Statement before the U.S. Senate Committee on Commerce, Science, and Transportation

CAFE Standards

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The Insurance Institute for Highway Safety is a nonprofit research and communications organization that identifies ways to reduce motor vehicle crashes and crash losses. I am the Institute's chief operating officer, and I am here to discuss the important relationships between vehicle fuel economy and safety. The Institute is particularly concerned that mandatory increases in fuel economy could increase the risk of serious injury in crashes or, at the very least, reduce the societal benefits of future vehicle safety improvements.

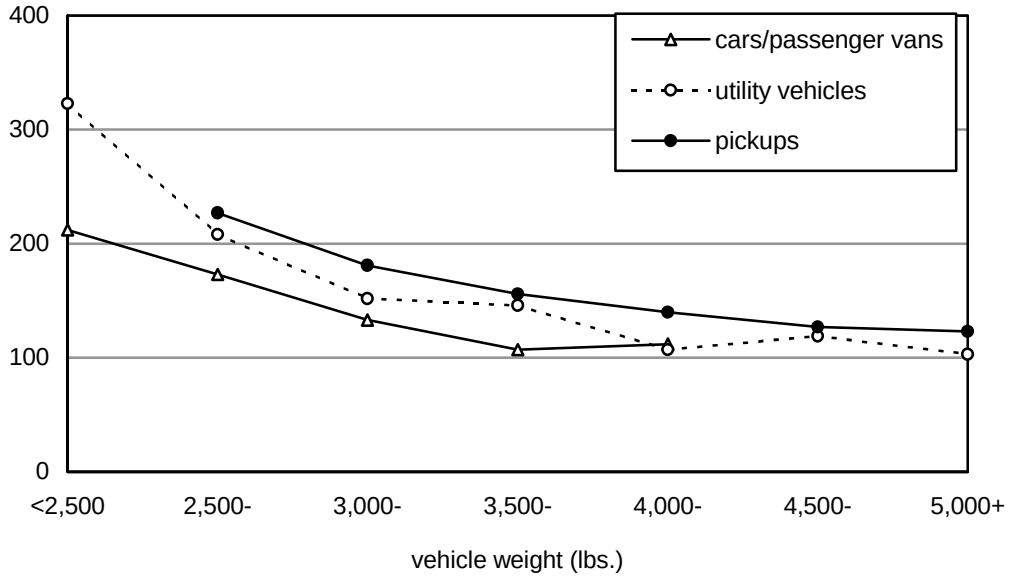
This concern is based on the inherent physical relationships between vehicle mass, fuel consumption, and safety. Larger, heavier vehicles consume more fuel to travel the same distance as smaller, lighter cars. At the same time the larger, heavier vehicles protect their occupants better in the event of a crash. This is true in both single- and multiple-vehicle crashes. Reductions in vehicle size and weight can improve fuel economy but only at the cost of reduced occupant protection. Simultaneous improvements in safety technology to protect occupants can hide or offset the safety costs of downweighting, but the basic fact remains that, for a given level of safety technology, heavier vehicles afford greater protection than lighter vehicles. No safety technology can be added to lighter vehicles that will offset their inherent disadvantages in protecting occupants in crashes. The protective effects of mass are independent of, and additive to, other safety factors.

This relationship is described in much greater detail in the recent report by the National Academy of Sciences (NAS) Committee to Review the Effectiveness and Impact of Corporate Average Fuel Economy (CAFE) Standards, July 31, 2001. I was a member of that committee, and the Institute largely agrees with the report's majority position on safety, so I will not repeat the details. I will instead focus on the primary implications of the report:

- Any regulatory action that increases the sale of small, lightweight vehicles, whether cars or light-duty trucks, will increase injury risk in crashes.
- This inherent relationship does not preclude the improvement of fuel economy without adverse safety consequences.
- As currently structured, CAFE standards provide an incentive for the sale of the smallest, lightest vehicles.
- Alternative CAFE structures that index fuel economy requirements to vehicle weight can mitigate or even reverse the negative safety implications of increased fuel economy requirements.

