Raising the Speed Limit from 75 to 80 mph on a Utah Rural Interstate: Effects on Vehicle Speeds

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ABSTRACT

Objective: In January 2009, the speed limit for all vehicles was raised from 75 to 80 mph on two sections of rural interstate highway I-15 in Utah. The current study evaluated the effects of the speed limit increase on vehicle speeds.

Methods: Vehicle speeds were measured at sites within and near the 80 mph speed zones and at more distant control sites in May 2008, May 2009, and May 2010. Log-linear regression models for passenger vehicles and for large trucks estimated percentage changes in vehicle speeds associated with the speed limit increase. Logistic regression models estimated the effects of the speed limit increase on the probability of passenger vehicles exceeding 80 mph. Models of the probability of large trucks exceeding 80 mph were not estimated due to very small proportions of trucks exceeding 80 mph in 2009 and 2010.

Results: Relative to baseline speeds measured before the speed limit change, mean passenger vehicle and large truck speeds and the proportion of vehicles exceeding 80 mph declined substantially for all site groups four months after the speed limit increase took effect, with larger declines at sites with the 80 mph limit. One year later, speeds had increased somewhat at sites within or near the 80 mph speed zones, but not at control sites, and all speeds still were lower than at baseline. Based on patterns in speeds at the control sites, mean passenger vehicle speeds and the probability of passenger vehicles exceeding 80 mph generally were lower than expected in 2009 and higher than expected in 2010 at sites within the 80 mph speed zones and at nearby sites, although not all the differences were statistically significant. Notably, the odds of passenger vehicles exceeding 80 mph at sites within the 80 mph speed limit zones were estimated to be 31 percent higher in 2010 than would have been expected without the speed limit increase, a marginally significant effect. At sites near the 80 mph speed zones, there was a non-significant increase of 10.3 percent in the odds of passenger vehicles exceeding 80 mph in 2010 compared with the odds that would have been expected without the speed limit increase. Large truck speeds at sites within the 80 mph speed zones were significantly lower by an estimated 7.3 percent in 2009 and an estimated 3.7 percent in 2010, on average, than would have been expected without the speed limit increase. At sites near the 80 mph speed zones, large truck speeds were higher by an estimated 0.6 percent in 2009 and 1.6 percent in 2010, relative to expected without the speed limit increase. Only the increase in 2010 was significant.

Conclusions: Contrary to prior studies on the effects of speed limit increases in other states, observed travel speeds on affected roads in Utah decreased relative to the speeds observed before the speed limit increase in both the first and second years of the speed limit increase. The widespread reduction in speeds may reflect the effect of the unusually deep and persistent recession in the United States, along with volatile gas prices. Although speeds did not recover to their baseline levels, passenger vehicle speeds within or near the 80 mph speed zones were increasing faster than at the control sites from the first to the second year of the speed limit change, Thus, 16 months after the change, there was evidence that sections with the higher limit were encouraging faster travel than would have been expected, had the speed limit not been raised. There was no evidence that increasing the speed limit was associated with increased large truck speeds, which could reflect a greater sensitivity of these vehicles to the depths of the U.S. recession and complex and unknown ways these vehicles may have been affected.

Keywords: Speed limit increase, Vehicle speeds, Speed limits, Passenger vehicle speeds, Large truck speeds

INTRODUCTION

High travel speeds increase the risk of crashing and the risk of injuries (Bowie and Walz, 1994; Elvik, 2005; Joksch, 1993). Since 2000, speeding has been a factor in about one-third of all fatal crashes in the United States. In 2011, speed was a contributing factor in about 16 percent of property-damage-only crashes, about 20 percent of crashes involving non-fatal or fatal injuries, and about 10,000 deaths (Insurance Institute for Highway Safety, 2013). According to the National Highway Traffic Safety Administration (2012), the economic costs of speed-related crashes total more than $40 billion each year.

Most U.S. states raised speed limits in response to the 1995 repeal of the national maximum speed limit, and the subsequent higher limits were associated with immediate and long-term increases in travel speeds and fatalities (Farmer et al., 1999; Friedman et al., 2009; Patterson et al., 2002; Retting and Greene, 1997; Retting and Teoh, 2008). Since the repeal of the national maximum speed limit, three states have permitted travel speeds in excess of 75 mph. Between 1995 and 1999, Montana eliminated numeric daytime speed limits for passenger vehicles on rural interstate highways, requiring only that drivers travel at “reasonable and prudent” speeds. Large trucks were limited to 65 mph. In 1999, the daytime speed limit for passenger vehicles was set at 75 mph. In 2006, Texas raised the daytime speed limit for passenger vehicles on segments of rural interstate highways I-10 and I-20 from 75 to 80 mph. The daytime limit for large trucks remained at 70 mph, and a nighttime limit of 65 mph remained in effect for all vehicles. The increased speed limit on both I-10 and I-20 was associated with higher mean passenger vehicle speeds and the increased odds of vehicles exceeding 75 and 80 mph (Retting and Cheung, 2008). In October 2012, a 41-mile newly built stretch of Texas 130 was opened with a speed limit of 85 mph.

