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What if Everything We Know About Highway Safety is Wrong?

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ABSTRACT

Public policy over the last two decades has proceeded on the basis that compelling improvements in vehicles and driver behavior is the best means of enhancing highway safety. While narrow focus analyses of the specific effects of specific regulations in specifically defined circumstances produces positive inferences on the efficacy of compulsory safety measures, a broader focus casts some doubt on the over all results.

The presence of a long term decline in the traffic accident rate confounds a simple before-and-after comparison of accident statistics. The question remains as to whether the number of accidents or fatalities per passenger mile of travel would have declined anyway. Further, there is the prospect that the expenditure of resources on a specific safety measure may merely transfer the risk rather than simply reducing risk.

This paper will examine some of the critical evidence from a broader perspective in order to better determine what the actual effects of compulsory safety regulations are and whether more voluntary and market-based approaches would produce a safer environment for those who value safety highly.

I. INTRODUCTION

Safe is preferable to dangerous. This is one of those choices for which we easily find universal concurrence. No one would seriously argue on behalf of increasing peril on our roadways. Merely being in favor of safety, though, does not answer the very pertinent question of how safer roads are to be obtained. From an engineering standpoint we could try to improve the road itself, the vehicle using the road, or the driver operating the vehicle. All three approaches have been employed in the attempt to lessen the danger. How effective have the safety measures promoted by public policy been?

While many appear to be satisfied that the assorted safety mandates promulgated by various levels of government are, indeed, making roads safer, the fact is we simply do not know whether public policy is helping or hurting the effort to enhance safety. How can this be? Doesn't logic tell us that installing traffic signals should reduce collisions, that wearing seat belts saves lives, and that driver education improves operator skill? As long as we deal with an abstract conception of an environment in which nothing else but the safety-enhancing improvement changes, logic would seem to dictate an obvious conclusion: intervention increases safety. However, the reality is that there is a complex inter-

action between safety-enhancement measures and human behavior that makes simplistic extrapolation from intent to results prone to err. As some of the data we shall review show, actions intended to improve safety may not have the desired effects.

That intended safety improvements might fail is not to be interpreted as an indictment of the good motives of those who have designed or promoted such measures. Likewise, neither should the questioning of the effects of various safety mandates be judged a neanderthal opposition to progress. The issue is whether chosen means to a desired end (safer roads) are suitable and cost-effective. Even though we may agree that it is difficult, if not impossible, to place a value on a human life, the issue of cost is still relevant. Resources available for meeting human needs are limited. Those expended on ineffective safety programs are not available for more urgently needed purposes. So, the notion that any money spent on safety is warranted because "no price is too high to pay for saving a life" ignores the very real opportunity cost entailed in any employment of scarce resources.

Over a decade ago, economist Sam Peltzman authored an article questioning the efficacy of mandatory safety improvements to vehicles (Peltzman 1975). His suggestion that regulations meant to improve safety might be useless or, worse, counterproductive shocked the safety establishment. His methodology was attacked on the grounds that is failed to *prove* that the criticized safety rules didn't work. Since his methodology was an examination of accident statistics in the post-safety regulation period, there never was any prospect for proving the inefficacy of the regulations. At the same time, though, the proponents of mandatory safety rules have little to offer other than similarly derived statistics in support of their case. They, too, have failed to *prove* that the safety measures are effective.

It may be that it will never be possible to conclusively prove whether specific safety measures do or don't work. Perhaps the best we can hope for is to weigh conflicting evidence and decide what we want to believe about the advisability of mandating specific safety regulations. It is the purpose of this paper to observe some of the evidence contradicting the conventional wisdom on safety. After all, none of the promotional efforts on behalf of any mandatory safety rules shows any awareness of conflicting evidence. Many of those making decisions on safety legislation or on how to expend highway resources have not been exposed to evidence that the rules or measures they contemplate may be ineffective. It is hoped that by creating some exposure and provoking a more robust debate on safety issues, better and more productive outcomes will result.

II. LONG TERM AGGREGATE TRENDS

The long term decline in traffic fatalities per vehicle mile of travel has been a source of pride for many safety advocates. The plunge from 18 fatalities per 100 million vehicle miles in 1925 to a current figure around 3 fatalities per 100 million miles (see table 1) would appear to reflect a successful safety program. That is, at first glance and without much thought it would seem to be evidence of successful regulation. However, the inexorable progress of the decline raises some doubt as to whether specific safety measures could really be the significant factors. The absence of any substantial deviations from the long term trend could be taken as indicative of the *lack* of consequence of specific safety measures.

