

Status Report

Insurance Institute for Highway Safety | Highway Loss Data Institute

Range of ratings

Small car ratings run the gamut in challenging small overlap front test

2014 MINI COOPER
COUNTRYMAN
INSURANCE INSTITUTE
FOR HIGHWAY SAFETY
GEN1410

**ALSO IN
THIS ISSUE**
Vol. 49, No. 6
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- ▶ First ratings for Mazda 5 in full battery of IIHS tests
- ▶ Teen crashes decline since advent of graduated licensing
- ▶ Going up: States keep raising speed limits

In a new round of ratings, half a dozen cars earn acceptable or higher and the rest earn marginal or poor. Only one qualifies for *TOP SAFETY PICK+*.

The Mini Cooper Countryman is the only small car to earn a good rating among the latest group of 12 cars subjected to the Institute's small overlap front crash test.

Two electric models and a hybrid also are in the mix, with varied results. The electric-powered Chevrolet Volt (with a gasoline engine "range extender") earns an acceptable rating, while its battery-electric rival, the Nissan Leaf, earns a poor rating. The Ford C-Max Hybrid, a small four-door wagon, earns an acceptable rating. Another small four-door wagon, the gasoline-powered Mazda 5, is rated poor.

Five small cars, all 2014 models, earn an acceptable rating, two earn marginal and four earn poor ratings for occupant protection in a small overlap crash in the Institute's latest round of evaluations. The Institute now has evaluated 32 small cars for small overlap front crash protection. Of them, 19 earn a good or acceptable rating and 13 earn marginal or poor.

Introduced in 2012, the small overlap test replicates what happens when the front corner of a vehicle collides with another vehicle or an object such as a tree or utility

pole. In the test, 25 percent of a vehicle's front end on the driver's side strikes a rigid barrier at 40 mph (see *Status Report*, Aug. 14, 2012, at iihs.org).

The test is more difficult than either the head-on crashes conducted by the National Highway Traffic Safety Administration (safercar.gov) or the IIHS moderate overlap test. In the small overlap test, the main structures of the vehicle's front-end crush zone are bypassed, making it hard for the vehicle to manage crash energy. The occupant compartment can collapse as a result.

"The Mini Cooper Countryman gave a solid performance," says Joe Nolan, the Institute's senior vice president for vehicle research. "The Countryman's safety cage held up reasonably well. The safety belts and airbags worked together to control the test dummy's movement, and injury measures indicate a low risk of any significant injuries in a real-world crash this severe."

To earn the top rating of good, automakers need to focus on overall crash protection. That means an occupant compartment that resists intrusion, safety belts that prevent a driver from pitching too far forward and side curtain airbags that



Fiat 500L

Small overlap front crash ratings for small cars

	Overall	Structure	Restraints & kinematics	Dummy injury measures			
				Head & neck	Chest	Hip & thigh	Lower leg & foot
Chevrolet Volt	A	A	A	G	G	G	G
Mini Cooper Countryman	G	A	G	G	G	G	G
Ford C-Max Hybrid	A	M	A	G	G	G	G
Mitsubishi Lancer	A	A	M	G	G	G	G
Scion FR-S built after December 2013	A	M	A	G	G	G	A
Subaru BRZ built after December 2013	A	M	A	G	G	G	A
Scion xB built after February 2014	M	M	M	G	G	G	G
Hyundai Veloster	M	M	M	G	G	G	A
Fiat 500L	P	P	A	G	G	P	A
Nissan Juke	P	P	M	G	G	G	P
Nissan Leaf	P	P	M	G	G	M	P
Mazda 5	P	P	P	G	G	P	P

Good **G** Acceptable **A** Marginal **M** Poor **P**



Driver space wasn't maintained well in the test of the Ford C-Max Hybrid due to intrusion into the occupant compartment and steering column movement. However, dummy injury measures were good in this electric model.



Mini Cooper Countryman

The Mini Cooper Countryman's safety cage held up well, and the safety belts and airbags worked as they should to control the test dummy's movement.



Fiat 500L

In the Fiat 500L, survival space for the driver was seriously compromised by intruding structure. Serious hip and leg injuries would be possible in a real-world crash.