In 2008, Utah authorized speed limits in excess of 75 mph on rural interstate highway I-15 between mileposts 64 and 222 (Figure 1). In January 2009, the speed limit for all vehicles was raised from 75 to 80 mph on two sections of I-15, each approximately 20 miles long (Figure 1), between mileposts 144 and 162 and between mileposts 188 and 207. As noted above, a prior study examined the effects of a speed limit increase from 75 to 80 mph on segments of rural interstates in Texas; that speed limit increase applied only to passenger vehicles (Retting and Cheung, 2008). The objective of the current study was to evaluate the effects of a speed limit increase for all vehicles from 75 to 80 mph on the speeds of passenger vehicles and large trucks.

METHOD

Vehicle speeds were measured at sites within and near the 80 mph speed zones and at more distant comparison sites before and after the speed limit increase.

Study sites

Baseline speed data were collected in May 2008, before the speed limit was raised in January 2009. Six study sites (D, G, and H in Figure 1, both directions) were selected within the segments of I-15 that were permitted to increase the speed limit to 80 mph. However, the speed limit was subsequently increased at only one of these sites (G northbound). Baseline speeds were measured at two additional sites on I-15 in Utah (C in Figure 1, both directions), four sites on I-15 in Nevada (A and B in Figure 1, both directions), and two sites on I-80 in Utah (I in Figure 1, both directions). The speed limit at these sites was 75 mph during the baseline speed data collection as well as during the after data collection periods.

Observations of speeds were repeated in May 2009, several months after the speed limit increase, and again in May 2010. In these observations, site G southbound was moved southward by 7 miles so as to be included in the 80 mph speed zone, and 4 additional sites were added, including 2 within the 80 mph speed zone (E in Figure 1, both directions) and 2 outside the speed zone (F in Figure 1, both directions). Thus, vehicle speeds were measured at 18 sites: 4 sites (E and G in Figure 1, both directions) within the 80 mph speed zone and 14 sites (A, B, C, D, F, H and I in Figure 1, both directions) where the speed limit remained 75 mph.

Data collection

Vehicle speeds were measured with photo radar mounted on a tripod and positioned off the right roadway shoulder. Speeds of passing vehicles were recorded electronically without triggering a strobe light. The electronic files contained the time of each measurement and the speed of each vehicle and a classification as a passenger vehicle or large truck based on the vehicle’s radar profile. Vehicles classified as passenger vehicles generally were cars, passenger vans, SUVs, and pickups. However, some large pickup trucks, large SUVs, and passenger vehicles pulling trailers may have been classified as large trucks based on their radar profiles. For the 2010 data collection only, passing vehicles were photographed, and the vehicles were classified as passenger vehicles, large trucks, buses, or motorcycles by a researcher based on visual examination of the photographs.

All observations were made on weekdays during daylight hours. For each site, the three rounds of data collection were matched by time of day, day of week, and week of month. Speeds at each southbound I-15 and westbound I-80 site were collected during the morning for about 3 hours (9 a.m. to 12 p.m. or 10 a.m. to 1 p.m.). Speeds at each northbound I-15 and eastbound I-80 site were collected during the afternoon for about 3 hours (1 p.m. to 4 p.m. or 2 p.m. to 5 p.m.). During the data collection in May 2010, there was a 45-minute period during which photos of vehicles were not taken at site A, northbound, on I-15 due to a camera malfunction.

During the 3-hour observation period at each site in all three rounds of observations, a technician counted all the vehicles in a 15-minute period during each hour, except at the I-80 eastbound site in 2008, and vehicles were classified as passenger vehicles, large trucks, buses, or motorcycles.

Analysis

Descriptive statistics of the measured speeds, including means and proportions of vehicles exceeding 80 mph, were calculated for each observation site separately for passenger vehicles and for large trucks. To estimate the effects of the speed limit increase on speeds, the sites were placed in three site groups: 1) the study group, where the speed limit was raised to 80 mph (E and G in Figure 1, both directions); 2) the spillover group, which included sites located 12 to 18 miles from the 80 mph speed zones and where the speed limit was not changed (D, F, and H in Figure 1, both directions); and 3) the control group, including sites farther from the 80 mph speed zones and where the speed limit was not changed (A, B, C, and I in Figure 1, both directions).