If we convert the long term data to a logarithmic scale (see table 2) we cannot help but note that the trend fluctuates around a straight line. This line approximates a constant 3% per year decline in fatalities per vehicle mile of travel. If legislated safety measures had had a significant impact on traffic fatalities, wouldn't we expect to see dramatic changes in the rate of decline? While the absence of dramatic changes in the rate of decline in traffic fatalities doesn't prove that legislated safety has no impact, neither does the long term decline prove that legislated safety is the cause of the salutary trend.

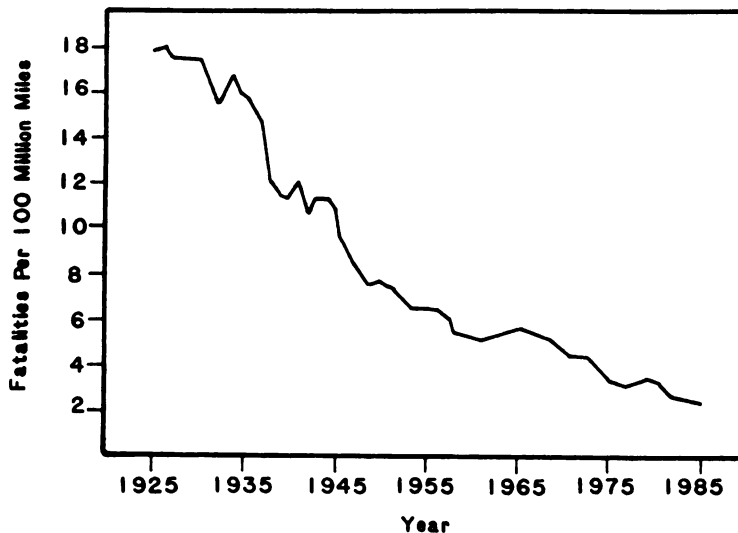
Similar long term declining trends in fatalities per vehicle mile of travel have been observed in other parts of the world. In general, there appears to be an inverse relationship between degree of motorization and fatality rates. As societies become more motorized, the fatality rates decline. This phenom-

non has been dubbed "Smeed's Law" (Adams 1985). Interestingly, the phenomenon cuts across time and cultural differences such that modern, safety-equipped cars in relatively unmotorized third World nations achieve fatality rates comparable to those in the United States when Model T Fords were the dominant vehicle (Adams 1987). Perhaps the long term decline in fatalities per mile would have occurred regardless of whether government mandated specific safety measures. If this is the case, then billions of dollars have been expended on devices that have had no significant effect on safety.

A further examination of long term traffic fatality statistics produces some interesting information. One of Peltzman's contentions was that drivers might choose to consume intended safety benefits in other forms (Peltzman 1975). For example, improved crashworthiness might induce many drivers to opt for more speed rather than more safety at previous speeds. Another possibility is that the perception of improved safety would contribute to a greater propensity to travel. That factors such as these might be at work can be observed from the long term data on traffic fatalities per capita (see table 3). Unlike the fatalities per vehicle mile data, there is no long term salutary trend. The 1985 death rate of 19 per 100,000 persons is right back where it was in 1925. The up and down fluctuations give no hint of assurance that the future will produce improved safety.

If traffic death rates have shown no improvement over several generations we are inevitably led to the question of whether all the effort and expense on behalf of specific safety measures was worth it. That people are traveling further and faster is a value in

TABLE 1
U.S. Motor Vehicle Fatalities



Sources

Statistical Abstract of the United States

Historical Statistics of the United States

TABLE 2
U.S. Motor Vehicle Fatalities
 (on Logarithmic Scale)



Sources:

Statistical Abstract of the United States
Historical Statistics of the United States

itself. However, the appeal that “if even one life is saved, the effort is worthwhile,” doesn’t have the same impact when actual human behavior effectively converts it to “if even one more mile is traveled . . .” Further, when we consider that there are threats to life and limb other than traffic hazards, it is entirely possible that funds expent on safety measures with negligible impact may lower overall safety. Consider that death by homicide has more that doubled over the last generation. Given this decidedly unsalutary trend, can we be confident that diverting police resources to the writing of citations for motorists not wearing seat belts, for example, will actually improve the net safety of the environment?

