
Changes in Traffic Safety Policies and Regulations in USA (1950-2010)

1. Introduction

Since the beginning of the widespread use of automobiles in the USA, the federal and state governments have implemented various policies and regulations to improve traffic safety. This report aims to examine regulatory changes implemented from 1950 through 2010, annual traffic safety trends, and any possible relationship between them. Regulatory changes include tougher restrictions on drinking and driving, the mandatory use of seat belts and helmets, setting safe speed limits and a graduated driver licensing plan. The report will also examine the judgment, if any, available in the literature on the successes and failures of various policies.

The first task in this regard is to examine the annual trends on traffic fatalities and injuries along with related variables such as annual automobile/motorcycle usage and ownership, as well as population trends. These trends are presented in the next section. The data used to examine these trends were obtained from official government sources, the National Safety Council (NSC) and specific individual sources, which are noted below.

2. Trends in Traffic Safety and Vehicle Ownership Data

2.1 Population Trends

The USA is one of the few industrialized nations whose population growth has remained above the replacement level in the recent past. The best estimate of the US population comes from the US Census Bureau data, and this estimate is available for every census year. Figure 1 shows the US population from 1950 through 2010, which is the study period for this report [1].

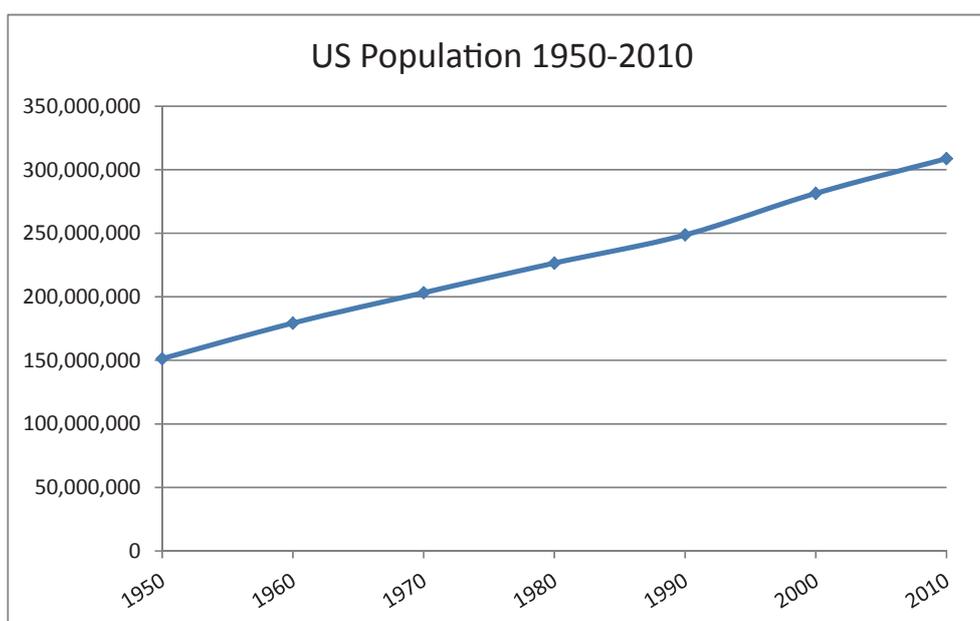


Figure 1 US population 1950-2010[1]

It can be observed that the US population grew from close to 150 million in 1950 to about 310 million in 2010. With such a large increase in population, traffic injuries/fatalities per capita were all but certain to go down over this period. Moreover, as noted below not only have per capita fatalities gone down in recent years but so have the overall fatalities.

2.2 Car Usage and Driving Trends

A more relevant figure (compared to total population) for examining the traffic-related injuries and fatalities in the USA would be the Vehicle-Miles Traveled (VMT). The trend since 1950 is shown in Figure 2 [2] along with the annual number.