To estimate changes in vehicle speeds associated with the speed limit increase, log-linear regression models were estimated separately for passenger vehicles and for large trucks and for the after periods of 2009 and 2010. In these models the dependent variable was the natural logarithm of speeds. Additionally, in order to evaluate the effects of the speed limit increase on the probability of vehicles exceeding 80 mph, logistic regression models were estimated for passenger vehicles for 2009 and 2010.

In these models, the dependent variable was a binary speed indicator (higher than 80 mph or not). As will be explained below, the proportions of large truck speeds exceeding 80 mph were very small during the after periods of 2009 and 2010. Therefore, logistic regression models of the probability of large trucks exceeding 80 mph were not estimated.

In both the log-linear regression models and the logistic regression models, the independent variables were vehicle counts per hour, percentage of large trucks, time of day (a.m. vs. p.m.), observation site indicators, and study period (after vs. before speed limit change). Two interaction variables for site group and study period also were included as predictors: the interaction between study vs. control group and after vs. before period and the interaction between spillover vs. control group and after vs. before period. The interaction variables tested whether the changes in speeds or probabilities of speeds higher than 80 mph after the speed limit increase differed between the study and control sites and between the spillover and control sites. These differences are interpreted as the changes in vehicle speeds or probabilities of speeds higher than 80 mph beyond what would have been expected absent the speed limit increase. For example, if the parameter for the interaction term between the study vs. control group and the after vs. before period is -0.0238 in a log-linear regression model for passenger vehicle speeds, the percentage change in average passenger vehicle speeds is calculated as ([exp(-0.0238)-1]x100), a 2.4 percent reduction compared with the speeds that would have been expected without the speed limit increase. If the parameter for the interaction term between the study vs. control group and the after vs. before period is -0.2035 in a logistic regression model for passenger vehicle speeds higher than 80 mph, the percentage change in the odds of passenger vehicles exceeding 80 mph is calculated as ([exp(-0.2035)-1]x100), a 18.4 percent reduction compared with the odds that would have been expected without the speed limit increase. The difference in the modeled changes in speeds or the changes in probabilities of speeds higher than 80 mph between the study and control sites was the primary measure of effectiveness. Any spillover effects were measured by the difference in the modeled changes in speeds or probabilities of speeds higher than 80 mph between the spillover and control sites.

Variables with p-values less than 0.05 were considered statistically significant.

RESULTS

Table 1 summarizes the vehicle counts per hour and the percentage of vehicles that were large trucks calculated from the 15-minute traffic count samples for each observation site and study period. There were few buses (less than 2 percent of observed vehicles at all sites) and motorcycles (less than 4 percent of observed vehicles at all sites). At most sites, the hourly vehicle counts during the morning and afternoon off-peak hours decreased from May 2008 (range 330-756) to May 2009 (range 270-588), and then increased in May 2010 (range 336-708). The trends in the percentage of large trucks were not as consistent among the sites, but the most common pattern was a decrease in the percentage from May 2008 to May 2009 followed by an increase in May 2010.

Table 2 shows the mean speed and proportion of speeds that were higher than 80 mph for passenger vehicles and for large trucks for each site group and study period, based only on the sites with observations in all three study periods. For passenger vehicles, the mean speed across the sites for each of the three site groups declined from May 2008 to May 2009. From May 2009 to May 2010, the mean speed increased slightly for the study and spillover groups and was virtually unchanged for the control group. The proportion of passenger vehicle speeds exceeding 80 mph for each site group declined substantially from May 2008 to May 2009. The proportion then increased slightly in May 2010 for the study and spillover groups while declining slightly for the control group.

For large trucks, the mean speed for each site group declined from May 2008 to May 2009. From May 2009 to May 2010, the mean speed increased slightly for the study and spillover groups and changed little for the control group. The proportion of large truck speeds exceeding 80 mph for each site group ranged from 7 to 27 percent in May 2008 and fell to nearly zero percent for all the site groups in both May 2009 and May 2010.

The mean speed and proportion of speeds that were higher than 80 mph for each site and study period are provided in Appendix A for passenger vehicles and in Appendix B for large trucks.

Log-linear regression models of vehicle speeds

Tables 3 and 4 provide results of the log-linear regression models that estimated effects of the speed limit increase and other predictors on passenger vehicle speeds and large truck speeds. After adjusting for the percentage of large trucks, hourly vehicle counts, time of day, and differences among observation sites, the estimated effects of the speed limit increase on passenger vehicle speeds and large truck speeds are summarized in Table 5.

