renewal. The survey included detailed questions about license restrictions, travel patterns, and driving exposure (e.g., miles and days driven during a typical week, driving at night, driving on high–speed roads, driving 5 miles or more from home); number of crashes and moving violations during prior 2 years and prior 6 months; as well as vision and diagnosed vision disorders (e.g., cataract, macular degeneration), number of prescription medications, and physical mobility limitations (e.g., difficultly walking one-half mile or up and down a flight of stairs). Information from drivers provided during the initial survey about license restrictions, along with information gathered about restrictions during recruitment, were used to classify drivers into one of the four licensing groups.

2.1. Data Analysis

Chi-square analysis and analysis of variance were used to explore relationships between license group and driver characteristics such as age, gender, driving exposure, and reported visual and physical impairments. The Mantel-Haenszel chi-square statistic was used to test for trends among ordinal variables. The Pearson chi-square statistic was used for analyses involving driver gender. Driver compliance with license restrictions was examined using three logistic regression models to analyze changes in relative risk of

Table 1
Reported driver age, gender, and driving patterns prior to license renewal by license group.

	Group 1 No road test, unrestricted license (n = 235)	Group 2: Road test, unrestricted license (n = 211)	Group 3: Road test, restricted license (n = 70)
Mean driver age (standard deviation)	79.8 (5.0)	81.0 (6.9)	83.4 (6.5)
Driver gender (percent)			
Male	38	49	40
Female	62	51	60
Mean and median number of miles driven during typical week			
Mean (standard deviation)	80.8 (89.8)	60.4 (78.7)	45.5 (58.3)
Median	50.0	32.5	25.0
Days driven during typical week (percent)			
0-2 days	15	19	29
3 or more days	85	81	71
Self-reported crashes in past 2 years (percent)			
0	89	63	87
1	9	34	7
2 or more	2	4	6
Self-reported crashes in past 6 months (percent)			
0	97	71	92
1	3	28	7
2 or more	0	2	1
How often drove on roads that were 5 miles or more from home (percent)			
Almost every day	29	23	16
Sometimes	62	66	73
Never or almost never	8	11	11
How often drove at night (percent)			
Did not drive at night	16	34	62
Hesitant to drive at night	26	17	9
Not at all hesitant to drive at night	59	50	29
How often drove on high–speed roads (percent)			
Did not drive on high–speed roads	12	18	32
Hesitant to drive on high–speed roads	10	15	13
Not at all hesitant to drive on high–speed roads	78	66	55

driving at night, on high–speed roads, and 5 miles or more from home, respectively, for drivers with the relevant restrictions relative to drivers with no restrictions. Although the headlight restriction prohibits driving anytime headlights are required, compliance was examined in terms of driving at night. P-values of 0.05 were used to evaluate all statistical tests, and all statistically significant findings are reported in the text.

3. Results

Initial telephone interviews were completed with 522 licensed drivers 70 and older. Of these, 232 drivers renewed without having to take a road test (Group 1). The remaining 290 drivers were asked to take a road test; 191 subsequently renewed without restrictions (Group 2), 93 received restricted licenses (Group 3), and 6 had their licenses suspended (Group 4). The small number of drivers who had their licenses suspended precluded including this group in analyses.

Of the 93 drivers who received license restrictions (Group 3), 46% received 1 restriction, 27% received 2 restrictions, 22% received 3 restrictions, and 5% received 4 restrictions. Sixty-six drivers received a headlight restriction (i.e., prohibiting driving when headlights are required), 49 received a geographic area restriction (i.e., prohibiting driving outside of city limits or beyond a certain radius from their homes), 41 received a speed restriction (i.e., prohibiting driving on roads above a certain speed limit), and 17 were restricted from driving on interstates.

3.1. Initial Survey Results

Driver age, gender, and driving characteristics of respondents in each license group for the initial survey are shown in Table 1. Reported visual impairments, mean number of prescription medications, and physical mobility limitations by license group are shown in Table 2.