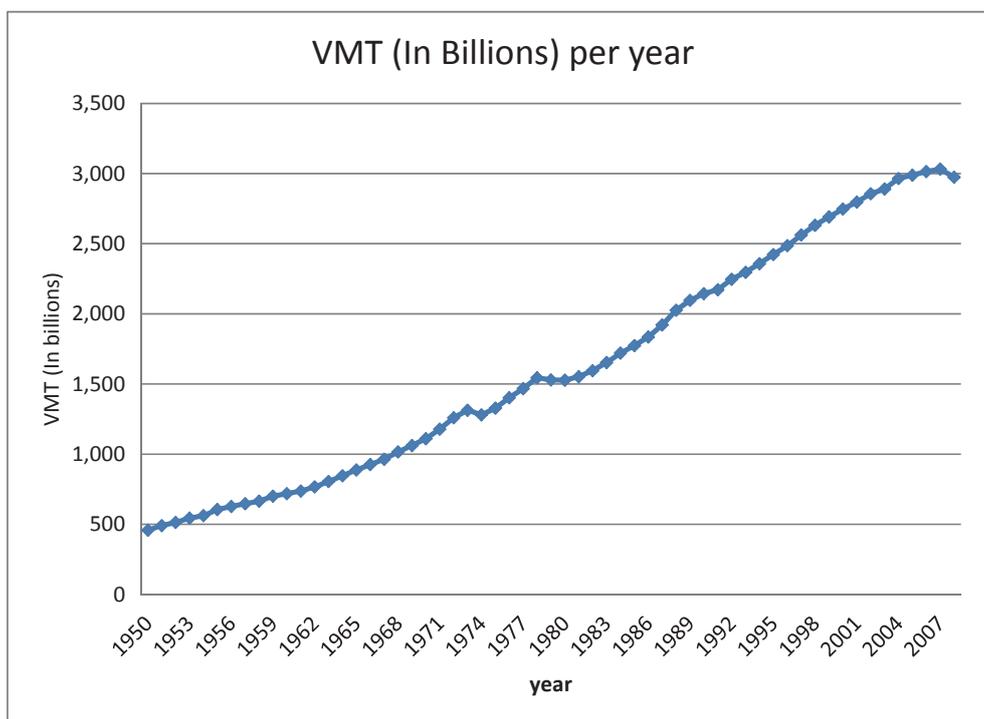


Figure 2 US vehicle miles traveled (VMT) per year, 1950-2010 [2]

VMT increased from close to 500 billion in 1950 to about 3 trillion in 2010, representing a six-fold increase. As shown in Figure 2, the annual VMT flat-lined or declined slightly only in the 1970s (during the oil embargo and economically challenging periods in late 1978 through 1981) and during the recent downturn (starting in 2008). The increase in VMT is not surprising since the number of people who owned at least one car in 2010 was 255.9 million, compared with close to 50 million in 1950 [2]. The increases in VMT also correspond closely to the increases in the miles of paved roads in the USA. The trend in paved roads is shown in Figure 3 [3].

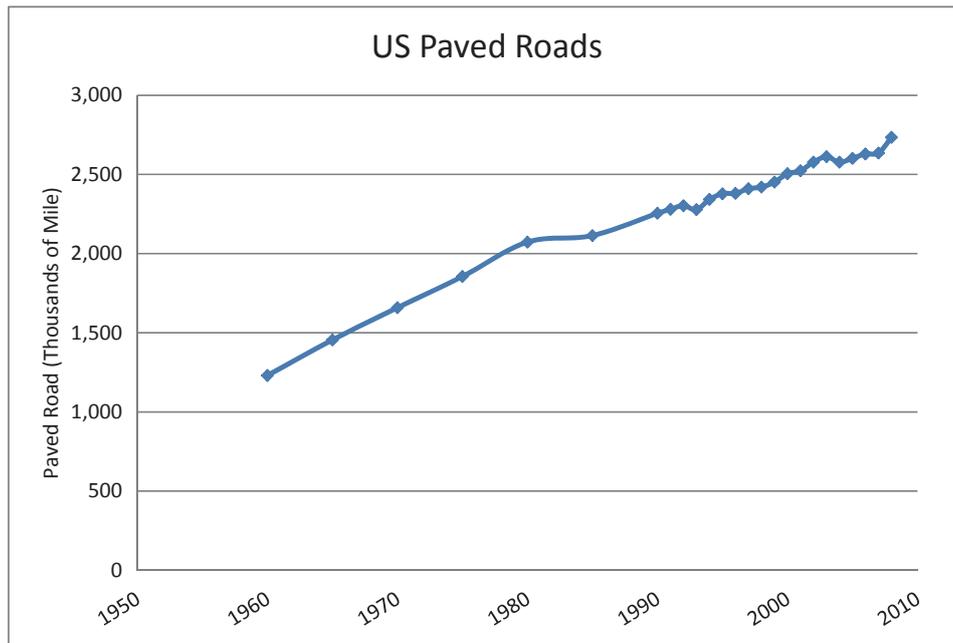


Figure 3 Paved road mileage in the USA by year [3]

2.3 Automobile Ownership per Capita

Since 1950 the USA has maintained one of the world's highest vehicle ownership rates. Vehicle ownership in the USA grew rapidly in the decades leading up to the 1980s, but slowed thereafter. Figure 4 shows the trend since 1950 in terms of vehicles per 1,000 people [4].

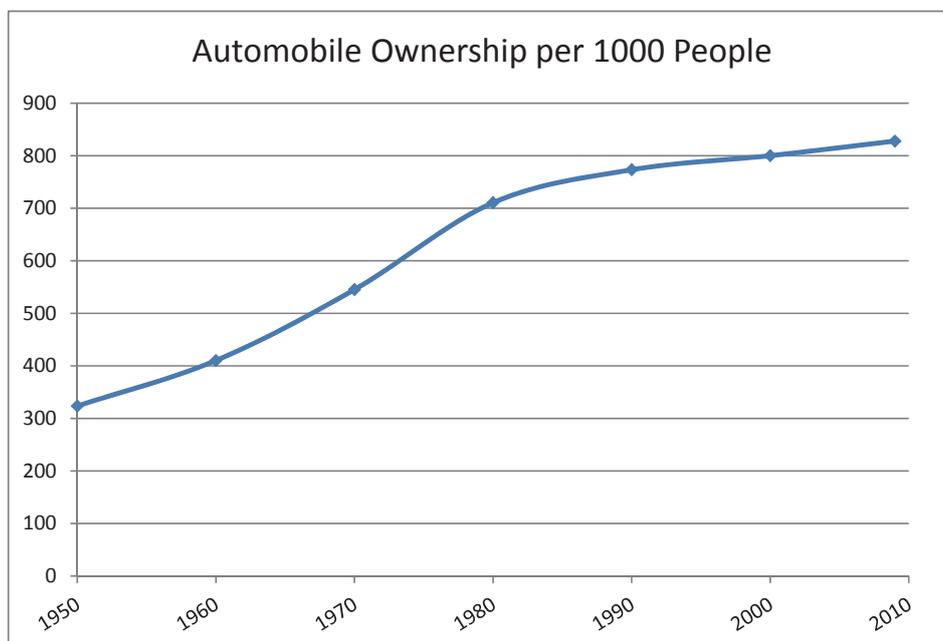


Figure 4 Automobile ownership per 1,000 people [4]

Figure 5 shows the trend in the number of registered motorcycles in the USA. The number declined during the 1980s, but has been steadily growing since the mid-1990s [5].