III. AMBIGUOUS EVIDENCE

While there are certain propositions about which there can be little argument—for example the damage done by collisions at high speeds is greater than at low speeds—this knowledge does not lead directly to feasible safety strategies in the real world. Obviously, the number and severity of collisions could be reduced to nil by prohibiting movement. However, we prefer the values to be achieved, albeit at some higher levels of risk, from movement. Safety is not, then, an all-consuming objective. We purposefully choose less safety in order to pursue

other ends. The debate that exists cannot be couched in simplistic safe vs. unsafe terms, despite emotional rhetoric (i.e., “unsafe at any speed”) that may be employed. There are trade-offs of safety vs. other objectives. Improvements that can be made are more properly considered as gains at the margin.

Most practical approaches to the safety issue aim at limiting or reducing negative consequences rather than imagining that risk is going to be eliminated. Even with this more realistic perspective, the directional effect of any measure intended to enhance safety is not as certain as many advocates of these measures might like to believe. Below we survey some of the research on the impacts of various programs intended as safety improvements. It is by no means clear that the intent is realized in practice.

The issue of drunken driving is a major concern in traffic safety. Enforcement personnel estimate that up to 50% of the fatal accidents on our highways involve an intoxicated driver. Coming up with methods of reducing this hazard could contribute to significant improvements in road safety. A currently popular proposal along these lines entails the restriction of packaged liquor sales. Specifically, many communities are banning the simultaneous vending of gasoline and packaged alcoholic beverages. The intent is that it will be more difficult for persons to both drink and drive. Recent evidence indicates that contrary to intent, the actual effect of

banning the sale of alcoholic drink at gas stations may be to increase drunken driving. In a study of 400 California communities, economists Patrick McCarthy and John Umbeck of Purdue University found that cities with the bans experienced increases in alcohol-related accidents ("Driven..." 1987).

While the ban does make it more inconvenient to obtain alcoholic beverages, it is not deterring determined drinkers. Some are going the extra mile to find liquor stores where they can buy their beverages. Others are settling for consuming their liquor at bars rather than transporting the packaged goods home for consumption. In the first instance, the policy is inducing intoxicated drivers to put in more miles of travel on the roads. In the second instance, an individual who previously got drunk in the privacy of his own home now becomes inebriated in a public place from which he has to drive home. In either case, the intended safety benefit from the regulation may be more than negated by the behavioral response of road users.

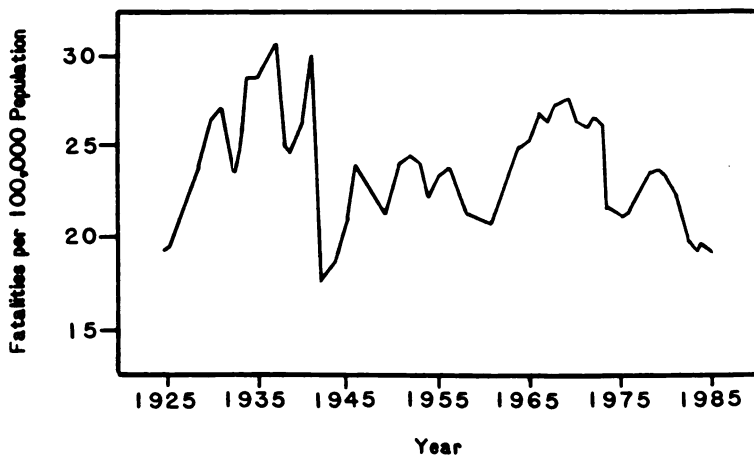
Securing traffic signals and painted crosswalks are favorite aims of neighborhood groups concerned about safety. Typically, the injury or death of a child moves people to demand action to enhance safety by installing lights, or painted crosswalks, or both. And we have all seen the public service announcements on television encouraging people to "cross at the green and not in-between." Obviously, signals and crosswalks must improve safety. Statistics, though, indicate otherwise. A study of intersections in Milwaukee failed to demonstrate any improvement in safety from the installation of traffic lights. In the three-year period prior to signalization, the intersections studied experienced 520 accidents. In the three years after signalization, there were 522 recorded accidents. Injuries sustained in the two periods were 134 and 154, respectively. Right angle collisions

were down by 34%, but rear-end, head-on, and vehicle-bicycle collisions were up by 37% to 41% (Short et al. 1982).

The statistics on painted crosswalks are even more disconcerting. There are six times as many accidents in marked crosswalks than in unmarked areas. Of course, crossing pedestrian volume is higher for marked crosswalks, but even after adjusting for this fact we find that the rate of accidents is still twice as high for painted crosswalks (Herms). Some pedestrians place too much confidence in the power of paint to induce drivers to stop. Perhaps we have oversold the idea that crosswalks are safe places. Thus, even though the law holds the driver responsible for stopping, the installation of marked crosswalks is not having the fully intended effect of reducing vehicle-pedestrian collisions.