Mean driver age differed significantly among license groups ($F(2) = 11.5$, $p < 0.001$), as did the mean number of miles driven during a typical week ($F(2) = 7.2$, $p = 0.008$). Pairwise t-tests indicated driver age increased across the three license groups. Drivers in Group 3 (road test, restricted license) were older than those in Group 2 (road test, unrestricted license) ($p = 0.007$), and drivers in Group 2 were older than those in Group 1 (no road test, unrestricted license) ($p = 0.03$). A similar trend was observed for weekly mileage, but the pairwise comparison was significant only for Group 2 versus 1 ($p = 0.02$). Similarly, the percentage of drivers who drove 3 days or more per week decreased across the three license groups ($\chi^2(1) = 7.9$, $p = 0.005$).

The percentage of drivers who reported having two or more crashes during the prior 2 years ($\chi^2(1) = 6.2$, $p = 0.0126$) and prior 6 months ($\chi^2(1) = 11.1$, $p < 0.001$) increased across the three license groups (Table 1). There was no significant relationship between license group and number of moving violations during the prior 2 years or prior 6 months. The percentage of drivers who said they did not drive at night ($\chi^2(1) = 37.2$, $p < 0.001$) or on high-speed roads ($\chi^2(1) = 19.0$, $p < 0.0001$) increased across the three license groups. The percentage who reported driving 5 miles or more from home almost every day decreased across the three license groups and was marginally significant ($\chi^2(1) = 3.5$, $p = 0.06$).

There were significant increases across the three license groups in the percentage of drivers who reported difficulty seeing at night ($\chi^2(1) = 14.8$ $p = 0.0001$) and who reported diagnoses of macular degeneration ($\chi^2(1) = 33.1$ $p < 0.0001$) (Table 2). There also were increases in the mean number of prescription medications ($F(2) = 3.4$, $p = 0.03$) and in the percentage of drivers who reported difficulty climbing up and down one flight of stairs ($\chi^2(1) = 17.4$, $p < 0.0001$), walking one-half mile ($\chi^2(1) = 30.2$, $p < 0.0001$), and doing heavy housework ($\chi^2(1) = 17.2$, $p < 0.0001$).

3.2. Comparison of Initial and Follow-Up Surveys

Of the 516 licensed drivers who participated in the initial telephone survey and had their licenses renewed, 77% (395 drivers)

Table 2
Reported driver visual impairments, prescription medications, and physical mobility limitations prior to license renewal by license group.

	Group 1: No road test, unrestricted license (n = 235)	Group 2: Road test, unrestricted license (n = 211)	Group 3: Road test, restricted license (n = 70)
Percent reporting difficulty seeing at night	18	20	41
Percent diagnosed with:			
Glaucoma	8	7	13
Cataract	58	56	72
Macular degeneration	7	7	34
Mean number of prescribed medications (standard deviation)	3.3 (2.6)	3.9 (3.4)	4.1 (3.2)
How easy or difficult to climb up and down one flight of stairs (percent)			
Very easy	50	35	34
Some difficulty	46	51	53
Very difficult	3	14	13
How easy or difficult to walk a half mile (percent)			
Very easy	56	28	33
Some difficulty	34	48	36
Very difficult	10	24	31
How easy or difficult to do heavy housework (percent)			
Very easy	62	37	45
Some difficulty	35	45	43
Very difficult	4	17	13

completed the follow-up telephone survey approximately 6 months later. There was no significant difference in the response rate for the follow-up survey by license group. To determine if drivers who completed the follow-up survey differed from those who completed only the initial survey, comparisons between the characteristics of both sets of drivers were examined overall and for each license group (Table 3).