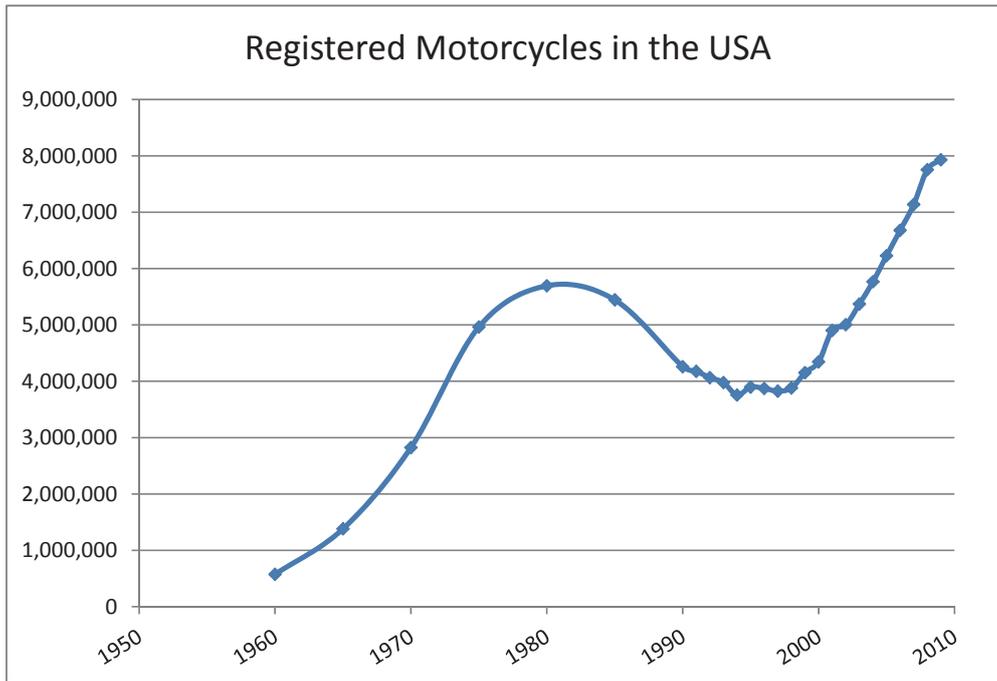


Figure 5 Number of motorcycles in the USA since 1960 [5]

2.4 Traffic-related Fatalities

In this section the trends in traffic-related fatalities are presented with respect to the raw numbers as well as normalized by VMT and population. It may be observed in Figure 6 that while the annual number of fatalities increased in the 1960s and then again slightly in the first few years of the new millennium, the more recent trend in fatalities has been downward since 2006. It will be interesting to examine if there are some recent regulations that may have affected these trends.

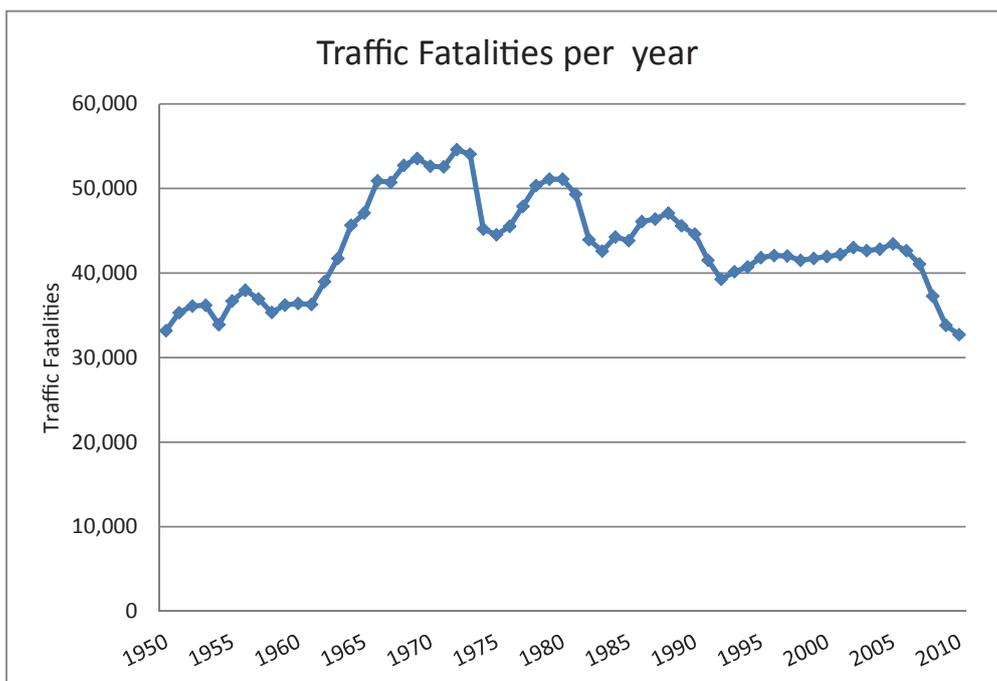


Figure 6 US traffic fatalities per year (1950-2010) [2]

In fact, according to the National Highway Traffic Safety Administration, traffic fatalities are at their lowest since 1950, despite the increases in the population and VMT. Fatalities as a fraction of population have gone down as shown in Figure 7. This was not the case in the 1960s, and while the fraction trended downwards between 1970s through 2005 it was not a consistent decrease [2].

