STATUS REPORT

INSURANCE INSTITUTE FOR HIGHWAY SAFETY

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BAD

STATISTICS LEAD TO MISINFORMATION

Sweep 'em out. That's what ought to be done with research "findings" based on misguided analyses of inappropriate data. This is the stuff to which British statesman Benjamin Disraeli referred, famously citing "lies, damned lies, and statistics" to bemoan the willy-nilly use of numbers.

Numbers can, and often are, used to "prove" just about any program or policy that anybody with an agenda wants to praise or discredit. It's an ongoing problem,

(continues on p.4)

GOOD STATISTICAL ANALYSES point to improving vehicle designs as reasons for recent declines in death rate

It's true that US motor vehicle death rates have been trending downward for decades. Since the mid-1980s, the rate per registered vehicle has declined 43 percent. Traffic safety policies aimed at improving drivers and roadways have influenced this trend, but it's a mistake to attribute all of the death rate reductions to such policies (see p.1). More sophisticated analyses are required to get a clearer idea of what's behind the reductions, and new Institute research helps to identify the reasons.

The researchers focused on two factors that have influenced the driver death rate per registered vehicle over 20 years (1985-2004). One is how vehicle use patterns change as vehicles age. The other is vehicle design changes — the introduction over time of different types of vehicles and more crashworthy ones to replace vehicles that weren't doing as good a job of protecting their occupants.

In the US fleet these two factors can have countervailing influences. As vehicles age, their death rates go up. On the other hand, more crashworthy vehicles have been introduced, and their death rates are lower than in the older vehicles they replaced. Plus the types of vehicles in the fleet have shifted, and the shift from driving cars to SUVs can change the death rates. Separating these factors brings into sharper focus the effects of other influences on the US motor vehicle death rate, including the effects of various traffic safety policies and programs aimed at improving drivers and roadways.

"While vehicle age effects have pushed the US death rate upward, vehicle design improvements have tended to push the rate downward. The unknown is the effect of the other factors, particularly changes in traffic safety policies," explains Adrian Lund, Institute president and an author of the research report. "Once we adjusted for vehicle age and design, the effects of the other influencing factors became apparent."

The main finding is that from the mid-1980s to the mid-1990s traffic safety policies appeared to be having a positive effect, reducing death rates. But around 1994 this benefit ceased. Since then the death rate would have been on an upward trend if vehicle design improvements hadn't continued to push it downward.

Effects of vehicle age on driver death rates: The researchers computed death rates for vehicle models that didn't change in design over three model years — 1996-98 models during 1999, for example. This eliminated the effects of any design changes on the death rate because there were no such changes.

Computing the rates for several model year groups without design changes during individual calendar years, the researchers found that, on average, the death rate per registered vehicle increased 2 percent from the first to the second year a vehicle was driven, 5 percent from the second to the third year, and 3 percent from the third to fourth year. There was no change from the fourth to fifth year, a 1 percent increase to the sixth year, and a 3 percent increase to the seventh year of vehicle use.

Researchers don't know exactly why death rates go up as vehicles get older. It's probably not because of vehicle deterioration, at least during the early years of a vehicle's use. It probably has more to do with who drives older vehicles versus newer ones and how they drive them. When researchers adjusted for driver age and gender and for type of crash, the effects of vehicle age diminished or even disappeared.

Removing the design effects: The researchers separated out vehicle design effects on death rates by following the same vehicles over time. The rates still were affected by vehicle aging so, having already estimated the age effects, the researchers factored them out too. Then the data revealed that the downward trend in death rates would have ended in 1993. An upward trend would have begun if not for the vehicle design changes.

This highlights the importance of the design changes. They haven't just led to better crash test performances (see *Status Report*, March 29, 2006; on the web at iihs.org). They've saved lives in real crashes faster than other effects could influence the death rate upward.

"The only problem is that people who aren't driving the newest vehicles aren't benefiting from the design changes," Lund says. "In fact, the risk for them is worsening."