Before elaborating on these points, we first need to review the relationship between vehicle mass and motor vehicle crash injury risk. In Figure 1, we see the risk of occupant crash fatality

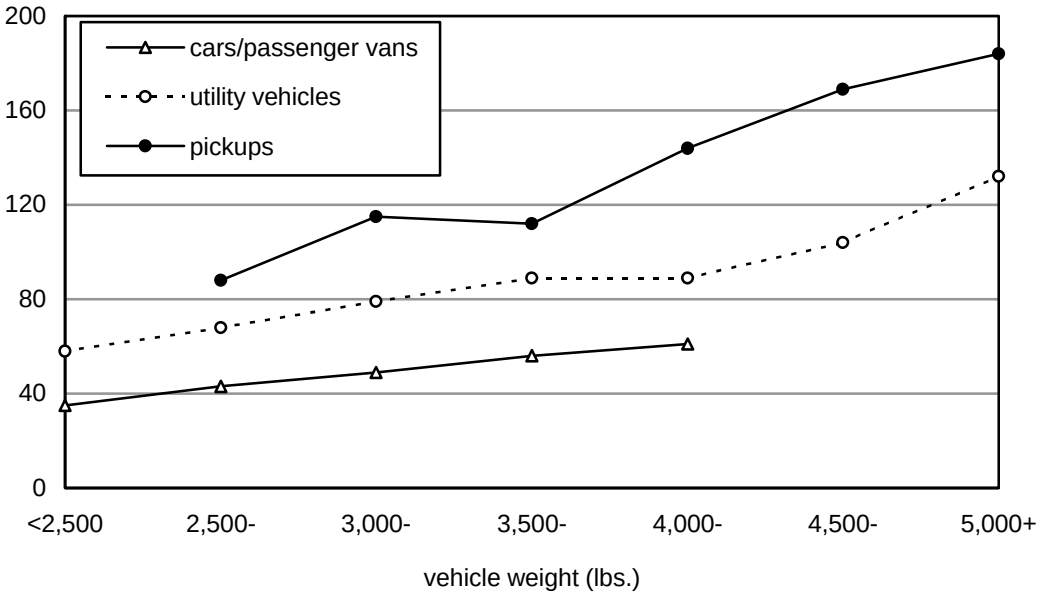
Figure 1
Occupant Death Rates, 1990-96 Model Passenger Vehicles
Deaths per Million Vehicles per Year



per vehicle on the road for 1990-96 model cars, sport utility vehicles (SUVs), and pickups during 1991-97, the most recent year for which the Institute has conducted these analyses. (Note: In contrast to the National Highway Traffic Safety Administration (NHTSA), the Institute classifies minivans, which typically are built on modified car platforms, as cars rather than trucks.) For each of these vehicle types, the risk of occupant death increases as vehicle weight decreases. The risk of fatal injury per registered vehicle is about twice as high for the lightest cars compared with the heaviest ones. Similar relationships occur for SUVs and pickups, although the typical SUV or pickup has a higher fatality risk than the typical car of similar weight. This is largely due to the increased risk of single-vehicle crashes, particularly rollover crashes, among light-duty trucks. So what we see from this figure is the basic protective effect of vehicle size and weight. We also see a diminishing protective effect as vehicle weight approaches 3,500 to 4,000 pounds.

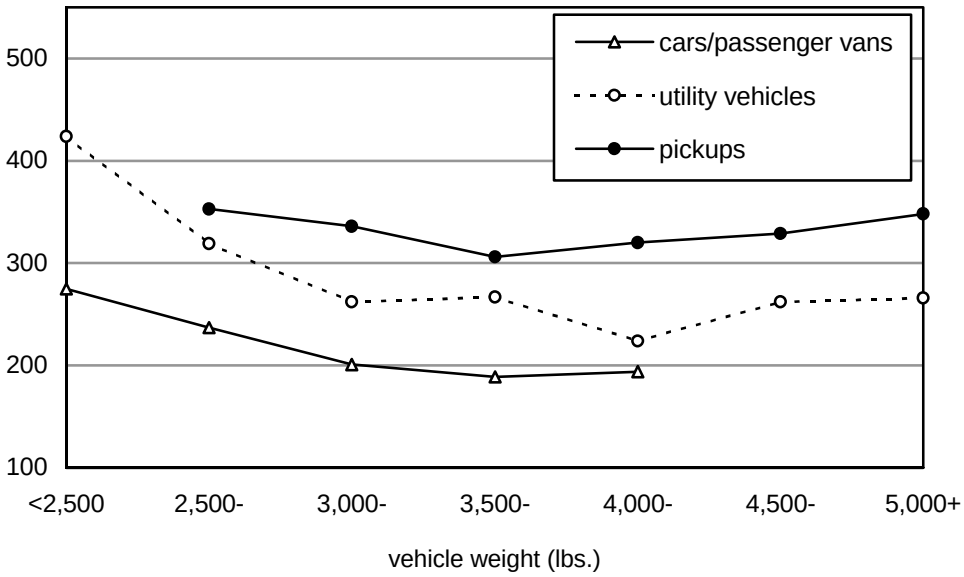
This protective effect of vehicle weight is not the full story. Many crashes involve more than one vehicle, and in multiple-vehicle crashes vehicle weight can increase the risk of injury in other vehicles at the same time it limits the risk to its own occupants. Figure 2 shows the number of occupant fatalities that occurred in other vehicles that collided with 1990-96 models during 1991-97, per registered 1990-96 vehicle. What we see from this figure is that the risk of fatality in other vehicles increases with increasing vehicle weight.