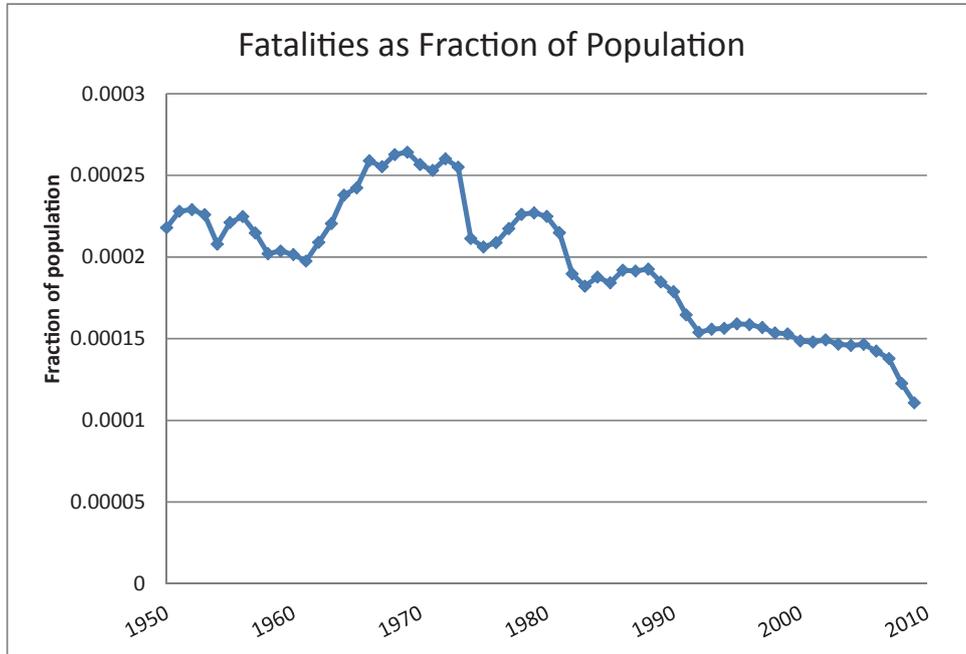


Figure 7 US traffic fatalities as a fraction of population (1950-2010) [2]

The fatalities normalized by VMT follow a far more consistent trend. The number of highway deaths normalized by VMT declined in the 1950s, increased in the 1960s, and has been on a steady decline since the 1980s [2].

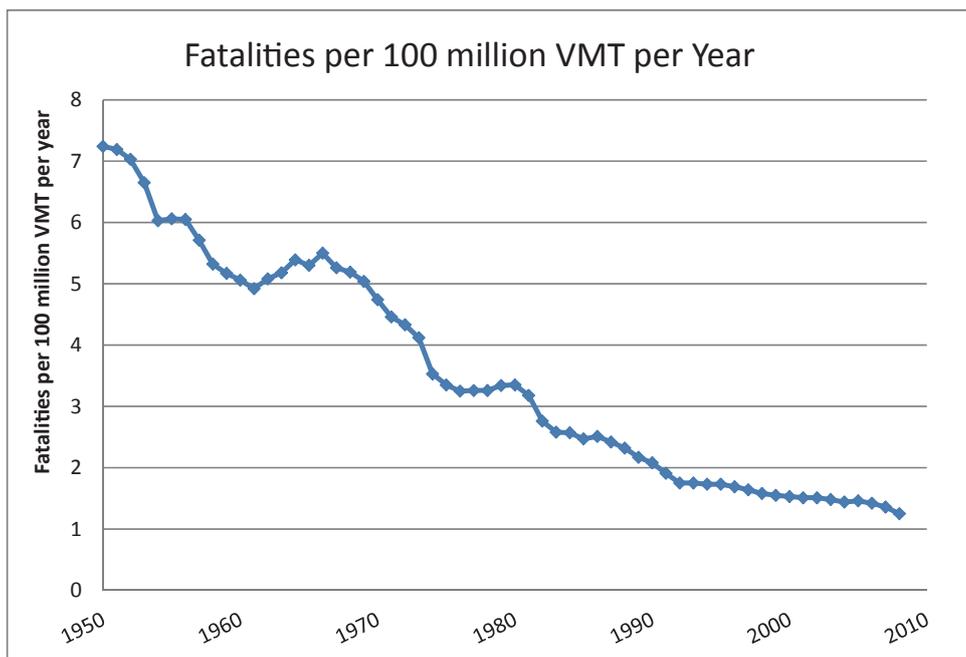


Figure 8 US fatalities per 100 million VMT 1950-2010 [2]

2.5 Pedestrian Fatalities

Information on pedestrian fatalities was gathered from the Federal Highway Administration (FHWA) website, which used two different sources, namely, the National Safety Council (through 1989; [6]) and the Fatality Analysis Reporting System (FARS; 1994 onwards; [7]). It appears that the pedestrian deaths have been reduced in terms of their absolute number, as well as a fraction of total traffic fatalities.