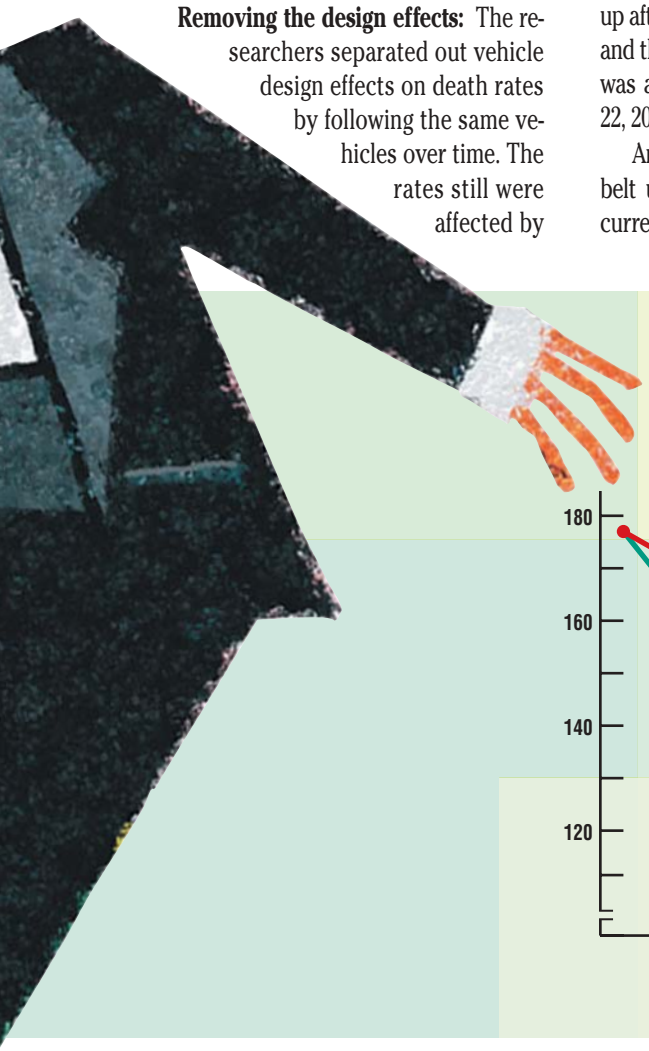
Offsetting effects on death rates: Changes in traffic safety policies pushed death rates in both directions during the study period. For example, speed limits and travel speeds went up after the 55 mph limit was amended in 1987 and then up some more after the national limit was abolished in 1995 (see *Status Report*, Nov. 22, 2003; on the web at iihs.org). This cost lives.

An offsetting trend has been increasing belt use. The biggest use rate increases occurred in the 1980s, when states began enacting safety belt laws. Buckling up leveled off in the 1990s, and for the past couple of years the rate has topped 80 percent (see *Status Report*, Jan. 11, 2003; on the web at iihs.org).

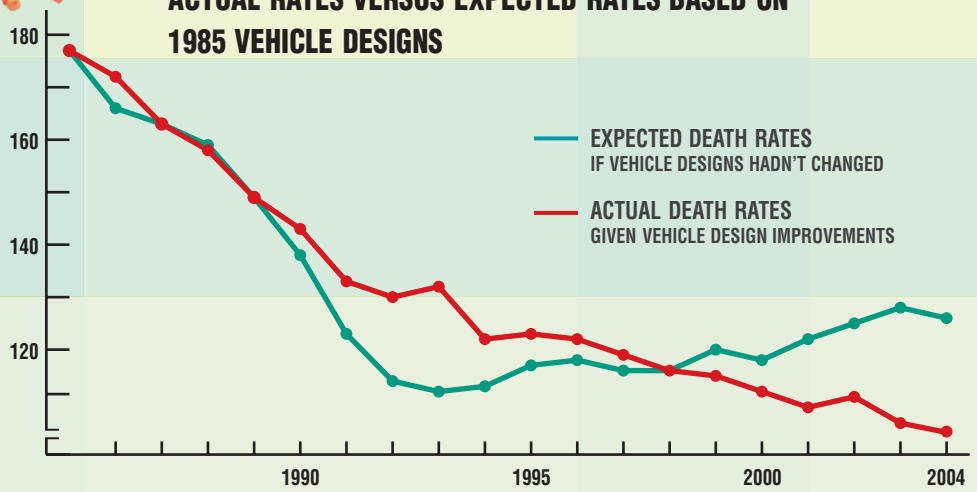
The death rate trend that would have been expected if vehicle designs hadn't changed (see graph, above) goes down and then starts up, indicating that policies like belt laws might have been helping to lower death rates until the mid-1990s. Since then they haven't.