If we are convinced that driver attitude is a major factor affecting the accident rate, the natural course would seem to call for improved training. Better driver knowledge and skill ought to be an unassailable aid to safer roads. Even here, though, the evidence is mixed. Insurance companies give premium reductions to drivers who have had driver education courses (Cushman 1986). Since these firms are in business to make money, they have a strong incentive to accurately assess risk. Consequently, it would appear well established that mandating driver education for high school students should enhance safety. How, then, do we explain the results of a Connecticut study (Robertson 1981) that showed the elimination of mandatory driver education classes was followed by lower accident rates for students of those schools? While it is likely that on an individual basis driver education improves safety, on an aggregate basis this may not be the case. Forcing students to take driver education courses may encourage earlier driving by those who would otherwise delay this

TABLE 3
U.S. Motor Vehicle Fatality Rate



Sources:
Statistical Abstract of the United States
Historical Statistics of the United States

undertaking. As a result, the streets could be made more dangerous by hastening teenagers into operating motor vehicles.

Another example of how we can mislead ourselves with unquestioning devotion to safety dogma is in the case of the 55 mph speed limit. Public transportation agencies have sported signs with the familiar "55 saves lives" slogan. Many attribute the decline in fatalities per vehicle mile of travel since 1974 to the reduction in maximum speed limits from 70 or 75 mph to 55 mph. The mechanism by which the 55 mph speed limit is supposed to work may be simple in theory, but in practice it is very mysterious. It is not that we challenge the idea that vehicles crashing at higher speeds inflict greater damage. Rather, we challenge the notion that an unobserved limit can be expected to have a significant impact on road safety. Before the 55 mph limit was relaxed for rural Interstate highways, surveys revealed that over 70% of the vehicles traveled at speeds in excess of 55 mph (Mancuso 1986). Observation of highway speeds in Arizona showed an average rural Interstate speed of 68 mph in 1973, the year before limits were lowered to 55 mph. In 1986, these same routes showed an average speed of 66 mph, even though the posted limit was 55 mph (Miller 1987). How can the mere posting of signs be credited with saving lives if the speed limit is ignored? It would seem that the vehement defense of the 55 mph speed limit as a boost to safety is more an act of faith than a demonstrated reality.

Perhaps the biggest current controversy in auto safety is the issue of mandatory seat belt use laws. A combination of factors has brought the focus of occupant restraint to compulsory belt wearing. Seat belts themselves became standard equipment for cars back in the 1960s. Thus, purchasers of new autos were compelled to pay for the addition of seat belts to vehicles. However, only a minority of drivers actually use the belts in their cars. The "flaw" in this safety equipment is that it requires action on the part of the user to be effective. The failure of users to regularly take action to save their lives spawned the campaign for passive restraints: those that could be effective even if the driver neglects to take the precaution of fastening his own seat belt. The mandated mechanism for achieving passive restraint is the so-called "air bag": a device that deploys automatically when the vehicle crashes.

The problem with the "air bag" is that it protects only against a limited variety of crashes for only an initial impact and costs a considerable amount of money. Quite logically, the automobile manufacturers would prefer a solution to the lack of seat belt use that does not add extra cost to their products. In order to give a lower cost option an opportunity, Secretary of Transportation Elizabeth Dole decreed that if states representing two-thirds of the population enacted mandatory belt use laws by April 1, 1989 vehicle manufacturers, would not be required to install "air bags" in all new cars. It is by no means clear that the alternative of enacting compulsory belt use laws will avert the cost of mandatory "air bags." Neither is it clear that the enactment of seat belt use laws will make highway travel safer.

Of course, the evidence is very persuasive that in any given crash vehicle occupants are more likely to survive if they are wearing seat belts. However, this does not prove that compulsory belt use laws will

make the traffic environment safer. There are several ways in which the intended safety improvement can break down. First, mere enactment of a mandatory use law is not the equivalent of attaining higher rates of use. The experience with non-observance of the 55 mph speed limit is reminder enough of this possibility. Second, resources devoted to enforcement of mandatory belt use laws are not simultaneously available for other purposes. For example, the time and money used to apprehend, cite, prosecute, and punish those not wearing seat belts is not available for the apprehension, arrest, prosecution, and punishment of potentially more dangerous threats to public safety (for example, drunken driving). Third, the imposition of compulsory seat belt use may have some undesirable side-effects that detract from, or even outweigh, the saving of lives for vehicle occupants.