Chevrolet Volt

Nissan Leaf

Nissan Leaf

Performance and protocol

Two eco-friendly models illustrate how performance can vary in the small overlap test. Driver space in the Volt was maintained reasonably well, and data taken from the dummy indicate a low risk of significant injuries. The Volt is rated acceptable. The story's different for the Leaf. Significant intrusion left little survival space for the dummy, meaning likely knee and leg injuries. The Leaf is rated poor. The Volt has an optional forward collision warning system and qualifies for *TOP SAFETY PICK+*.

When testing hybrid or electric models, IIHS follows special safety protocols. Post crash, technicians check for high voltage and high temperature, which could lead to a potentially fatal electrical shock and/or fire. No one can touch the car until given the all-clear. Technicians wear safety gear, including eye protection, rubber boots and rubber gloves. They're tethered at the waist to a long pole, which can be used to pull them away from the vehicle in an emergency. No issues with the batteries or electric systems were seen in the Volt and Leaf tests.



provide enough forward coverage to cushion a head at risk of hitting the dashboard or window frame or things outside the vehicle. Collapsing structures can knock front airbags and seats out of position, exacerbating the problem.

"Collapse of the occupant compartment is the downfall for four small cars in this group, including the Fiat 500L, Mazda 5, Nissan Juke and Nissan Leaf," Nolan explains. "A sturdy occupant compartment allows the restraint systems to do their job, absorbing energy and controlling occupant motion."

In the Fiat 500L, a four-door variant of the much smaller Fiat 500 coupe, intruding structure seriously compromised the driver's survival space, knocking the steering wheel back and to the right of the driver. That put the front airbag out of position so the dummy's head slid off the left side and hit the A-pillar. Although sensors in the head indicate the impact wasn't severe, contact with hard surfaces shouldn't occur. In addition, injury measures taken from the dummy indicate serious injury to the driver's left hip would be likely, and injuries to both lower legs would be possible in a real-world crash of this severity. The Fiat 500L (and 500) earns a poor rating for small overlap front crash protection.

First results for Mazda 5

The Mazda 5 shares the distinction with two other cars of being the worst-performing models the Institute has evaluated in the small overlap test. The other two are the 2014 Kia Forte, a small car, and the 2012 Prius v, a midsize hybrid.

"When we tested the Mazda 5 we saw a host of structural and restraint system problems. Parts of the occupant compartment essentially buckled, allowing way too much intrusion," Nolan says.

Injury measures taken from the dummy indicate a high risk of injuries to the left thigh and left lower leg in a real-world crash this severe. The steering wheel moved to the right, and the dummy's head barely contacted the front airbag before sliding off the left side. The safety belt allowed the dummy's head and torso to move too far forward, so the head made contact with the left side of the dashboard. The side curtain airbag didn't deploy at all, exposing the head to contacts with side structure and outside objects. Plus, the driver door unlatched during the test, something that shouldn't happen and puts occupants at risk of being ejected from the vehicle.

The Mazda 5 also is distinct in that it is the only vehicle in this group to earn a marginal rating in one of the Institute's other four evaluations — moderate overlap front, side, rollover and rear. The Mazda 5 earns a marginal rating in the side impact test. That also makes it the only 2014-model car the Institute has evaluated to earn anything less than acceptable in the side test. Most models earn a good rating. Measures taken from the driver dummy indicate a likely pelvis fracture, and measures taken from the dummy seated in the rear passenger seat indicate that rib fractures and/or other internal organ injuries would be possible in a crash of this severity.

Volt and Leaf electrics

Back in 2011, the Volt and Leaf were the first mainstream plug-in electric models to undergo IIHS crash test evaluations. The 2011 models earned top ratings in the moderate overlap front, side, head restraint and roof-strength evaluations (see *Status Report*, April 26, 2011). That's still the case with the 2014 versions of both cars.

"Electric vehicles have a unique challenge in the small overlap test because of their heavy batteries. The Volt performed reasonably well, earning an acceptable rating, while the Leaf struggled," Nolan says.