"We haven't seen the concentrated push in recent years for effective traffic safety policies that we saw in the 1980s," Lund points out. "Serious problems still are out there — faster travel speeds, for example — and we need to address them with the same resolve we applied to raising belt use and reducing alcohol-impaired driving in the 1980s and early 1990s. We also need to design roadways that are more forgiving of all the errors that motorists inevitably are going to make."

For a copy of "Trends over time in the risk of driver death: what if vehicle designs hadn't improved?" by C.M. Farmer and A.K. Lund, write: Publications, Insurance Institute for Highway Safety, 1005 North Glebe Road, Arlington, VA 22201, or email publications@iihs.org.



INFLUENCE OF VEHICLE DESIGN IMPROVEMENTS:
DRIVER DEATHS PER MILLION REGISTERED VEHICLES, ACTUAL RATES VERSUS EXPECTED RATES BASED ON 1985 VEHICLE DESIGNS



PASSENGER VEHICLE DESIGNS HAVE BEEN CONTINUALLY IMPROVED. WITHOUT THESE IMPROVEMENTS, THE DEATH RATE WOULD HAVE STOPPED DECLINING IN 1994 AND STARTED GOING UP. THIS REVEALS NOT ONLY THE IMPORTANCE OF DESIGN CHANGES BUT ALSO THE DIMINISHING BENEFITS OF TRAFFIC SAFETY POLICIES IN REDUCING DEATHS IN RECENT YEARS.

RESEARCHERS ALWAYS USE APPROPRIATE DATA AND ANALYZE THOUGHTFULLY . . . . *DON'T THEY?* NOT EXACTLY, WHICH IS WHY BENJAMIN DISRAELI RELEGATED STATISTICS TO A PLACE BENEATH LIES AND DAMNED LIES. HE KNEW THAT NUMBERS OFTEN ARE MISUSED TO SUPPORT THIS OR THAT POSITION OR POINT OF VIEW.

(continued from p.1) and the field of highway safety is no exception. A new report by former Institute president Brian O'Neill and statistician Sergey Kyrychenko points to multiple examples of how motor vehicle death rates have been misinterpreted. These examples serve as powerful warnings of how *not* to use data.

Trends in the death rates have been widely used to measure highway safety progress over time and to compare relative highway safety performance among countries. Politicians often express national goals in terms of targeted reductions in the motor vehicle death rate per mile driven. The problem is that this rate is influenced by numerous factors that have nothing at all to do with traffic safety policies. An example is the presumption that a decline in deaths per mile traveled indicates that traffic safety programs are working effectively and vice versa. In fact, the relationship between miles traveled and fatality risk is more complicated. The risk per mile is much lower on congested freeways, for example, than on uncongested ones. Such differences in risk because of congestion do affect death rates, but they're unrelated to traffic safety policies.

So even though it may seem appropriate to measure changes in deaths per mile over time or across jurisdictions to gauge the success or failure of highway safety countermeasures, these rates are influenced by too many factors unrelated to the countermeasures.