Overall, there were no significant differences between drivers who completed and who did not complete both surveys in terms of driver age or mean number of days driven during a typical week, but drivers who completed both surveys tended to drive more miles per week ($t(509) = -2.2$, $p = 0.03$) and were more likely to be female ($\chi^2(1) = 15.4$, $p < 0.001$). The only significant differences when examined by license group were that, for Group 2 ($\chi^2(1) = 6.4$, $p = 0.0117$) and Group 3 ($\chi^2(1) = 11.3$, $p < 0.001$), drivers who completed both surveys were more likely to be female.

To examine changes in driving exposure between the initial and follow-up surveys, changes in mean number of miles driven during a typical week were examined for each license group. Drivers in Group 3 (road test, restricted license) reported a 36% reduction in weekly mileage, from 46 miles in the initial survey to 29 miles in the follow-up survey ($t(49) = -2.7$ $p = 0.01$). Drivers in Group 1 (no road test, unrestricted license) and Group 2 (road test, unrestricted license) reported smaller and nonsignificant reductions in weekly mileage (Table 4).

Three separate logistic regression models were used to determine whether license group was associated with whether or not drivers drove at night, on high–speed roads, or 5 miles or more from home following license renewal. Predictors in the model were time (initial survey and follow-up survey) and restriction (e.g., relevant restriction or no restriction). An interaction term was included to identify whether the change in outcome (e.g., night driving) between the initial and follow-up surveys varied by group (e.g., drivers with headlight restriction vs. those with no restrictions).

Table 3
Reported driver age, gender, and driving patterns by license group and by whether or not drivers completed follow-up surveys.

	Completed initial survey only	Completed initial and follow-up surveys
Overall	n = 121	n = 395
Mean driver age(standard deviation)	81.8 (6.1)	80.6 (6.2)
Driver gender (percent)		
Male	58	38
Female	42	62
Mean number of miles driven during typical week (standard deviation)	52.8 (56.0)	71.2 (87.8)
Mean number of days driven during typical week (standard deviation)	4.7 (2.2)	4.6 (2.1)
Group 1: No road test, unrestricted license	n = 48	n = 184
Mean driver age	80.4 (5.1)	79.6 (4.9)
Driver gender (percent)		
Male	46	36
Female	54	64
Mean number of miles driven during typical week (standard deviation)	61.9 (56.6)	85.6 (96.0)
Mean number of days driven during typical week (standard deviation)	4.7 (2.3)	5.1 (2.0)
Group 2: Road test, unrestricted license	n = 50	n = 141
Mean driver age	81.8 (7.0)	80.8 (6.9)
Driver gender (percent)		
Male	64	43
Female	36	57
Mean number of miles driven during typical week (standard deviation)	48.08 (60.3)	65.0 (84.1)
Mean number of days driven during typical week (standard deviation)	4.8 (2.0)	4.3 (2.0)
Group 3: Road test, restricted license	n = 23	n = 70
Mean driver age	84.6 (5.5)	83.0 (6.9)
Driver gender (percent)		
Male	70	30
Female	30	70
Mean number of miles driven during typical week (standard deviation)	44.6 (42.5)	45.8 (62.7)
Mean number of days driven during typical week (standard deviation)	4.5 (2.4)	3.8 (2.1)

For the initial survey, the odds ratio of driving at night with a headlight restriction versus no restriction was 0.14; hence drivers with a headlight restriction were 86% less likely than drivers without the restriction to drive at night. For the follow-up survey, drivers with a headlight restriction were 94% less likely to drive at night (Table 5). However, the interaction term in the model was not statistically significant, indicating that changes in night driving between the initial and follow-up surveys were not significantly different between the two groups.

Drivers with a speed restriction were 70% less likely to drive on high-speed roads than drivers without the restriction in the initial survey, and 92% less likely in the follow-up survey. The relative difference between the odds ratios was statistically significant (interaction point estimate = 0.26, $p = 0.01$), indicating that the decrease in the number of drivers who drove on high-speed roads between the initial and follow-up surveys was significantly larger for drivers with a speed restriction than for drivers without the restriction.