For passenger vehicles, the estimated effect of the speed limit increase on passenger vehicle speeds was obtained by interpreting the interaction term between the study vs. control group and the after vs. before period. Based on this parameter, average passenger vehicle speeds at sites within the 80 mph speed zones were an estimated 2.4 percent lower in 2009 and an estimated 0.2 percent higher in 2010 than the speeds that would have been expected without the speed limit increase. Only the difference in 2009 was statistically significant. The estimated spillover effect of the speed limit increase on passenger vehicle speeds was obtained by interpreting the interaction term between the spillover vs. control group and the after vs. before period. The passenger vehicle speeds were an estimated 0.3 percent higher in 2009 and an estimated 1.9 percent higher in 2010 at sites near the 80 mph speed zones relative to the expected speeds without the speed limit increase. Only the difference in 2010 was statistically significant.

For large trucks, based on the interaction term between the study vs. control group and the after vs. before study period, average large truck speeds at sites within the 80 mph speed zones were 7.3 percent lower in 2009 and 3.7 percent lower in 2010 than the speeds that would have been expected without the speed limit increase. Both differences were significant. Large truck speeds at sites near the 80 mph speed zones were an estimated 0.6 percent higher in 2009 and an estimated 1.6 percent higher in 2010 than the speeds that would have been expected without the speed limit increase. Only the difference in 2010 was significant.

Models of the probability of passenger vehicles exceeding 80 mph

Table 6 provides results of the logistic regression models that estimated effects of the speed limit increase and other predictors on the probability of passenger vehicles exceeding 80 mph. After adjusting for the percentage of large trucks, hourly vehicle counts, time of day, and differences among observation sites, the estimated effects of the speed limit increase on the odds of passenger vehicles exceeding 80 mph are summarized in Table 7.

Based on the interaction term between the study vs. control group and the after vs. before period, the odds of passenger vehicles exceeding 80 mph at sites within the 80 mph speed zones were an estimated 18.4 percent lower in 2009 and 30.7 percent higher in 2010 than would have been expected without the speed limit increase. The difference in 2010 was marginally significant (p=0.064). Similarly, the odds of passenger vehicles exceeding 80 mph at sites near the 80 mph speed zones were an estimated 34.5 percent lower in 2009 and an estimated 10.3 percent higher in 2010 than the expected odds without the speed limit increase. Only the difference in 2009 was statistically significant.

DISCUSSION

About four months after the speed limit increase from 75 to 80 mph on two segments of a rural interstate in Utah, there were substantial declines in the mean speeds of passenger vehicles and large trucks and in the proportion of vehicles exceeding 80 mph on roadway segments where the speed limit increased and on nearby and more distant roadway segments where the speed limit remained 75 mph. One year later, speeds had not recovered to the pre-speed limit change levels. However, relative to what would have been expected without the speed limit increase based on the pattern of speeds at the control sites, passenger vehicle speeds, on average, were higher at sites within the 80 mph speed zones and at the nearby sites where the 75 mph speed limit was unchanged, although only the latter change was significant. For both sets of sites, the probabilities of passenger vehicles exceeding 80 mph also were higher than would have been expected without the speed limit increase; the increase was marginally significant for the sites within the 80 mph speed zones.

Truck speeds showed a different pattern. When measured more than one year after the speed limit change, mean large truck speeds at the sites within the 80 mph speed zone were significantly lower than would have expected without the speed limit change, whereas mean large truck speeds were significantly higher than expected at nearby sites where the speed limit remained 75 mph. Reliable estimates of the effects of the speed limit change on the probability of large trucks exceeding 80 mph could not be derived, due to the very small proportions of large trucks exceeding 80 mph during the after periods 2009 and 2010.

It is not clear why the un-modeled passenger vehicle and truck speeds were substantially lower for all the site groups in May 2009, about four months after the speed limit change, compared with baseline speeds measured in May 2008. Nor is it clear why speeds remained substantially lower than baseline speeds when measured in May 2010. The traffic volumes also declined substantially at almost all study sites in May 2009 compared with May 2008. Traffic volumes then increased in May 2010 but still were lower than in May 2008 at most sites. A possible factor in the declining vehicle speeds and traffic volumes, especially for large trucks, was the economic downtown occurring during the study period. The U.S. gross domestic product declined by 5 percent from the second quarter of 2008 to the second quarter of 2009, and then increased by 3.3 percent from the second quarter of 2009 to the second quarter of 2010 (U.S. Bureau of Economic Analysis, 2012). Another consideration in the declining speeds for large trucks may have been the increasing use of speed governors. Slower truck speeds reduce fuel consumption. It has been reported that the spike in fuel costs in 2008 may have precipitated wider use of speed governors by motor carriers to contain fuel costs (Bomkamp, 2008; Lavelle, 2008). Regardless, the use of control sites and traffic volumes in the statistical models should have controlled for these and other general factors such as weather conditions affecting travel volumes and speeds.