Driver space in the Volt was maintained reasonably well in the test, and injury measures taken from the dummy indicate a low risk of any significant injuries to a person in a similar crash. In the Leaf, the dummy had a different experience. The Leaf chalked up as

Mazda 5 ratings in IIHS tests

Small overlap front

P

Moderate overlap front

G

Side

M

Roof strength

G

Head restraints & seats

A



This is the first time the Institute has published ratings for the Mazda 5 in the full battery of tests. The small wagon struggled in the small overlap front and side tests. The Mazda 5 is the only 2014 model car evaluated to earn anything less than acceptable in the side test. The Institute has been evaluating models for side impact protection since 2003.

much as 16 inches of intrusion in the lower occupant compartment and 14 inches in the upper occupant compartment. The instrument panel, parking brake pedal and steering column were all pushed back toward the driver. Injuries to the left knee and left lower leg would be likely in a crash of this severity, and injuries to the left thigh would be possible.

Award winners

The Volt, which has a basic-rated optional forward collision warning system, is the only car in this test group to earn a 2014 *TOP SAFETY PICK+* award. The C-Max Hybrid, Countryman, Mitsubishi Lancer, and the Scion FR-S and its twin the Subaru BRZ qualify for *TOP SAFETY PICK*, the Institute's second-highest award. These models miss the "plus" award because they don't have an available front crash prevention system.

To qualify for *TOP SAFETY PICK+*, a vehicle must earn a good or acceptable rating for small overlap protection, a good rating in the Institute's other four tests, and a basic, advanced or superior rating for front crash prevention. To qualify for *TOP SAFETY PICK*, a vehicle must earn a good or acceptable rating for small overlap protection and a good rating in the other four tests.

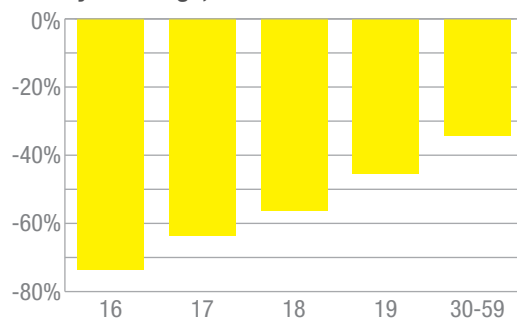
"Consumers in the market for a small car now have six models to consider on our list of 2014 *TOP SAFETY PICK+* award winners, and an additional 13 that earn *TOP SAFETY PICK*," Nolan says. "Consumers trading the inherent safety of a larger vehicle for the convenience or fuel economy of a small car should focus their search on these vehicles with state-of-the-art safety designs." ■



Teen crashes fall since the advent of graduated licensing

U.S. teenagers are crashing less often, both per capita and per mile driven, since the advent of graduated driver licensing (GDL) in the mid-1990s, a new IIHS study confirms. A separate study published recently in *Injury Prevention* makes the connection with GDL more explicit, finding that graduated licensing reduces

Change in per capita fatal crash rates by driver age, 1996-2012



There has been a steady, steep decline in teenagers' per capita crash rates since 1996 when the nation's first graduated driver licensing system went into effect in Florida.

both the amount of driving done by teenagers and the likelihood that they will crash when they do drive.

Teen crash rates per mile driven still far exceed those of older drivers, but the studies are the latest to suggest that changes in licensing policies during the past two decades are working.

"Since 1996, when the nation's first graduated licensing system went into effect in Florida, there has been a steady, steep decline in teenagers' per capita crash rates," says Anne McCartt, IIHS senior vice president for research and lead author of the Institute's study. "We found the steepest reduction among 16 year-olds, who are most likely to be affected by graduated licensing."

A 2007 IIHS study found that between 1996 and 2005, per capita fatal and non-fatal crash rates dropped sharply for 16 year-olds and also fell for 17 and 18 year-olds (see *Status Report*, June 15, 2007). The new study extends the time period and includes more recent data about travel patterns. Institute researchers used data from government crash databases, the Census Bureau and the 1995-96, 2001-02, and

2008 National Household Travel Surveys to calculate rates of fatal crashes and police-reported crashes for drivers ages 16-19 and drivers ages 30-59. They found that per mile driven, rates of fatal crashes and police-reported crashes were much higher for teenagers than for the 30-59-year-old group during 2008 and much higher for 16-17 year-olds than for older teenagers. Lower per capita rates of fatal and police-reported crashes for 16 year-olds compared with older teenagers and adults stem from the fact that younger teenagers are less likely to be licensed and may drive less when they are.