Figure 2
Occupant Death Rates in Other Vehicles in Two-Vehicle Crashes, 1990-96 Model Passenger Vehicles, Deaths per Million Vehicles per Year



From a societal perspective, the effect of vehicle weight includes both of these effects — the protective benefits for a vehicle's own occupants plus the increased risk to other road users. In Figure 3, the total number of crash deaths involving 1990-96 models during 1991-97 is shown by vehicle weight. These fatality counts include pedestrians and cyclists but exclude deaths in

Figure 3
Occupant and Other Road User Death Rates in Crashes, 1990-96 Model Passenger Vehicles, Deaths per Million Vehicles per Year



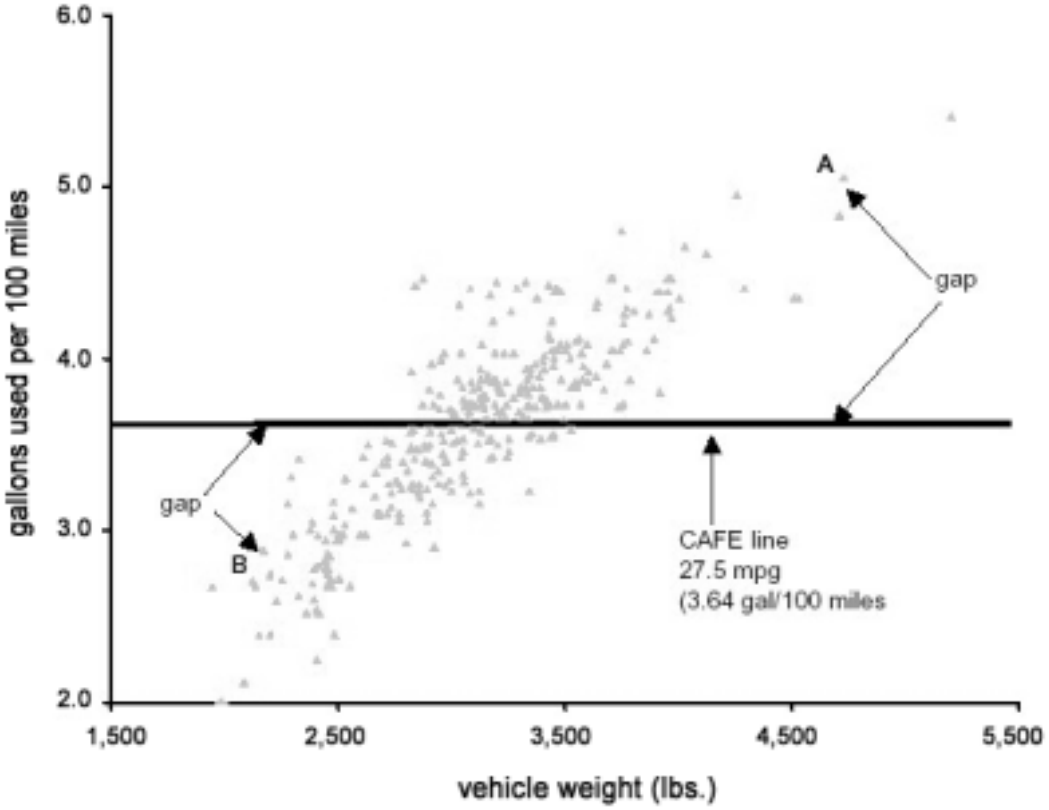
crashes involving three or more vehicles, which are relatively few and in which the implications of vehicle weight would be difficult to isolate. This figure illustrates that, from a societal view, increasing vehicle weight to about 3,500 or 4,000 pounds reduces total fatality risk. Beyond about 4,000 pounds, increasing vehicle weight results in a net increase in fatalities, as the risk to other road users more than offsets the increased occupant protection afforded by the additional weight.