Several limitations of the study are worth noting. As noted above, both passenger vehicle and large truck speeds declined substantially at all of the study sites after the speed limit increase. The study occurred during a time period when the economic downturn was occurring, and there was variability in gas prices. These factors may have complicated the findings. It is unknown to what extent economic factors may have affected travel speeds, but it is likely that truck travel patterns were affected to a greater extent than passenger vehicle travel patterns. The posted speed limit was increased to 80 mph only on portions of the section of I-15 where higher speed limits were authorized. At the time of the baseline speed data collection, it was unknown where the speed limit would be raised. Only one of the observation sites actually was within the 80 mph speed zones, and the corresponding southbound site for this northbound site was relocated so as to be included in the 80 mph speed zones. Although speed observations were conducted for additional sites located within the 80 mph speed zones in the post-speed limit increase observations, there were no baseline speed observations for these sites. Other factors not included in the study may have influenced vehicle speeds but could not be examined due to limitations in the data, such as possible changes in speed enforcement at some of the observation sites.

The present study shows that when speed limits are increased, passenger vehicle travel speeds will be higher than would have been expected without the speed limit change, and some drivers' speeds will exceed the new limit. This can occur not only on the roadways with higher speed limits but at nearby sites where speed limits are unchanged. There was no evidence that increasing the speed limit was associated with increased large truck speeds. High travel speeds increase the risk of crashing and the risk of injuries. The present study did not evaluate crash outcomes. Prior studies have found that increases in speed limits on interstate highways are associated with increases in motor-vehicle occupant fatalities (Baum et al., 1989, 1990, 1991; Farmer et al., 1999; Friedman et al, 2009; Patterson et al., 2002).

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Table 1. Vehicle count per hour and percentage of large trucks for each study site and year

		Before speed limit change		After speed limit change			
		May 2008		May 2009		May 2010	
Sites	Site group	Vehicles per hour	Percentage of large trucks	Vehicles per hour	Percentage of large trucks	Vehicles per hour	Percentage of large trucks
NV I-15							
A Southbound	Control	540	23	270	24	516	29
A Northbound	Control	546	23	348	20	504	19
B Southbound	Control	564	32	426	25	498	26
B Northbound	Control	612	24	408	18	522	22
UT I-15							
C Southbound	Control	588	25	534	18	468	15
C Northbound	Control	624	21	534	15	576	20
D Southbound	Spillover	504	14	408	13	420	16
D Northbound	Spillover	756	16	588	18	708	13
E Southbound	Study	—	—	354	18	336	17
E Northbound	Study	—	—	294	11	390	9
F Southbound	Spillover	—	—	324	27	348	23
F Northbound	Spillover	—	—	324	22	390	24
G Southbound	Study	462	32	450	18	468	25
G Northbound	Study	474	13	432	18	462	21
H Southbound	Spillover	330	28	324	22	336	27
H Northbound	Spillover	402	22	384	22	384	22
UT I-80							
I Westbound	Control	348	36	402	24	384	24
I Eastbound	Control	—	—	480	20	450	24

Table 2. Mean speed and percentage of speeds exceeding 80 mph for passenger vehicles and large trucks for each study site group and year for sites with observations in May 2008, May 2009, and May 2010

	Before speed limit change		After speed limit change			
	May 2008		May 2009		May 2010	
	Mean speed (mph)	Percentage of speeds higher than 80 mph	Mean speed (mph)	Percentage of speeds higher than 80 mph	Mean speed (mph)	Percentage of speeds higher than 80 mph
Passenger vehicles						
Study group	79.1	45	72.3	6	73.5	7
Spillover group	76.5	27	71.2	2	72.9	3
Control group	75.7	24	70.8	3	70.8	2
Large trucks						
Study group	75.0	27	64.9	0	65.7	0.2
Spillover group	70.2	7	65.0	0.1	65.6	0.1
Control group	68.6	7	64.2	0.2	64.0	0.1