The per capita rates of fatal and police-reported crashes among teens fell steadily from 1996 to 2012. While the largest declines were among younger teens — for example, 16 year-olds went from 33 fatal crash involvements per 100,000 people in 1996 to 9 in 2012 — all teens had much larger declines than the 30-59 year-olds, for whom fatal crashes per 100,000 people also fell, from 20 to 13. Teen drivers' crash rates per mile driven also dropped substantially and, in general, more steeply than those of the adult drivers.

The proportion of younger teen drivers' fatal crashes at night and with two or more teenage passengers also declined from 1996 to 2012. That is consistent with restrictions on night driving and young passengers that are part of GDL systems in almost all states. Previous Institute research has found that stronger restrictions on night driving are associated with larger reductions in fatal crash rates, as are laws that limit teen passengers (see *Status Report*, May 31, 2012, at iihs.org).

The proportion of fatally injured teenage drivers with positive blood alcohol concentrations also decreased, while it changed little for middle-age drivers.

One risk factor not addressed by GDL is speeding. The authors found that more than a third of teens' fatal crashes involved speeding, compared with less than a fifth for 30-59-year-old drivers. The percentage of fatal crashes in which drivers were speeding increased 7 percent for 16 year-olds and held more or less steady for the other ages.

In the second study, researchers found that teens are in fewer crashes when exposed to GDL, in part because they drive

less and in part because they crash less often when they do get behind the wheel.

Like the IIHS analysis, this study also used data from the three most recent travel surveys. For each of the survey periods, researchers looked at the daily travel reported by people in four age groups: 16, 17, 18 and 20-24. Teenagers were classified as exposed to GDL if, at the time of the survey, their state had a GDL law with a learner phase of at least three months and either a night driving or passenger restriction in the intermediate license phase. The researchers then used the government's fatal crash data to calculate mileage-based and per capita fatal crash rates for each age group. The 20-24-year-old group was included to help control for non-GDL-related factors that influence driving, such as the economy.

The researchers conclude that GDL laws cut the per capita fatal crash rate by about a third for 16 year-olds, with half the reduction coming from a 21 percent decrease in average miles driven and half from a 17 percent drop in the rate of fatal crashes per miles driven. For 17 year-olds, GDL reduces the per capita fatal crash rate by 17 percent, with all of the reduction coming from less driving, the study finds. The reduction for 17 year-olds wasn't statistically significant.

The authors speculate that teens may drive less under GDL because it includes an extended learner phase that requires permit holders to drive with supervision, and an adult may not always be available. Intermediate restrictions also limit the hours and circumstances under which they drive. Finally, some teens may put off licensure until they are no longer subject to restrictions. Other research has shown that teens are indeed delaying driving, but the reasons in recent years seem to have more to do with economic considerations than a desire to avoid GDL (see *Status Report*, June 27, 2013).

Some have theorized that GDL would cause crash rates to go up for older teens not under the restrictions, since they might not have as much driving experience as a result. However, neither this study nor the IIHS study found any evidence that teens older than 17 have been adversely affected as states have implemented and strengthened GDL.

For a copy of "Tracking progress in teenage crash risk in the United States since the advent of graduated licensing programs" by A.T. McCartt and E.R. Teoh, email publications@iihs.org. "The association of graduated driver licensing with miles driven and fatal crash rates per miles driven among adolescents" by M. Zhu et al. was published online by *Injury Prevention* in February. ■

Going up: States keep raising speed limits

Loosening speed limits on U.S. freeways and interstates appears to be in vogue among some state lawmakers regardless of the safety costs. This year, four states have raised posted limits to as high as 80 mph or extended maximum limits to more roads. In all, 38 states have speed limits of 70 mph or higher on some portion of their roads.

Idaho and Wyoming raised the maximum speed limit from 75 to 80 mph on interstates, effective July 1 in both states. In Utah, the current maximum posted speed limit is 80 mph. Last year the state increased the number of interstate segments posted at 80 mph and decided this spring to allow other DOT-approved freeways to be posted in excess of 75 mph, effective in May. Georgia raised limits on urban interstates to 70 mph, up from 65 mph.

