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Driving miles estimates by teen drivers: how accurate are they?

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Abstract

The objective of this study was to determine how accurately teens can report miles driven. Participants were 118 drivers in Connecticut (average age 17½ years; average time licensed 11 months). Half had their own vehicle; half shared family vehicles. Teens completed a telephone survey about their preceding week's driving, then completed a daily trip log for the next week and a second survey about the details of the logged week's trips and miles. Teens with their own vehicle provided odometer readings. Summing the miles for every trip was generally consistent with estimates from odometer readings. Overall mileage estimates were 20–30% lower than those from trip-by-trip listings, except for very low estimates for the first week by teens who shared vehicles. The results indicate that single overall estimates frequently understate total miles driven, but that prompted reviews of each trip can provide valid and detailed information.

Crash rates for young, newly licensed drivers are high, particularly right after licensure.^{1,2} Policy recommendations seek to limit exposure by delaying licensure and restricting high-risk early driving.^{3,4} All states and the District of Columbia have done this by adopting some form of Graduated Driver Licensing (GDL),⁵ which reduces crashes and injuries by restrictions such as no teen passengers and no late-night driving.^{6–10}

To evaluate the impact on actual teen driving of policies and programs, it is important to be able to determine how much teens really drive. Researchers commonly ask teens to report their driving in terms of miles, trips, or time over the period of a day, week, month, or year. However, little is known about the accuracy or validity of these reports.

The purpose of this study is to determine the accuracy and validity of self-reports of the amounts of driving by teens.

Methods

Participants were drawn from teens already participating in a longitudinal study of parent influences on teen driving.¹¹ They were originally recruited when they obtained their learner's permits at Connecticut DMV offices in 2000 and 2001. Teens licensed less than 1 year were mailed a letter describing this study as an option within the larger study and encouraging them to participate. Teens who participated were paid for completed interviews and daily logs (see

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below) up to a maximum of \$50. Interviews were conducted between February and August 2002. At the time of the study, Connecticut had no passenger or curfew limits for new drivers.

In two interviews about 10 days apart, participants estimated miles and trips driven in the preceding week. A trip was defined as a journey from one point to another, eg from home to school. A round trip counted as two trips. If there were intermediate stops, each segment counted as a separate trip. Participants first provided an overall estimate of the total number of miles and trips driven and then enumerated all trips driven on each of the preceding seven days and the miles driven for each trip.

Teens who drove their own vehicle were called for an odometer reading prior to the first week and were asked for odometer readings in each interview.

For each of seven days prior to the second interview, participants completed a daily log of each trip they drove, including start time, origin and destination, passengers, and other details. Participants referred to their written logs in the second interview.

Parental consent and teen assent were obtained according to procedures approved by the Institutional Review Board of the National Institute of Child Health and Human Development.

Results

A total of 231 teens were sent letters and subsequently called for this study; 118 (51%) provided data through two weeks of driving.

Fifty-eight participants (28 male and 30 female) drove their own vehicle; 60 (25 male and 35 female) shared vehicles. Participants' average age was 17 years 6 months; they had been licensed an average of 11 months.

Two estimates of weekly driving mileage were available for all of the study participants; a third estimate was available for those with their own cars:

- overall (unaided total mileage estimate, before the interview's trip enumeration activity),
- trip-based (the sum across the enumerated trips),
- odometer-based (the difference between the current odometer reading and the previous one, interpolated when the period between readings was more than seven days).

Miles driven per week were calculated for each measure (table 1). For participants with their own vehicles ($n = 58$), the averages were 193 (odometer), 183 (trip detail), and 141 miles (overall report), or annual driving rates of between 7000 and 10 000 miles. Participants who shared vehicles ($n = 60$) drove 109 miles/week, based on their trip details—about 5500 miles per year. Their summary overall reports were much lower, just 16 miles in the first week and 89 miles in the second week.

Analysis of variance was used to test differences. Since mileage estimates were skewed, with most values moderate and a few values much higher, a natural logarithm transformation was used for these analyses and the correlations described next. In table 1, effects within mileage source that were significant at $p < 0.01$ are shown in bold type. There were no significant gender differences.

In addition, some differences between sources of mileage estimation were statistically significant (all $p < 0.01$): odometer-based mileage was not significantly different than mileage

from adding the trip details; both were significantly greater than unaided overall mileage reports. Drivers who shared vehicles produced extremely low overall estimates of their mileage in the first week compared to trip-based estimates; their overall and trip-based estimates were much more consistent in the second week after they had filled out daily trip logs.

To better assess how consistent each person's different estimates were, correlations between types of estimates were computed on the logarithmic transformations, separately for week 1 and week 2. The correlations in week 1 were between 0.645 and 0.732, showing a high degree of consistency. In week 2, the correlation between overall report and trip-based mileage estimates was 0.753, but the correlations with odometer mileage dropped to 0.294 and 0.155, respectively. The drops are statistically significant and reflect the greater average time period between odometer readings in week 2 (15 days) than in week 1 (9 days).

Information on the types of driving is available from trip details and is briefly described below. The teens in this study reported 4717 trips covering 34 000 miles over the two weeks they were tracked, 4 trips and 29 miles per driving day. The teens drove about one-fourth less on school days (23 miles per day) than on non-school weekdays (31 miles per day) or weekend days (32 miles per day), though total miles in weeks with school days were not significantly different than in weeks with no school.