Table 3. Log-linear regression modeling results for passenger vehicle speeds

	2009 vs. 2008			2010 vs. 2008		
	Estimate	Standard error	p-value	Estimate	Standard error	p-value
Intercept	4.3187	0.0072	<0.0001	4.3349	0.0070	<0.0001
Study site E vs. control site I	0.1262	0.0048	<0.0001	0.0884	0.0058	<0.0001
Study site G vs. control site I	0.0820	0.0033	<0.0001	0.0701	0.0035	<0.0001
Spillover site D vs. control site I	0.0470	0.0036	<0.0001	0.0376	0.0050	<0.0001
Spillover site F vs. control site I	0.0132	0.0037	0.0004	-0.0095	0.0040	0.0170
Spillover site H vs. control site I	0.0337	0.0030	<0.0001	0.0140	0.0030	<0.0001
Control site A vs. control site I	0.0757	0.0023	<0.0001	0.0670	0.0031	<0.0001
Control site B vs. control site I	0.0560	0.0023	<0.0001	0.0328	0.0030	<0.0001
Control site C vs. control site I	0.0236	0.0026	<0.0001	0.0172	0.0035	<0.0001
After vs. 2008	-0.0730	0.0021	<0.0001	-0.0708	0.0018	<0.0001
Effect of speed limit increase: interaction between study vs. control sites and after vs. 2008	-0.0238	0.0035	<0.0001	0.0017	0.0037	0.6507
Spillover effect of speed limit increase: interaction between spillover vs. control sites and after vs. 2008	0.0033	0.0026	0.2016	0.0192	0.0026	<0.0001
Vehicles per hour (per ten vehicles)	0.0001	0.0001	0.1085	0.0002	0.0001	0.1441
Percentage of large trucks	-0.0018	0.0002	<0.0001	-0.0024	0.0002	<0.0001
Morning vs. afternoon	-0.0005	0.0013	0.6868	0.0133	0.0018	<0.0001

Table 4. Log-linear regression modeling results of large truck speeds

	2009 vs. 2008			2010 vs. 2008		
	Estimate	Standard error	p-value	Estimate	Standard error	p-value
Intercept	4.2735	0.0168	<0.0001	4.3537	0.0145	<0.0001
Study site E vs. control site I	0.1040	0.0109	<0.0001	0.0185	0.0114	0.1046
Study site G vs. control site I	0.0683	0.0072	<0.0001	0.0462	0.0072	<0.0001
Spillover site D vs. control site I	-0.0172	0.0081	0.0324	-0.0502	0.0100	<0.0001
Spillover site F vs. control site I	-0.0114	0.0081	0.1579	-0.0348	0.0073	<0.0001
Spillover site H vs. control site I	0.0069	0.0062	0.2655	-0.0091	0.0057	0.1091
Control site A vs. control site I	0.0131	0.0051	0.0096	0.0126	0.0057	0.0282
Control site B vs. control site I	0.0112	0.0047	0.0172	-0.0083	0.0056	0.1395
Control site C vs. control site I	-0.0649	0.0059	<0.0001	-0.0870	0.0068	<0.0001
After vs. 2008	-0.0792	0.0047	<0.0001	-0.0895	0.0036	<0.0001
Effect of speed limit increase: interaction between study vs. control sites and after vs. 2008	-0.0763	0.0077	<0.0001	-0.0379	0.0075	<0.0001
Spillover effect of speed limit increase: interaction between spillover vs. control sites and after vs. 2008	0.0058	0.0058	0.3170	0.0155	0.0054	0.0040
Vehicles per hour (per ten vehicles)	0.0008	0.0002	<0.0001	0.0005	0.0002	0.0528
Percentage of large trucks	-0.0036	0.0004	<0.0001	-0.0060	0.0004	<0.0001
Morning vs. afternoon	0.0239	0.0030	<0.0001	0.0500	0.0034	<0.0001

Table 5. Summary of results from log-linear regression models of percentage changes in speeds after the speed limit increase for passenger vehicles and for large trucks, relative to expected speeds without speed limit increase

		Passenger vehicles		Large trucks	
Study Group	Study period	Percent change in speeds	P value	Percent change in speeds	P value
Effect of speed limit increase within 80 mph speed zone: interaction between camera vs. control intersections and after vs. warning period	2009 vs. 2008	-2.4	<0.001	-7.3	<0.001
	2010 vs. 2008	0.2	0.651	-3.7	<0.001
Spillover effect of speed limit increase: interaction between spillover vs. control sites and after vs. 2008	2009 vs. 2008	0.3	0.202	0.6	0.317
	2010 vs. 2008	1.9	<0.001	1.6	0.004