To put this another way, Figure 3 illustrates that reducing the weight of midsize cars or small SUVs will increase the total fatality risk. However, reducing the weight of the heaviest SUVs and pickups could result in a net societal safety benefit. So some vehicle downweighting need not result in a net safety cost if it involves the heaviest vehicles.

Besides downweighting the heaviest vehicles, there are other ways to increase fuel economy without negative safety consequences. The NAS committee's report notes the existence of technology that could increase fuel efficiency and achieve large increases in fuel economy without reducing vehicle weights or altering current vehicle performance. However, nothing about the current CAFE structure encourages manufacturers to achieve fuel economy by reducing the weight of their largest vehicles or by installing expensive technology. In fact, CAFE is structured so that increasing the production of small, lightweight, and fuel economical — but less safe — vehicles can offset the production of large, heavy vehicles, which offer manufacturers much greater opportunity for profit.

Figure 4 illustrates this. It shows the distribution of 1999 model cars by weight and fuel economy (in gallons per 100 miles traveled). It also shows the mandated CAFE standard of 27.5 miles per gallon (the horizontal line at 3.64 gallons per 100 miles). For a manufacturer, CAFE is computed by taking the difference between each vehicle's fuel economy and the required level and averaging across the various vehicles. Note that any manufacturer with a heavy model that consumes fuel much above the required level (vehicle A in Figure 4, for example) can satisfy CAFE by also producing small, lightweight, and fuel economical models (like vehicle B). Because there usually is much more profit to be made from larger, heavier, feature-laden vehicles, this aspect of CAFE can be detrimental to safety by providing an incentive to develop and sell small, less protective vehicles. The danger is twofold — the number of small, lightweight vehicles on the road increases and, because those vehicles permit manufacturers to increase production of large, heavy vehicles, the overall incompatibility of the passenger vehicle fleet increases. Essentially, the sale of the lightweight vehicles permits the sale of the heavy vehicles that pose the greatest danger to the occupants in the lightweight vehicles.

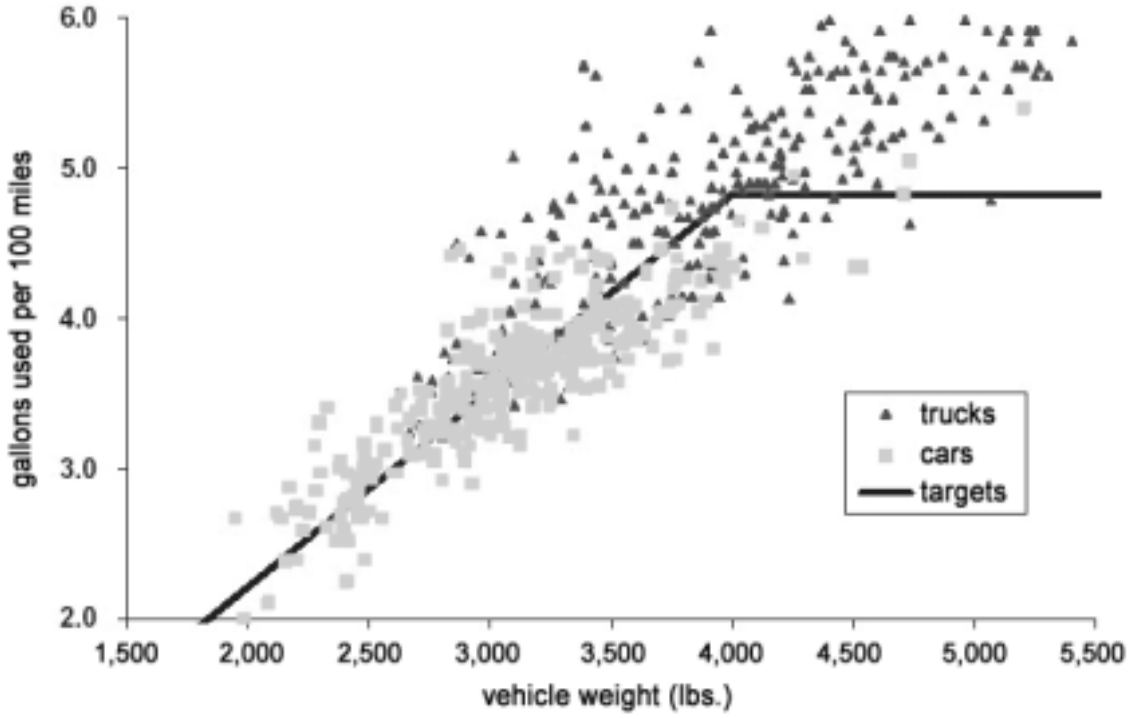
Figure 4
CAFE Encourages Production of Small, Lightweight Vehicles to Offset Large, Heavy, Profitable Vehicles