Figure 9 US pedestrian fatalities per 100 million VMT 1950-2010 [6] [7]

Figure 10 shows the number of motorcycle fatalities since 1994. The number consistently increased till 2008, and then dropped significantly in 2009 [7].

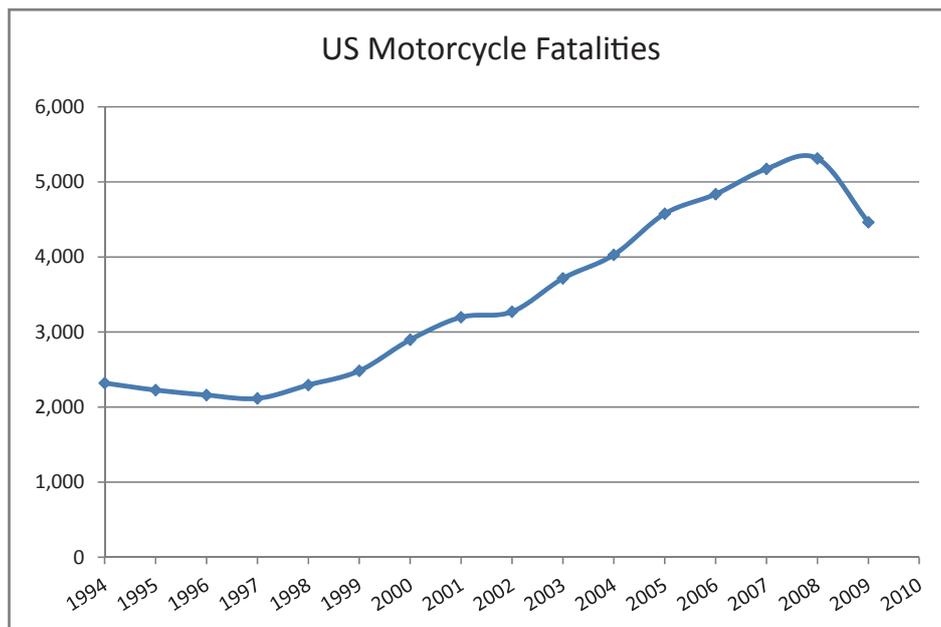


Figure 10 US motorcycle fatalities (1994-2009) [7]

Figure 11 shows the number of bicycle fatalities from the FARS dataset since 1994 [7]. It is apparent that while the overall trend is downward and the numbers are below 1,000, the trend is not as significant as that for pedestrian fatalities. Note that the accurate data for pedestrian, bicycle, and motorcycle fatalities from FARS are available only from the year 1994 onwards.

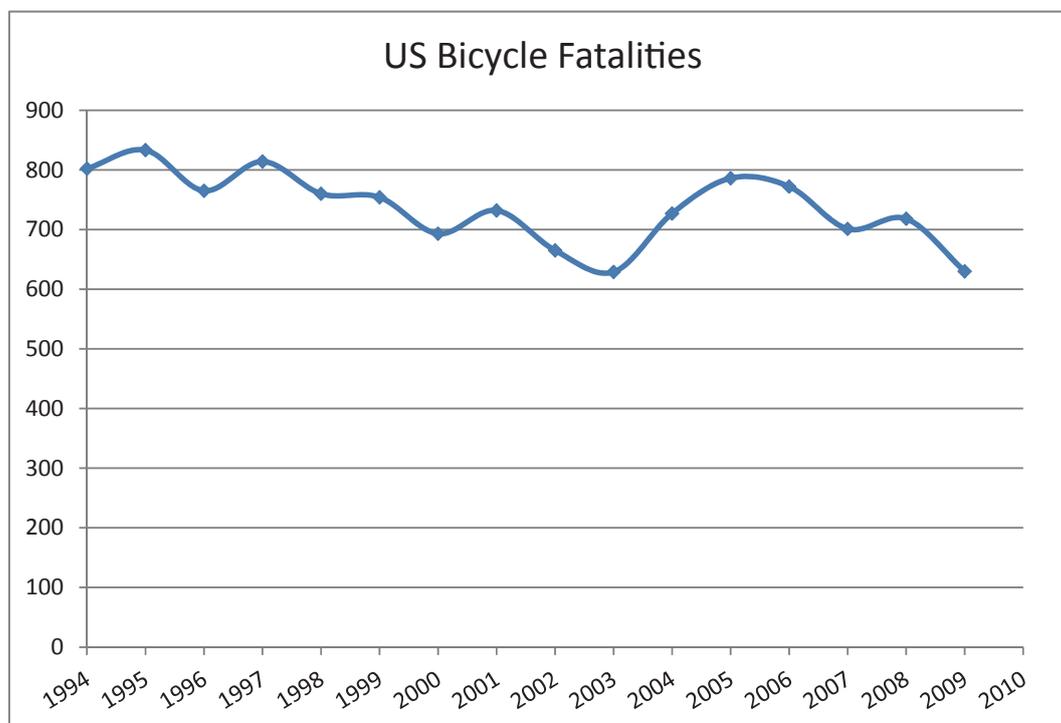


Figure 11 US bicycle fatalities [7]

Note that the injury information is not as accurate as the fatality information due to poor reporting reasons, especially if one wants to examine data from 1950 onwards. For example, FARS and the GES estimates on traffic crash injuries are only available from the early 1990s and thereafter. The author concluded that reliable and accurate nationwide traffic injury data that can be correlated with nationwide regulatory regime from the year 1950 onwards are not readily available for the USA.