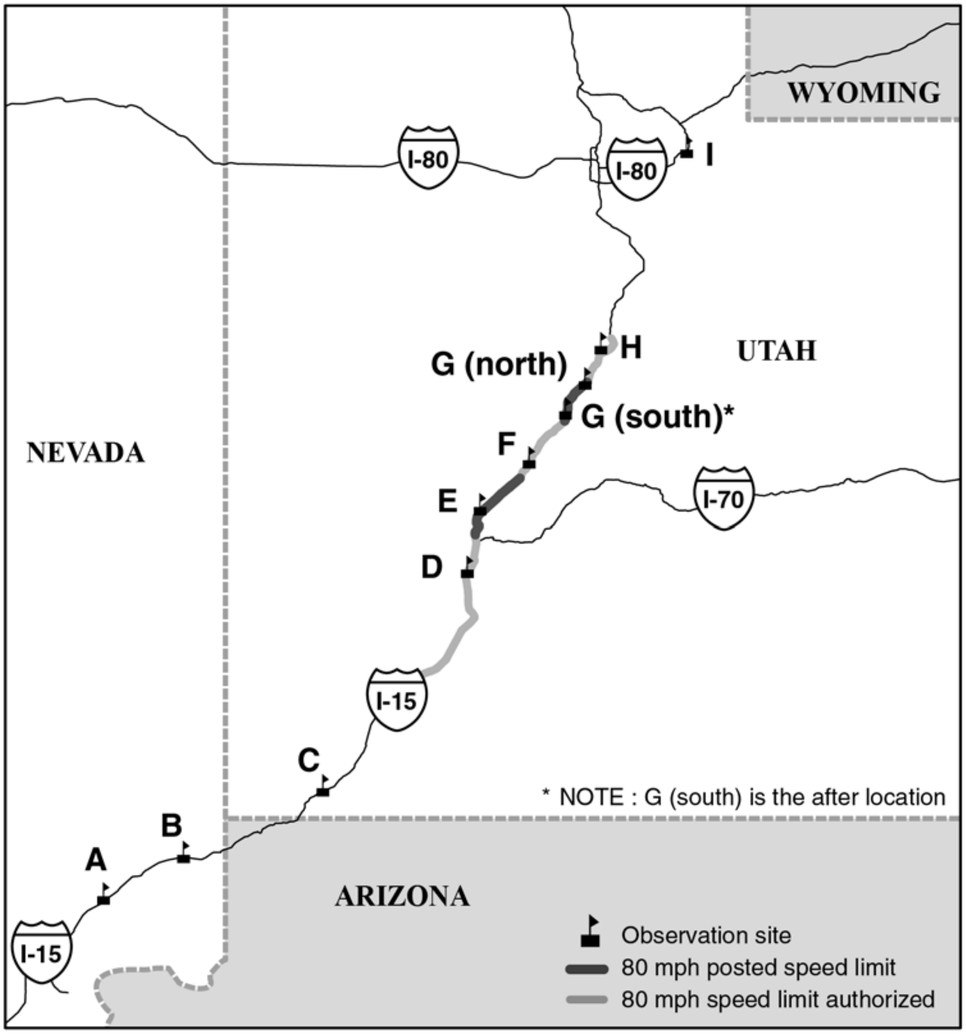
Table 6. Logistic regression modeling results of passenger vehicle speeds exceeding 80 mph

	2009 vs. 2008			2010 vs. 2008		
	Estimate	Standard error	p-value	Estimate	Standard error	p-value
Intercept	-2.222	0.2517	<.0001	-2.3355	0.2584	<.0001
Study site E vs. control site I	3.9978	0.2123	<.0001	4.3813	0.2504	<.0001
Study site G vs. control site I	2.8015	0.1788	<.0001	2.9706	0.198	<.0001
Spillover site D vs. control site I	2.3005	0.2157	<.0001	2.6904	0.2577	<.0001
Spillover site F vs. control site I	0.2635	0.4275	0.5377	1.6138	0.2898	<.0001
Spillover site H vs. control site I	1.2947	0.1771	<.0001	1.2267	0.1893	<.0001
Control site A vs. control site I	2.7071	0.1767	<.0001	2.9787	0.2047	<.0001
Control site B vs. control site I	2.03	0.1789	<.0001	2.0526	0.2044	<.0001
Control site C vs. control site I	1.5171	0.1915	<.0001	1.8203	0.2207	<.0001
After vs. 2008	-2.442	0.0892	<.0001	-2.6383	0.0907	<.0001
Effect of speed limit increase: interaction between study vs. control sites and after vs. 2008	-0.2035	0.1339	0.1287	0.268	0.1447	0.0641
Spillover effect of speed limit increase: interaction between spillover vs. control sites and after vs. 2008	-0.4228	0.1313	0.0013	0.0983	0.1375	0.4745
Vehicles per hour (per ten vehicles)	-0.0074	0.0036	0.0376	-0.0129	0.0043	0.003
Percentage of large trucks	-0.0164	0.0059	0.0053	-0.0072	0.0066	0.2745
Morning vs. afternoon	-0.1144	0.055	0.0375	-0.1274	0.0696	0.0672