It's the same with deaths per registered vehicle and per population. Per-vehicle rates can be useful for short-term comparisons, but over time and from jurisdiction to jurisdiction the composition of vehicle fleets changes (see p.2). Per-capita rates are influenced by changing demographics including, for example, the proportions of teenage and other high-risk drivers.

Competent researchers don't use broad-brush rates like these to evaluate specific traffic safety programs. They use datasets directly related to the programs — for example, death rates on specific roads to assess the effects of speed limit changes on those roads. Such evaluations can lead to useful insights about program effectiveness and help to guide policymakers.

"Just as often data are misused," O'Neill says. "And whether they're misused inadvertently or deceitfully, as Disraeli observed, to bolster a favored viewpoint, the result is the same. Policy can end up being misguided."

Same data lead to opposite conclusions: A sure sign that data are being misused is when the same death rates are cited to "prove" opposite points of view. In 1999 the US Centers for Disease Control and Prevention cited the declining death rate on US roads from the 1970s through the 1990s to proclaim the success of the nation's approach to reducing this public health problem. Meanwhile, Leonard Evans also tracked the declining US death rate over about the same time interval, comparing this trend to those in other countries. His main finding is that US policy has been a "dramatic failure" because the death rate in this country hasn't declined as much as elsewhere.

So which is it? Have US traffic safety programs and policies succeeded or have they failed?

"We don't know from Evans or from the Centers for Disease Control because neither one of them took differences in factors such as urbanization and demographics into account when comparing death rates over time or across jurisdictions," O'Neill says.

How data are misused to justify speeding: Organized in 1982 to oppose the 55 mph speed limit, the National Motorists Association still opposes reasonable speed limits. To make its case, this group misuses motor vehicle death rates to try to make it seem as if safety is unrelated to speed limits and travel speeds. According to a 2005 news release, "the fatality rate has continued to decline despite higher speed limits and higher driving speeds. This clearly demonstrated that the 22-year-long experiment with an arbitrary national speed limit served no positive purpose."

What's overlooked is that per-mile death rates across all kinds of US roads — rural and urban ones, interstate highways and city

streets, etc. — are too broad to assess the effects of a specific policy change like raising speed limits on specific roads.

Study after study confirms that deaths on rural interstates go up when speed limits are raised (see *Status Report*, Nov. 22, 2003; on the web at iihs.org). The National Motorists Association furthers its agenda by ignoring these findings of scientific studies in favor of misusing the irrelevant per-mile death rate.

Misuse of death rates in SUN countries: Another example involves the SUNflower report, a comparison of road safety policies in Sweden, the United Kingdom, and the Netherlands. These policies were studied because the three countries reportedly have the lowest death rates in the world, and the authors of the SUNflower report assumed this was because of the effectiveness of the safety policies.

However, O'Neill and Kyrychenko point out that the authors of the SUNflower report didn't consider whether other countries with higher death rates might have equal or better traffic safety programs but worse demographics, less crowded roads, or other factors that can lead to higher death rates despite good safety policies and programs.

Misuse of state-by-state data: Four US jurisdictions (Connecticut, Massachusetts, New Hampshire, and Vermont) had lower mileage death rates than the SUN countries during the period of study. But this was largely because of urbanization and demographics in the New England states, not because they have especially good safety programs and policies.

Differences in safety policies vary widely among US states — just as widely as among EU countries. But while nobody tries to lump together the death rates in the EU countries for comparison with elsewhere, this does happen in the case of US state death rates. They're frequently lumped together into an overall rate for comparison with rates in other countries.