A study of the post-mandatory belt use law in Great Britain raises some disturbing implications. As expected, driver and front-seat passenger fatalities were down by 18% and 25%, respectively, in the post-law period. At the same time, though, fatality rates for back-seat passengers, pedestrians, and cyclists were up by 27%, 8%, and 13%, respectively (Harvey and Durbin 1986). If one considers non-occupants killed only by those vehicles covered by the belt use law, we find pedestrian death rates up by 14% and cyclist deaths up by 40% (Hamer 1985c).

There is some controversy over the above statistics. While statistics cannot prove the cause and effect relationship we might like to have in order to be certain, they can suggest possible cause and effect sequences. John Adams of University College in London has gained some notoriety by suggesting a link between mandatory belt use laws and increased risk to pedestrians and cyclists (Adams 1985). The instantaneous reaction may be to reject the idea that a driver would purposefully risk a crash merely because a seat belt gives him better protection. Yet, calm reflection tells us that the willingness to take greater risks is influenced by perceptions of enhanced safety: non-swimmers more willingly venture into water with life-jackets, high-wire acts are more daring when there is a safety net, firemen equipped with oxygen and asbestos suits venture into burning buildings, etc. In traffic safety terms, statistics have consistently shown higher crash rates for larger cars (Evans (a)). For its part, Great Britain's Department of Transportation predicted a potentially alarming increase in pedestrian deaths if mandatory seat belt use because law (Hamer 1985c). Shamefully, though, this accurate prediction was officially suppressed until two years after the mandatory belt use law went into effect (Hamer 1985 a). We do not do the cause of better safety a service by refusing to contemplate inconvenient data or arguments. If forcing people to use seat belts is such a meritorious undertaking, it ought to be able to prevail over all contrary evidence and arguments.

IV. REAL SAFETY ENHANCEMENT

Most transportation practitioners are engineers. It stands to reason that an engineering approach to safety would predominate in highway agencies and in the advice transportation professionals give to those who legislate safety rules. Unfortunately, the

engineering approach does not allow for offsetting human behavioral responses to intended safety improvements. All other things being held constant, the removal of a hazard or the provision of safety device ought to result in less danger. The problem is that in the real world, few things are held constant for very long. Human beings are one of the most dynamic elements in any prospective safety equation. We cannot expect to have any lasting or significant impacts on safety if we ignore the impacts of changes in human behavior in response to our intended safety improvements.

A dispassionate examination of the record in intended safety improvements cannot fail to convince us that we do not really know whether the wide array of measures taken have produced net gains. Even if we can be sure that a specific device, like a seat belt, makes vehicle occupants safer, this is not the same as making the roads safer. If all, or even part, of the result of mandatory safety rules is a mere shifting of the burden of risk, can we really justify the use of compulsion to achieve such mixed and/or questionable ends?

The current focus of most safety programs is too narrow. Better brakes, bumpers, or belts are the physical products of intended safety improvements. Even if the physical product is improved, though, there is no assurance that the environment is safer. It is not the means of a person's demise that is so crucial as the fact of his demise. Does it really matter that fewer people die as the result of brake failure, if in the end the traffic fatality toll is unchanged in total? That the traffic death rate per capita is the same today as it was six decades ago should inspire more restraint in our willingness to impose mandatory safety regulations on the traveling public. This should especially be the case when we presume to save people from the consequences of their own negligence.

The notion that there is no downside to public mandates aimed at increasing safety is a cruel self-deception. Everything has its cost. Over the last decade some \$1.3 billion spent on intended safety improvements by the federal government produced "little demonstrated effect in reducing the traffic crash toll" according to the General Accounting Office ("GAO . . ." 1980). Perhaps this money could have been employed to better effect in some other manner. For example, while statistics do not show an improvement from government efforts in traffic safety, they do show a deteriorating trend in crimes of violence. A person's chance of being murdered has doubled since the 1960s. Resources that many states are now committing to enforcement of seat belt use laws are resources that could be devoted to better efforts to prevent crimes of a more serious nature.

So, the opportunity cost of mandating intended safety improvements has been an overlooked aspect in the overwhelming majority of safety promotional campaigns. This is all the more critical when it becomes apparent that the "obvious" safety improvements do not necessarily produce the intended results. It is one thing to tread on individual freedom armed with the rationale that the inflicted compulsion is for the individual's "own good." As the evidence shows, though, we cannot be sure that the safety rules government imposes are for the individual's own good. Less enthusiasm for coercion and more respect for individual autonomy would

appear to be the scientifically warranted direction for those truly interested in enhancing safety to take.

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ENDNOTE

* Arizona Department of Transportation