3. National Organizations for Traffic Safety

3.1 A Brief History since 1950

In 1950, the Bureau of Public Roads under the Department of Commerce was the agency responsible for overseeing highway transportation [8]. In the mid-1960s (possibly due to the rise in fatalities we observed in the last section) concern about improving highway safety rose significantly in the USA. It was around the same time that the National Academy of Sciences published *Accidental Death and Disability—The Neglected Disease of Modern Society* [9]. In 1966, the US Congress held a series of hearings regarding highway safety and passed legislation to create the US Department of Transportation as a cabinet department of the executive branch of government. It began operation on

April 1, 1967. The mission of USDOT [10] is to “serve the United States by ensuring a fast, safe, efficient, accessible, and convenient transportation system that meets our vital national interests and enhances the quality of life of the American people, today and into the future.”

The same act created the Federal Highway Administration (FHWA), which took over the functions of the Bureau of Public Roads [8]. Several other agencies were also established around the same time, including the National Traffic Safety Agency, the National Highway Safety Agency, and the National Highway Safety Bureau. These agencies later became the National Highway Traffic Safety Administration (NHTSA), which is a coordinated national highway safety program aimed at reducing death on nation's roads. The legislation passed in that era also allowed and provided incentives to use federal funds to develop and strengthen state-level highway traffic safety programs [11].

3.2 Federal Highway Administration (FHWA): Role in Traffic Safety

FHWA supports state and local jurisdictions in the design, construction, and maintenance of the highway system (Federal Aid Highway Program). In terms of traffic safety, FHWA performs research in the areas of automobile safety, congestion, highway materials and construction methods. FHWA also publishes the Manual on Uniform Traffic Control Devices (MUTCD), which is used by most highway agencies in the United States. The MUTCD specifies standards for traffic control devices, such as traffic signals, and defines conditions that may justify putting a signal at an intersection [12].

3.3 National Highway Traffic Safety Administration (NHTSA)

NHTSA was officially established in 1970. As we observed in the preceding section, highway fatalities (normalized by VMT) have been on a decreasing trend since then. The decline is partially due to the following factors: automobile enhancements that provide better protection to vehicle occupants in collisions, improved highway signage standards, and increased use of restraints by drivers.

The agency is a division of USDOT and was created to carry out safety programs formerly governed by the National Highway Safety Bureau (one of its predecessor agencies). Specifically, the agency directs the highway safety and consumer programs established by the legislation passed since the mid-1960s [11]. It is safe to say that consumers today have a far greater access to vehicle safety information through NHTSA than they would in its absence.

3.4 Insurance Institute for Highway Safety (IIHS)

IIHS is a non-profit organization aimed at reducing deaths, injuries, and property damage that result from crashes on the nation's roads. It was founded in 1959 by the three major insurance associations of the time, and initially focused on supporting the highway safety efforts of state and federal agencies.

In 1968, however, it became an independent research and communications organization. IIHS produces ratings for popular passenger vehicles and certain consumer products associated with road safety (e.g., child seats) [13].

The next section examines the various state and federal regulations that may have contributed to the downward trends in fatalities and injuries presented this section.

4. Traffic Safety Regulations

Since 1950 several policies and regulations have been implemented to improve traffic safety in the USA. Some of them have been in response to events while some have been pre-emptive responses to research showing the risk to drivers, passengers, and/or pedestrians. In general, these policies can be divided into: i) mandated improvements to vehicular technology; ii) regulations aimed at driver/passengers, including licensing and equipment requirements (seat belts, helmets, etc.) and efforts to curb driving under the influence; and iii) changes in the national speed limit. All three sets of regulations have led to consequences, including potentially some unintended ones.

The next section focuses on mandates on vehicular technology and their possible relationships with traffic fatality/injury trends, followed by regulations aimed at drivers and the national speed limit.

4.1 Vehicular Technology

In terms of vehicular improvement mandates, air bags are the most significant for saving lives. Airbags were introduced into automobiles in the USA in the 1960s with the aim of reducing injury associated with frontal impacts. Since 1991, airbags have been required on the driver's side and as a result, air bags are widely credited with saving lives. In a study [14], it was found that the odds of a passenger dying in an automobile collision were reduced by approximately two-thirds when the airbag was deployed. The same study found that the combination of seat belt use and air bag deployment reduced the driver's risk of dying in a head-on collision by over 80 percent, representing a very significant improvement. In addition to airbags, the NHTSA has mandated that all 2012 model passenger automobiles weighing less than 10,000 lbs. be equipped with ESC (Electronic Stability Control) [15].

4.2 Driver/passenger-related Regulations

There have been several regulations that require the drivers to behave in a certain way. Some of these regulations attempt to protect the drivers themselves while some others protect other road users. Seat belt regulations are an example of the former while the DUI (driving under the influence) laws exemplify the later.