Except for a brief time in the late 1960s and early 1970s, the US government hasn't been authorized to influence traffic safety programs aimed at drivers —

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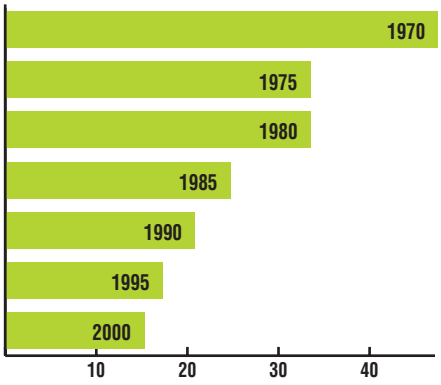
DEATHS PER BILLION MILES TRAVELED



TOO BROAD TO MEASURE THE SUCCESS OR FAILURE OF ANY SPECIFIC TRAFFIC SAFETY POLICY OR PROGRAM. IT TAKES MORE SOPHISTICATED ANALYSES TO CONDUCT RESPONSIBLE EVALUATIONS OF PROGRAM EFFECTIVENESS. O'NEILL AND KYRYCHENKO CONDUCTED SUCH ANALYSES, FINDING THAT FACTORS WHOLLY UNRELATED TO TRAFFIC SAFETY PROGRAMS ARE MOSTLY RESPONSIBLE FOR THE DECLINING PER-MILE DEATH RATE.

belt laws, motorcycle helmet laws, speed limits, etc. (see *Status Report*, Dec. 7, 2002; on the web at iihs.org). These programs, established by state legislators, vary widely from state to state. Largely because of differences among belt laws, for example, use rates vary from about 50 percent in some jurisdictions to more than 90 percent in others.

Comparing data as broad-brush as per-mile death rates across states obscures the effects of these differing programs and policies. For example, New Hampshire has the fourth lowest per-mile death rate among the 50 states. Does this mean its programs and polices are better or more effective than those in other states? No. In fact, New Hampshire is the only US state without a belt use law. Its buckle-up rate is much lower than in other states. Nor does New Hampshire have a motorcycle helmet law. Its per-mile death rate is low largely because of factors related to urbanization and demographics, not because of its safety policies.

O'Neill and Kyrychenko conducted statistical exercises, including regression analyses, to explore the effects of factors related to urbanization, demographics, and climate on death rates in New Hampshire and the other 49 states. The main finding is that the first two factors strongly influence state death rates. Climate differences also are influential, though not as much.

The very rural state of Montana, for example, has the highest per-mile death rate among the 50 states. What happens when its rate is standardized by urban versus rural mileage to match the US as a whole? Then Montana drops to 27th among the states in terms of its death rate per mile traveled. States with the highest per-mile rates also have the lowest median incomes, percentages of population with college degrees, and school spending per pupil. They have the highest proportions of high-risk drivers, those 16-20 years old. States with high population densities and traffic congestion have low per-mile death rates. In fact, almost 70 percent of the variability among passenger vehicle occupant death rates can be explained by urbanization and demographics.

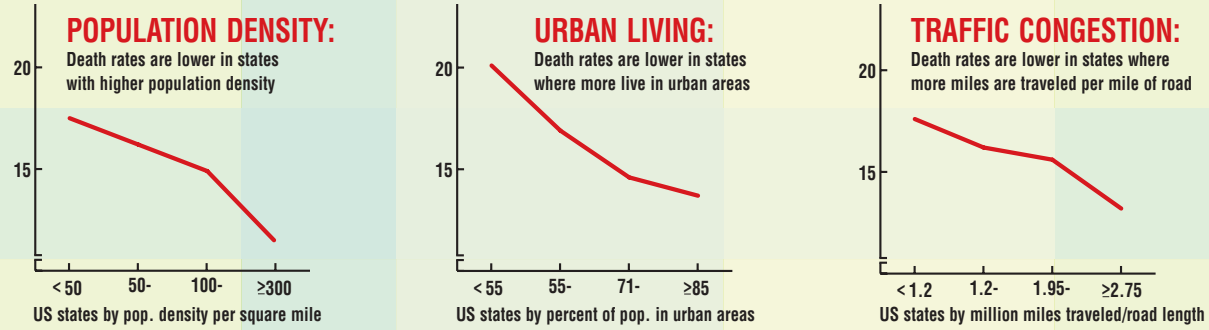
How to determine true policy effects: Factors unrelated to traffic safety policies can overwhelm the effects that might be accruing from specific programs. This doesn't mean the programs aren't worthwhile. There's no question about whether a safety belt law would have saved lives over the years in New Hampshire. It would have. Lives also would have been saved if New Hampshire had a law requiring motorcyclists to wear helmets. But the effectiveness of specific traffic safety policies like belt and helmet use laws cannot be meaningfully evaluated by simply comparing overall state death rates.