Table 2 shows details of the driving trips. Trips were coded by destination. The endpoint of most trips, 36%, was home, followed by 21% at a friend's home, 14% for errands, 10% at school, 8% at work, and 11% split among restaurants, recreation spots, and other/unknown destinations.

One-third (34%) of all trips originated between 2 pm and 5:59 pm. About 13% of trips originated between 9 pm and 11:59 pm, and about 4% between midnight and 5:59 am, the most dangerous hours. One-fourth (26%) of trips occurred on Saturday and Sunday, accounting for nearly one-third (31%) of miles driven. On school days, more trips were taken during the morning (6 am–9:59 am) and afternoon (2 pm–5:59 pm) and fewer during the middle of the day (10 am–1:59 pm).

Discussion

Accurately measuring how much teens drive is important in the assessment of their driving safety, yet we know of no studies evaluating possible measures. We tested three methods, with mixed results.

The most robust results were obtained from having teens enumerate every trip. Whether from unprimed recall (week 1) or from daily logs (week 2), results were credible and averaged nearly 150 miles/week or 7500 miles/year. Teens with their own vehicles drove two-thirds more (183 vs 109 miles/week) than teens who shared vehicles. This method is similar to that used by the US Department of Transportation in the National Household Transportation Survey, last conducted in 2001¹²; it produced estimates consistent with values from odometer readings.

Simply asking teens how many miles and trips they drove in the past week produced low estimates. For an important segment of the teen population, those who do not have their own vehicle, the estimates could be extremely low. For the first week, with no prior sensitization, these teens estimated about 16 miles driven, on average, when the more credible value from trip details was 100 miles. In the second week all teens produced overall estimates that were still 20–30% less than from trip details.

The differences between the measures for miles driven also applied to numbers of trips taken. In particular, the shared-vehicle teens in week 1 provided an average overall estimate of just 5.3 trips, versus an average of 15.3 trips based on their enumeration of individual trips.

Key points

- 118 Connecticut teens estimated miles driven, overall and trip-by-trip, for two one-week periods.
- Trip-by-trip enumerations, either in recall (week 1) or using daily logs (week 2), provided the best estimates.
- Teens with their own vehicles drove about two-thirds more than teens who shared family vehicles.
- Overall week mileage estimates were 20–30% lower than trip-by-trip listings, except during the first week for teens who shared vehicles, whose overall estimates were very low.
- Practical limitations keep odometer readings from being generally effective measures of overall teen driving.

The main drawback to prompting teens for trip details is that the procedure required 10–15 minutes to obtain information for a full week compared with about 1 minute for the global assessment, including warm-up context questions. However, the procedure produced credible and consistent values for participants who had their own cars as well as for those who shared vehicles.

Odometer readings provide useful information for the segment of teens who exclusively drive their own vehicles. They are not applicable to teens who share vehicles or drive multiple vehicles, a significant and different portion of the teen population that drives less and perhaps may be less aware of their driving.

The study was limited by using a pre-screened sample and assessing only two weeks of driving. The design did not allow for random ordering of overall versus detailed seven-day recall, so the detailed recall was informed by the overall estimates. Odometer readings too often covered more than seven days, and they applied for only one segment of teen drivers.

Conclusion

Of the methods tested here for measuring the amount of teen driving, obtaining trip-by-trip details provided the most reliable, credible, and informative estimates. Retrospective (asking about individual trips of the previous week without forewarning) and concurrent (having teens complete trip logs each day) estimates provide comparable estimates, ones that are reasonable and consistent with other estimates of total teen driving.

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Table 1

Miles per week

	Week's mileage, by source		
	Overall est.	From detail	Odometer
Have exclusive car?			
Own	141	183	193
Share	53	109	
Week			
First	85	142	
Second (log)	109	150	
Have exclusive car by week			
Own–first	153	184	215
Own–second (log)	128	182	170
Share–first	16	100	
Share–second (log)	89	118	
Total	96	146	193

Bold type indicates effects within mileage source that are significant at p,0.01.

Table 2

Trips by type, time of day, and day of week

	No./week	%	Miles/week	%
Trip destination				
Home	7.3	36.4	53.8	37.4
Friend's home	4.2	21.1	26.0	18.1
Store/shopping	1.2	6.2	7.4	5.1
Personal errand	1.5	7.7	9.2	6.4
School	2.0	10.0	12.4	8.6
Work	1.6	7.9	9.4	6.5
Restaurant	0.6	3.2	4.1	2.9
Recreation spot	0.7	3.7	7.5	5.2
Other/unknown	0.8	3.8	14.1	9.8
Time departed				
6 am–9:59 am	2.6	13.2	15.4	10.7
10 am–1:59 pm	3.3	16.7	26.2	18.2
2 pm–5:59 pm	6.8	33.9	49.7	34.6
6 pm–8:59 pm	3.7	18.7	26.4	18.4
9 pm–11:59 pm	2.7	13.4	20.5	14.2
Midnight–5:59 am	0.8	4.2	5.7	3.9
Total	20.0	100.0	143.9	100.0
	No./day	%	Miles/day	%
School day/weekend?				
Mon–Fri, school	4.0	37.6	23.5	30.5
Mon–Fri, no school	4.2	36.4	31.4	37.9
Weekend	3.7	26.0	32.0	31.6