4.3 Seatbelt Laws

When driving on the road, there is always a possibility of ending up in a crash. Even when a driver is careful enough not to cause a crash, he or she may become involved in a crash caused by someone else. Use of seatbelts is one of the ways in which one can decrease the impact of a crash. Seat belts hold the riders in place so that they will not be thrown out of the vehicle in a crash, and thus lower the level of potential injury. In the USA, a federal law requiring seat belts to be installed on all automobiles was enacted in 1968, and from 1984 onward states gradually began requiring passengers to wear seat belts. After these laws were enacted, seat belt use rose from 50 to 70 percent in the first month alone. The US Department of Transportation estimated a 16 to 20 percent reduction in front seat occupant fatalities due to these regulations [16].

As of right now, 32 states, the District of Columbia, and territories including American Samoa, Guam, the Northern Mariana Islands, Puerto Rico and the Virgin Islands have primary seat belt enforcement, while 17 states have secondary enforcement. Primary enforcement means that a police officer can fine individuals who do not wear seat belts, even when another traffic offense has not been committed. Secondary enforcement means that police cannot ticket a driver solely for lack of seat belt use [17]. State laws also vary depending on whether the passenger is seated in the front seat or in the rear seat. New Hampshire is the only state that has no seat belt law for adults. It is expected that the stricter the enforcement of seat belt use, the higher the number of people who use them. A study by Calkins and Zlatoper [18] compared the fatality rates of crashes in states with primary enforcement against those of states with secondary enforcement. Information on the fatality count from a year prior to the mandatory seat belt laws and a year after the enforcement of the law was examined in the research. This study showed that on average the primary states observed a 17% reduction in traffic fatalities, while in the secondary enforcement states the reduction was only 3%. It was argued that in the secondary enforcement states only the “safe” drivers followed the law and put on the seat belts while “unsafe” drivers, such as the younger drivers, did not [18]. In fact, subsequent research has shown that the drivers/passengers most likely not to obey seat belt laws are teenagers [19].

4.4 Helmet Laws

The laws requiring use of protective headgear while riding a motorcycle or bicycle vary state by state. The current disposition of laws is documented by IIHS [20]. In some states there are no specific laws that require individuals to wear a helmet while riding a motorcycle. In several others, there are no laws requiring individuals over the age of 18 to wear helmet while riding a bicycle. It is obvious that wearing a helmet while riding a bicycle or motorcycle is much safer than not wearing one. In fact, as noted by Macleod et al. [21], in 1975 all but three states in the USA had mandatory helmet use laws. However, it is interesting to note that some states that required the use of helmet in the past have rescinded those laws. The reason for the change was the cause of individual rights prevailing in some

cases over public safety. In this regard, the trends in traffic safety have been clear, with increased incidence of head injuries and related fatalities. For example, Muller [22] examined the monthly time series of motorcycle occupant deaths from 1/1994 to 12/2001 in Florida, a state that on July 2000 exempted adult motorcyclists from wearing helmets provided they had medical insurance of \$10,000 or more. It was estimated that this exemption led to a 48.6% increase in motorcycle occupant deaths. The results showed a lower increase at 38.2% and 21.3% respectively, when trends in miles traveled and motorcycle registrations were controlled [22]. Similar results were obtained from Pennsylvania by Mertz and Weiss [23] following the relaxation of helmet use laws in that state.

4.5 DUI Laws

Driving under the influence (DUI) of alcohol/drugs is a significant problem in the USA, especially due to the dependence on automobiles and lack of public transportation options in large swathes of the country. As a result, according to FARS more than 1/3 of all traffic fatalities are associated with alcohol consumption [24]. This statistic remained fairly consistent from 1994 through 2009. The citizen action groups that have contributed significantly towards the campaign against drunk driving include Mothers against Drunk Driving (MADD), Students against Drunk Drivers (SADD) and Remove Intoxicated Drivers (RID). Most of these groups emerged in 1980s in response to fatalities and injuries of minors and then prevalent light sentencing for drunk drivers [25].

Following the repeal of Prohibition in the 1930s, some states lowered their drinking age to 18-20 and until the late 1960s, individual states had the right to make their own DUI laws ([25], [26]). During the 1970s, research emerged which suggested that a lower drinking age correlated to increased alcohol related traffic fatalities in youth. As a result, a few states reinstated the age of 21 as the minimum legal drinking age (MLDA) either incrementally or immediately during the 1970s ([25], [26]). McCartt et al. [26] also noted that states with a MLDA of 21 began seeing lower crash rates in the under-21 demographic group. In 1984, the Federal Uniform Drinking Age Act was passed to encourage states to set their MLDA to 21. [25]. Since MLDA establishment remained within states' jurisdiction, individual states were not obligated to comply. However, the Federal Uniform Drinking Age Act stipulated that any state wishing to receive federal highway funding needed to enact a zero tolerance law for those under 21 by the year 1999 [27]. Recently, it has been argued that MLDA-21 results in increases in binge drinking [26].

The literature clearly shows that from 1966 through 1975 (when many states lowered their minimum drinking age) the rates of alcohol-related crashes among the under-21 group increased (e.g., [26]). However, the study did point to the possibility that the lower rates of underage alcohol-related crashes during select time periods could be due to the lower numbers of people in that age group. In addition to a reduction in crashes, there was a decline in the prevalence of drinking and driving from 1973

through 1996. For example, the estimated percentage of weekend nighttime drivers with a positive BAC (blood alcohol content) fell from 36% in 1973 to 26% in 1986 and to 17% in 1996 [28].