Table 4
Mean number of miles driven during typical week for initial and follow-up surveys by license group.

Mean number of miles driven during typical week	Group 1: No road test, unrestricted license (n = 184)	Group 2: Test, unrestricted license (n = 141)	Group 3: Test, restricted license (n = 70)
Initial survey	85.6	65.0	45.8
Follow-up survey	82.5	62.2	29.2
Percent change	-4	-4	-36

Table 5
Odds of driving during restricted conditions by restriction type and survey period.

	Headlight restriction	No restriction	Odds ratio	95 percent confidence interval
Initial survey				
Drive at night	15	240	0.14	0.07-0.27
Do not drive at night	33	72		
Follow-up survey				
Drive at night	6	225	0.06	0.03-0.13
Do not drive at night	42	87		
	Speed restriction	No restriction		
Initial survey				
Drive on high–speed roads	24	271	0.30	0.14-0.65
Do not drive on high–speed roads	12	41		
Follow-up survey				
Drive on high–speed roads	11	265	0.08	0.04-0.17
Do not drive on high–speed roads	25	47		
	Geographic restriction	No restriction		
Initial survey				
Drive 5 miles or more from home	25	291	0.25	0.09-0.64
Do not drive 5 miles or more from home	7	20		
Follow-up survey				
Drive 5 miles or more from home	24	293	0.18	0.07-0.47
Do not drive 5 miles or more from home	8	18		

Drivers with a geographic area restriction were 75% less likely to drive 5 miles or more from home than drivers without the restriction in the initial survey and 82% less likely in the follow-up survey. Changes in driving 5 miles or more from home were not significantly different between the two groups.

The characteristics of drivers with license restrictions who did and did not comply with their restrictions were examined in terms of age, gender, diagnosed visual impairments, and physical mobility limitations (e.g., ease of or difficulty walking one half-mile). The examination was considered exploratory given the small numbers of drivers with restrictions. Drivers who did not comply with restrictions were not markedly different from those who reported compliance; many also were aware of their visual impairments and physical mobility limitations (table not shown). For example, of the six drivers who reported not complying with the headlight restriction, five said they experienced difficulty seeing at night.

Drivers were asked in the follow-up survey how many crashes they had during the prior 6 months since renewing their licenses. No driver reported more than one crash during this period, and there was no significant relationship between license group and number of reported crashes.

4. Discussion

Iowa's license restriction program appears to be able to identify drivers with greater crash risk, based on a variety of self-reported medical and physical impairments. Even at the initial survey, there were clear distinctions among drivers in the three license groups, and these patterns tended to follow a linear pattern. Drivers who were required to take a road test for license renewal (Groups 2-3) were older than those who were not required to take a road test (Group 1); among drivers who took a road test, those who received license restrictions (Group 3) were older than those who did not receive restrictions (Group 2). Diagnosed visual impairments, number of prescription medications, and physical mobility limitations increased across license Groups 1-3. Similar patterns were observed in terms of weekly mileage and exposure to higher risk driving situations (e.g., driving at night or on high-speed roads). Many drivers who received license restrictions already were self-limiting their driving to some degree by driving fewer miles and avoiding driving at night and on high-speed roads. Drivers with a head light restriction already were 86% less likely to drive at night than drivers without license restrictions. So it appears that license restrictions reinforced decisions already made by some drivers. Previous studies have shown that many older drivers limit their driving to situations and environments they perceive as less challenging (Braitman & McCartt, 2008; Charlton, Oxley, Fildes, & Les, 2003; Lyman, McGwin, & Sims, 2001; Stutts, 1998; Vance, Roenker, & Cissell, 2006; West et al., 2003).