Table 7. Summary of results from logistic regression models of percentage changes in odds of passenger vehicles exceeding 80 mph after the speed limit increase, relative to expected odds without the change

		Percent change in odds of exceeding 80 mph	p-value
Effect of speed limit increase within 80mph speed zone: interaction between camera vs. control intersections and after vs. warning period	2009 vs. 2008	-18.4	0.129
	2010 vs. 2008	30.7	0.064
Spillover effect of speed limit increase: interaction between spillover vs. control sites and after vs. 2008	2009 vs. 2008	-34.5	0.001
	2010 vs. 2008	10.3	0.475

Figure 1. Road segments on I-15 in Utah that were authorized to increase speed limits to 80 mph, segment where speed limits were increased to 80 mph, and sites on I-15 in Utah and Nevada and on I-80 in Utah where vehicle speeds were observed



Appendix A
Mean speeds and percentage of speeds higher than 80 mph
for passenger vehicles for each study site and year

		Before speed limit change		After speed limit change			
		May 2008		May 2009		May 2010	
Sites	Site group	Mean speed (mph)	Percentage of speeds higher than 80 mph	Mean speed (mph)	Percentage of speeds higher than 80 mph	Mean speed (mph)	Percentage of speeds higher than 80 mph
NV I-15							
A Southbound	Control	78	38	72.3	6	73	7
A Northbound	Control	79.9	49	72.5	4	72.5	3
B Southbound	Control	73	12	71.8	4	70	1
B Northbound	Control	77.1	28	73.9	10	72.5	6
UT I-15							
C Southbound	Control	75.3	22	69.4	1	72	2
C Northbound	Control	74.9	15	69.9	1	69.4	1
D Southbound	Spillover	78.2	36	71.8	3	75	8
D Northbound	Spillover	78.3	34	70.9	1	72.9	2
E Southbound	Study	—	—	76.1	20	75.8	18
E Northbound	Study	—	—	75.8	20	77.7	39
F Southbound	Spillover	—	—	68.5	0.2	73.6	5
F Northbound	Spillover	—	—	68.4	1	66	0
G Southbound	Study	79.1	45	71.2	3	75.6	14
G Northbound	Study	79	45	73.3	9	72	2
H Southbound	Spillover	73.6	12	72.7	5	71.1	1
H Northbound	Spillover	74	15	70.2	2	71.4	3
UT I-80							
I Westbound	Control	71.3	4	66.8	0.4	67.4	0.1
I Eastbound	Control	—	—	68	0.4	69.1	0.4

Appendix B
Mean speeds and percentage of speeds higher than 80 mph
for large trucks for each study site and year

		Before speed limit change		After speed limit change			
		May 2008		May 2009		May 2010	
Sites	Site group	Mean speed (mph)	Percentage of speeds higher than 80 mph	Mean speed (mph)	Percentage of speeds higher than 80 mph	Mean speed (mph)	Percentage of speeds higher than 80 mph
NV I-15							
A Southbound	Control	69.5	6	63.5	0	66.4	0.4
A Northbound	Control	74.7	30	64.7	1	66.1	0
B Southbound	Control	66.6	2	65.3	0	62.9	0
B Northbound	Control	71.6	10	67.1	0.3	67.6	0.4
UT I-15							
C Southbound	Control	71.5	4	64.9	0	66.7	0
C Northbound	Control	62.6	3	58.4	0	56.1	0
D Southbound	Spillover	73.5	16	63.9	0	66.8	0
D Northbound	Spillover	72.2	12	64.3	0.4	64.4	0
E Southbound	Study	—	—	66.9	1	67.8	1
E Northbound	Study	---	—	68.6	3	67.1	2
F Southbound	Spillover	—	—	63.3	0	67.2	0
F Northbound	Spillover	—	—	62.6	0	60.3	0
G Southbound	Study	73.6	19	64	0	68.1	0.4
G Northbound	Study	76.5	36	65.7	0	63.4	0
H Southbound	Spillover	67.7	0	66.8	0	66.3	0.4
H Northbound	Spillover	68.7	2	64.9	0	65.9	0
UT I-80							
I Westbound	Control	67.4	0.3	63.6	0	63.1	0
I Eastbound	Control	—	—	64.3	0.3	65.3	0