In terms of most effective policies, the literature has suggested that dram shop liability laws (holding alcohol selling establishments liable for crashes involving their patrons) strongly correlates with a decrease in alcohol-related crashes [27]. Another successful strategy was lowering the BAC limit from .10 to .08, which reduced alcohol-related crashes anywhere from 3 to 40% [29]. However, studies of individual states do not consistently reflect this reduction rate due to the wide variability among different states [30]. On the other hand, McCartt et al. [26] found little to no evidence to support that zero tolerance MLDA-21 was effective in lowering prevalence of drunk driving or crashes. Although the crash rates among minors did show a decrease, it may have been attributable to other causes such as increased prevalence of seat belt use, stricter DUI laws and improved vehicle safety [26].

4.6 Graduated Licensing Programs

Before the 1990s, most states had a single-stage driver licensing system in which 16 or 17 year olds could obtain full driving privileges in one step. In the past 15 years, however, almost all states have implemented the graduated driver licensing (GDL) programs for teenagers trying to obtain a license. The goal of such programs is to lower traffic fatalities caused, and suffered in most cases, by young drivers by making them better prepared for the task of driving. Research in the mid-1990s showed that the fatality rate for drivers between the ages of 16 and 20 was almost three times that of middle-aged, experienced drivers [31]. While individual details may vary, the overall structure of the GDL programs is as follows [31]:

- First stage: The student driver learns how to drive for 6 months with a supervisor over the age of 21 always present.
- Second stage: After passing the driving test, the new driver receives a limited license that allows them to drive alone under certain restrictions. For example, they cannot drive during high-risk times, such as at night, or with more than two passengers.
- Third stage: The probationary restrictions on the license are removed.

Research evaluating GDL programs [32] found that they were quite effective in reducing traffic fatalities among 15 to 17 year olds. Their analysis indicated that the average GDL program led to at least a 5.6% reduction in fatalities. GDL programs with more restrictive policies (characterized as “good” by the IIHS) were noted to have reduced fatalities among 15 to 17 year olds by as much as 19%. It is clear that this kind of program is seen as a step in the direction of saving lives, and hence has been adopted by almost all states.

4.7 Speed-limit Laws

Higher speed increases the distance it takes to safely stop a vehicle, which can make it harder to avoid crashes. The reaction time necessary to prevent collision is decreased significantly as speed goes up. Hence, it is critical from a safety standpoint that vehicles be driven at an appropriate speed. Speed limit regulations can play a critical role in that regard.

Up until the mid-1970s, there was a wide variance in highway speed limits from state to state. The national maximum speed limit (NMSL) of 55 miles per hour (mph) was instituted as an energy conservation measure in response to the 1973 oil embargo [33]. Vernon et al. [33] noted that the number of traffic fatalities decreased nationwide, from 54,000 in 1973 to 45,000 in 1974 following the implementation of NMSL. This was widely attributed to the decrease in speed limits, leading the US Congress to pass Public Law 93–643 to make the change in speed limits permanent, with highway safety being cited as the main purpose [33]. In 1987, however, states were allowed to raise the speed limit to as high as 65 mph on certain rural interstates, and in 1995 the national speed limit was eliminated completely, with the responsibility of setting speeds on highways once again going back to individual states. The state-by-state information on existing highest speed limits on freeways can be found in [34]. Most of the studies that attempted to assess the impact of this change on traffic safety concluded that the number and/or rate of severe crashes went up after the removal of the NMSL, but the impact on overall crash rate and frequency was somewhat mixed ([33]; [35]; [36]; [37]).

More recently, in 2006 the daytime speed limit for passenger vehicles on segments of I-10 and I-20 in the state of Texas was increased from 75 to 80 mph [38]. The study examining these changes found that the increase in speed limits led to higher travel speeds and that to reduce the risk of speed-related crashes highly visible police traffic enforcement and speed cameras should be implemented, accompanied with publicity [38].

5. Conclusions

Highway traffic deaths have long been a concern for public health officials. Legislators and regulators have implemented several changes over the years to make highways safer for motorists, pedestrians and bicyclists. To make a philosophical case that highway crashes and related fatalities can be eliminated; NHTSA carried out a campaign titled “crashes aren’t accidents” to change the prevalent terminology in the traffic safety community [39]. The term “accident” gives the impression that highway crashes and the resulting injuries/fatalities are a matter of chance. Therefore, “crash” is a more appropriate term since one can take steps to avoid crashes. The efforts of policymakers towards eliminating crashes include legislation specifying maximum speed limits, seat belt usage, etc. While the mere existence of such laws may influence motorists’ behavior, enforcement of these laws may also significantly affect highway safety. This study tried to determine the trends in highway fatalities

and several regulations and their effect on highway safety. Recent trends suggest that USA is moving in the right direction in terms of improving highway safety. However, it cannot be ruled out that this is merely the reflection of a slow economy and this safety improvement trend will reverse with an improving economy. In this regard, the USA should be vigilant about continuing to implement policies that have been identified as successful in the literature (documented in this report) as well as attempt to learn from efforts abroad toward achieving zero fatalities.

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