Compliance rates with headlight and speed restrictions generally were fairly high. Previous research has noted a high degree of compliance with night driving restrictions among older drivers in British Columbia (Nasvadi & Wister, 2009). Still, a small percentage of drivers with license restrictions in the current study reported noncompliance with headlight and speed restrictions. It was more difficult to assess compliance with geographic area restrictions because some drivers were limited to driving within city limits or within a certain radius from their homes that would permit driving 5 miles or more from home. Three-quarters of drivers with geographic area restrictions in the follow-up survey reported driving 5 miles or more from home, suggesting potentially less compliance with a geographic area restriction than with headlight or speed restrictions.

One hypothesis about noncompliance is that drivers who perceive themselves as capable drivers may be less likely to comply with restrictions. The number of drivers with license restrictions who did not comply with restrictions was too small to draw meaningful conclusions, but exploratory examination of the data suggested this is not the case. Almost all of the drivers with a headlight restriction who continued to drive at night reported difficulty seeing at night. So it appears that some drivers who do not comply with restrictions recognize that they do have some difficulties in these driving situations. Another possibility regarding noncompliant drivers is that they felt it was necessary to make certain trips, such as going to the grocery store or a doctor's appointment, even if it means violating a restriction. It is unknown how drivers can be motivated to comply with their restrictions, or why they fail to comply with them. Stutts, Stewart, and Heusen-Causey (2000) found that many older drivers in North Carolina with license restrictions (i.e., speed, interstate, daylight) did not identify any restrictions other than corrective lenses. So it may be that some older drivers do not understand their restrictions or are not aware of having them.

The most noteworthy change in driving behavior resulting from license restrictions was a significant reduction in weekly mileage for drivers with any kind of restriction relative to drivers without restrictions. Drivers with license restrictions reduced their weekly mileage by about 40% between the initial and follow-up surveys, whereas weekly mileage for drivers without restrictions (Groups 1-2) changed little. It is unclear whether these changes would have occurred independently of license restrictions, but it seems unlikely given that the weekly mileage of drivers without restrictions changed little during the same period, even among those who were required to take a road test.

It was not possible to evaluate the effects of license restrictions on crashes in a rigorous way. The time period following renewal (6 months) was not long enough to study crash effects; there were very few self-reported crashes in the follow-up survey. Therefore, it is not surprising that there was no relationship between license outcome and number of subsequent crashes. Although access to state crash records was granted, the records did not indicate the date that a

current license restriction was applied, so the effects of special restrictions on crashes could not be studied with driver license record data. However, a recent study of drivers 66 and older in British Columbia using 1999-2006 data found that the risk of an at-fault crash was 87% lower among drivers with license restrictions (i.e., speed, daylight, geographic area) compared with drivers with no restrictions, after controlling for driver age and gender (Nasvadi & Wister, 2009).

Another study limitation was reliance on driver self-reports for information about driving habits and visual and physical impairments. In particular, because drivers were interviewed after renewal and licensing outcome, it is possible that knowing the outcome affected some drivers' responses. Drivers who received restrictions may have been more likely to say they avoided situations (e.g., night driving) before renewal. However, some drivers reported driving in situations in which they were legally prohibited from driving, providing some evidence that they were being honest. Several studies using driver self-reports reveal that, generally speaking, drivers do provide accurate information (Babor, Steinberg, Anton, & Del Boca, 2000; Freier, Bell, & Ellickson, 1991; Patrick et al., 1994).

Driver recruitment also was problematic. Although examiners were instructed to recruit everyone who took a road test, it became clear that examiners likely were not recruiting everyone. Although it was not possible to know examiners' selection criteria, it is likely examiners were more apt to recruit drivers who passed the road test without restrictions than drivers who received restrictions or did not pass the test. Drivers who had their licenses suspended also may have been less likely to agree to participate in the survey.

In summary, license restrictions may be an effective alternative to premature driving cessation and provide some drivers additional time on the road and, hence, continued mobility and independence. License restrictions reduce driving exposure to some degree, particularly driving in higher risk settings. Overall safety benefits of license restrictions are unknown. Additional research is needed to determine the effects of restrictions on older driver crashes in the United States and whether some restrictions are more effective than others in improving safety.

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