Instead the evaluations have to start with relevant measures of program outcome — changes in motorcyclist death rates to evaluate the effects of helmet laws, for example. Then the evaluations have to account for factors such as climate and economic conditions that might be affecting the rates. Once these are accounted for, the program effects, if there are any, won't be obscured. Then and only then can the findings be deemed meaningful enough to guide policymaking.

This is what Disraeli would have advised. O'Neill and Kyrychenko advise it too.

For a copy of "Use and misuse of motor vehicle crash death rates in assessing highway safety performance" by B. O'Neill and S. Kyrychenko write: Publications, Insurance Institute for Highway Safety, 1005 North Glebe Road, Arlington, VA 22201, or email publications@iihs.org.

INFLUENCE OF 3 URBANIZATION FACTORS ON DEATHS PER BILLION MILES TRAVELED, 2001-03



URBANIZATION EXPLAINS A LOT OF THE VARIABILITY IN DEATH RATES AMONG THE 50 STATES. THIS DOESN'T MEAN STATE TRAFFIC SAFETY POLICIES AND PROGRAMS AREN'T ALSO INFLUENCING THE RATES, BUT IT DOES MEAN THEIR EFFECTS AREN'T APPARENT, LET ALONE QUANTIFIABLE, UNTIL RESEARCHERS ACCOUNT FOR OTHER INFLUENCING FACTORS LIKE URBANIZATION.

Overhaul of federal FUEL ECONOMY program serves safety too

Requirements go further than initially proposed toward reducing safety versus fuel economy conflict

Responses weren't surprising when the National Highway Traffic Safety Administration (NHTSA) announced on March 29 that it will toughen fuel economy requirements for SUVs, pickups, and vans. Vehicle manufacturers said it would be a challenge to meet the new requirements. Environmentalists said the agency should have done more.

The safety implications of the policy change are plain, though. The new requirements, which will phase in for 2008-10 models and take full effect with 2011 models, will remove the long-standing incentive for auto manufacturers to meet tougher fuel economy targets primarily by downsizing their vehicles, thus compromising crashworthiness.

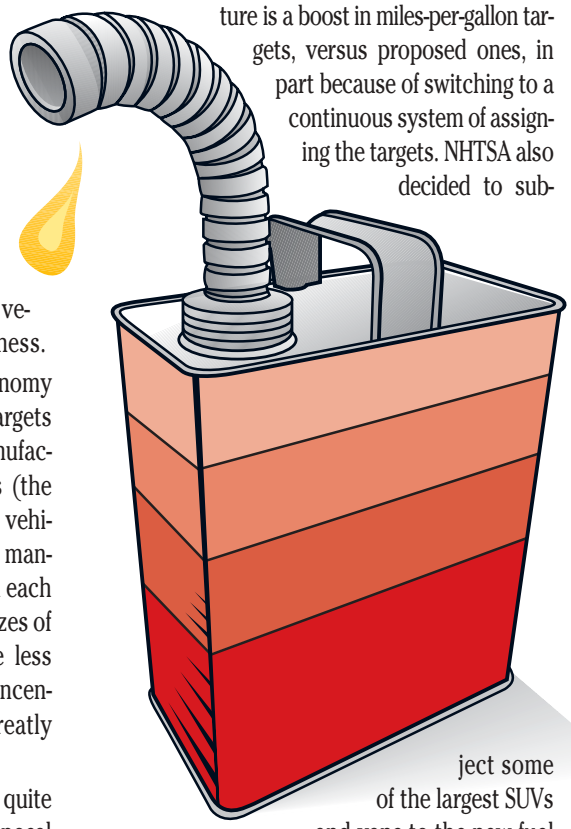
NHTSA will continue to set fuel economy targets, but under the new system the targets won't be applied uniformly across a manufacturer's fleet of SUVs, pickups, and vans (the current uniform requirement for these vehicles is 22.2 miles per gallon). Nor will all manufacturers meet the same targets. Instead each fleet's fuel economy will depend on the sizes of vehicles sold. Bigger vehicles will have less stringent targets. This will remove the incentive to downsize vehicles and, in turn, greatly reduce the conflict with safety.