As the NAS committee reported, CAFE need not be structured in this manner. The standards could promote fuel economy *and* safety, if the fuel economy requirements were indexed to vehicle weight. Figure 5, which appears in the NAS report labeled "Enhanced CAFE Targets," shows the fuel economy of all passenger vehicles in 1999, and a single CAFE requirement is plotted for cars and light trucks. The idea is that fuel economy requirements would increase as vehicles become lighter. Thus, there would be no incentive to downweight the lightest vehicles because their fuel economy requirements would simply increase. Increased sales of such lightweight vehicles could not be used to offset the fuel requirements of heavier vehicles.

To further enhance the safety effect of modifying the current CAFE structure, the NAS committee considered that the sliding fuel economy requirement could end at around 4,000 pounds. Above this, the societal consequence of increasing vehicle weight appears to be negative as vehicle aggressivity effects outweigh occupant protection effects. By holding all vehicles above this weight to a common value (shown here as the current fuel economy level for light trucks), there would be an incentive for manufacturers to reduce the weights, and therefore the aggres-

Figure 5
Weight-Based Fuel Economy Target Could Remove Incentive for Small Lightweight Cars and Encourage Weight Reduction in Heaviest Vehicles



sivity, of the heaviest vehicles. The Institute believes strongly that NHTSA should investigate this enhanced CAFE structure and, if its initial promise is confirmed, it should be seriously considered as an alternative to the current CAFE structure.

The Institute is concerned that current efforts to increase the fuel economy of the U.S. vehicle fleet could result in more deaths and injuries in crashes. However, the Institute does not view improved fuel economy and safety as inherently incompatible goals. The chief problem is that the current CAFE structure encourages the sale of small, lightweight, and less protective vehicles in order to permit the sale of large, heavy vehicles. Although the heavy vehicles are more protective of their occupants, the additional protective effect of weight diminishes at greater weights while the aggressive effect increases. Thus, simply ratcheting up current CAFE requirements for cars or light-duty trucks would be expected to increase motor vehicle fatality risk by increasing the sales of lightweight cars and trucks.

The NAS committee identified a number of vehicle and engine technologies that could increase fuel economy without downweighting or losing vehicle performance characteristics. But these technologies come at a cost, and nothing in the current CAFE structure encourages manufac-

turers to adopt fuel efficiency strategies as opposed to the potentially cheaper and less safe strategy of downweighting. In contrast, incentives do exist to add weight-increasing features to large, profitable vehicles while subtracting features and weight from small, cheap vehicles. The risk is compounded by the likelihood that younger, riskier drivers who cannot afford the protection of the heavier vehicles will drive the small, cheap vehicles.

Congress should be guided by history as it considers this issue. The first fuel economy standards were imposed in the 1970s after the oil crisis. In response, new technologies were introduced, but a large proportion of the resulting improvements in fuel economy came from vehicle weight reductions. Cars in 1993 were, on average, 700 pounds lighter and light-duty trucks were 300 pounds lighter than in 1976. NHTSA has estimated that in 1993 each 100-pound decrease in car weight was associated with a 1.13 percent increase in fatality risk in crashes. This suggests, as the NAS report concludes, that if car drivers in 1993 had chosen vehicles as heavy as those in 1976, there would have been fewer sales of the lightest vehicles and more sales of the heavier ones. This would have meant 2,100 fewer fatalities in crashes. The NHTSA analysis also indicates that, because light-duty trucks were 300 pounds lighter in 1993, there were 100 fewer fatalities in truck crashes. This effect of truck weight reduction occurs because light-duty trucks, on average, are heavier than most other passenger vehicles and the aggressive effect of additional mass outweighs the protective effect.

Simply ratcheting up fuel economy requirements within the current CAFE structure could cause a repeat of this negative effect. Although the technology exists to improve fuel economy without downweighting the smallest, lightest vehicles, economic forces may argue against the adoption of such technology. Certainly, the current CAFE structure does nothing to prevent the increased sale of small, lightweight, and less safe cars and light trucks. The Institute understands that Congress may decide that current world events as well as environmental concerns require improved fuel economy as part of the U.S. response. However, we urge Congress to direct NHTSA to consider new CAFE structuring that could improve both fuel economy and safety. Such consideration is necessary to ensure that the fuel economy improvements that might save lives in the distant future do not result in vehicle downsizing and downweighting that surely will result in needless fatalities in the near future.