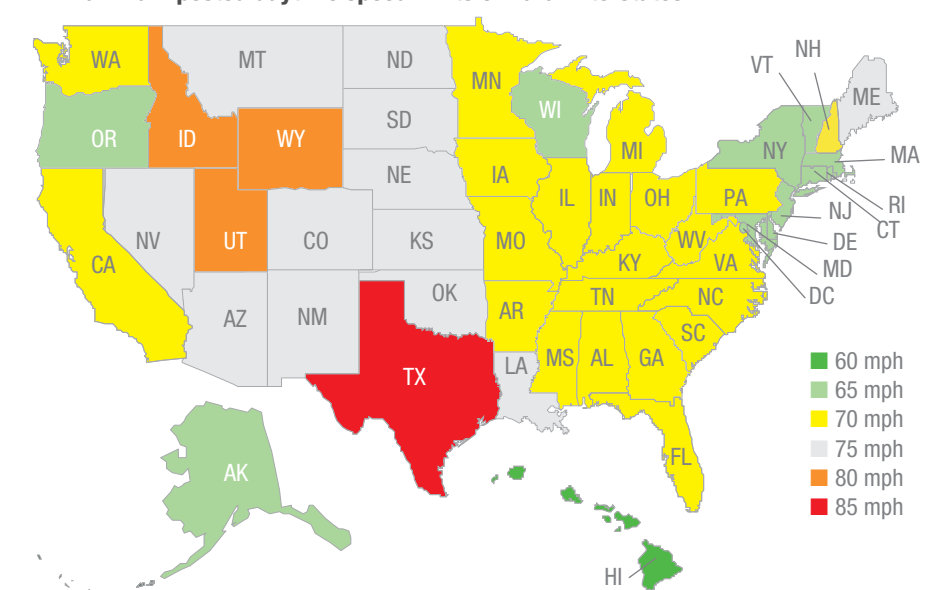
Several other states have unsuccessfully tried to raise speed limits this year. Florida Gov. Rick Scott in May vetoed a bill that would have lifted speed limits on portions of interstates throughout the state to as fast as 75 mph. In Maryland, a bill would have raised limits to 70 mph on interstates. Other states that considered similar moves include Massachusetts, Missouri, Mississippi, New York, Oklahoma and Wisconsin.

During the 2013 state legislative season, six states (Illinois, Maine, New Hampshire, Ohio, Pennsylvania and Utah) either raised maximum speed limits or expanded the maximum speed limit to cover more roads.

Driving faster may put motorists at their destinations a bit sooner, but that doesn't mean the journey will be a safe one. More than 10,000 deaths — about a third of all crash fatalities — occurred in speed-related crashes during 2012. High speeds make a crash more likely because they increase the distance needed to stop a vehicle. Collisions also become more deadly because crash energy increases exponentially as speeds go up. Research shows that raising speed limits leads to more deaths (see *Status Report*, Nov. 22, 2003).

The National Highway Traffic Safety Administration in a May report estimates that crashes involving a speeding vehicle traveling over the posted limit or too fast for conditions cost the nation \$59 billion in 2010, an average of \$191 for every person in the U.S.

Maximum posted daytime speed limits on rural interstates



Meanwhile, at least one locality is intent on lowering speed limits this year. In New York City, Mayor Bill de Blasio in June won approval from state lawmakers in Albany to lower the default speed limit to 25 mph from 30 mph with an eye toward making city streets safer for pedestrians. The bill awaits Gov. Andrew Cuomo's expected signature before heading to the New York City Council for approval. ■

Status Report

Range of ratings for small cars in small overlap front test ▶ 2

First ratings for Mazda 5 in full battery of IIHS tests ▶ 5

Teen crashes decline with advent of graduated licensing ▶ 6

States keep raising limits on freeways and interstates ▶ 7

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The **Highway Loss Data Institute** shares and supports this mission through scientific studies of insurance data representing the human and economic losses resulting from the ownership and operation of different types of vehicles and by publishing insurance loss results by vehicle make and model.

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