NHTSA won't set fuel economy targets quite the way it proposed last year. The proposal called for sorting SUVs, pickups, and vans into six categories with differing fuel economy targets (see *Status Report*, Feb. 25, 2006; on the web at iihs. org). The Institute responded by pointing out that this would give manufacturers room to "game" the system by, for example, changing vehicle sizes and weights within categories without changing their fuel economy targets. This would mean safety could continue to be compromised because reducing vehicle size or weight reduces, on average, how well occupants are protected in crashes.

To discourage such maneuvering, the Institute suggested replacing NHTSA's proposed categories of vehicles with a continuous system under which each incremental decrease in vehicle size would trigger an incremental increase in the fuel economy requirement.

This is what NHTSA did, saying it agreed with the Institute about its "concern over the potential to downsize within a step function category, particularly the smallest size categories, where reducing vehicles' size or weight likely would have the largest impact on occupant safety."

This change in how fuel economy targets are applied represents the biggest departure from what NHTSA proposed in 2005. Another departure is a boost in miles-per-gallon targets, versus proposed ones, in part because of switching to a continuous system of assigning the targets. NHTSA also decided to subject some of the largest SUVs and vans to the new fuel economy requirements. These had been omitted in the proposal, and NHTSA says covering them will save fuel beyond the 9 billion gallons already projected from toughening the requirements for all SUVs, pickups, and vans.



In announcing the standards, U.S. Transportation Secretary Norman Y. Mineta said these are "the most ambitious fuel economy goals for light trucks ever developed." There's an important safety gain, too, because the standards finally unlink fuel economy goals from their consequences in terms of occupant protection.

Institute founder THOMAS C. MORRILL died last month

Helped to establish the Institute as a research group in 1969 and served two terms as chairman of the board

In the 1960s when State Farm Insurance executive Thomas C. Morrill first served as chairman of the Institute's board of directors, this organization was a pass-through for the industry to fund state highway safety programs. Morrill and others saw a brighter future, hired Dr. William Haddon, Jr., as president in 1969, and reorganized the Institute into a research and communications group.

Now the Institute follows the comprehensive research approach established by Dr. Haddon, under the direction of Morrill and other board members.

During Morrill's second term as chairman of the Institute in 1970, he addressed insurance executives at the Economic Club of Detroit, voicing how the interests of the industry coincide with society's interest in reducing crash injuries and other losses: "The motivation is reduction in the insurance costs of your customers and ours through the mitigation of crashes and their consequences .... The total harmony of insurer and consumer interest in crash loss reduction justifies the effort."

Morrill was born in 1909. After attending Northwestern University and Central College, he joined State Farm in 1950 and was named vice president two years later. He served on the Institute's board of directors for 19 years, retiring in 1978. He retired from State Farm in 1991. Thomas Morrill died in Peoria, Arizona, on March 3.

"He will be remembered by all of us at the Institute and others in the highway safety community as a pioneer who helped to establish a scientific approach to reducing injuries and property damage losses resulting from crashes," says Institute president Adrian Lund.

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On the inside

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