We need better crash test dummies, says Government Accountability Office

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Women and older people are being failed by our crash test dummies, according to the US Government Accountability Office. The GAO has just published a new report on the topic and is concerned that the National Highway Traffic Safety Administration has not done enough to fill knowledge or research gaps that would make our vehicles safer for those more-vulnerable classes of occupants. Consequently, the GAO is recommending that NHTSA create a comprehensive plan to improve that crash test dummy data.

There’s no question that cars today are safer than they were even two decades ago. In addition to the crash testing required by the Federal Motor Vehicle Safety Standards (FVMSS), programs like NHTSA’s New Car Assessment Program (NCAP) and the Insurance Institute for Highway Safety’s Top Safety Picks publicize their test scores, which has forced manufacturers to improve occupant protection to get those all-important safety scores, and now cars have to be designed to deal with offset collisions, side impacts, and rollovers, as well as head-on crashes.

But the benefits of improved in-car safety have been mostly seen by men.

The Hybrid III (M) is the most commonly used crash test dummy and dates back to 1986. It represents a 50th percentile adult male and is 5-feet 9-inches (1.75 m) tall and weighs 171 lbs (78 kg). NHTSA only began including female crash test dummies at the turn of the century, amending the FVMSS in 2000 to reflect that requirement. The female Hybrid III dummy represents a 5th percentile adult female at 4-feet 11-inches (1.5 m) tall and 108 lbs (49 kg), but it's a scaled version of the larger male dummy and does not reflect some of the physiological differences between men and women. The dummy also lacks sensors in its lower legs.

It's dismaying but perhaps not entirely surprising, then, that women are at greater risk of death and injury during a car crash. In 2013, NHTSA found that during a crash, younger female front-row occupants were 17 percent more likely to die than male front-row occupants, and women suffered a greater risk of injuries to the chest (26 percent greater), the neck (45 percent greater), the arms (58 percent greater), and the legs (80 percent greater).

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The situation has at least improved somewhat over time. In a 2022 follow-up study, NHTSA found the differential risk between female and male front-row occupants improved from 19.9 percent greater risk of death for model year 1960–1999 vehicles to 9.4 percent for model year 2000–2020 vehicles and to 2.9 percent when looking just at model year 2015–2020 vehicles.

The greater risk of injuries to female occupants may partly be due to physiological reasons, such as bone density and bone and ligament geometry, but the report also notes that "the shorter stature of females relative to males may help explain the increased risk of leg injuries, as shorter people may need

to sit in a forward position on the seat track, which results in their lower legs being closer to the front of the vehicle." (Some data suggests the types of cars driven by women may be smaller and lighter and that women tend to be in the vehicles that are struck rather than striking in side and rear impacts.)

Age and weight also play a role. Older individuals are at greater risk of injury and death during car crashes; the 2013 study found that "a 75-year-old driver is about five times more likely to die than a 21-year-old in a similar crash." Again, this effect is partly ameliorated in newer vehicles, particularly in post-2009 vehicles. The GAO report also notes that older passengers are more likely to be injured in the rear seat but that front impact tests don't require a rear seat dummy. Heavier people also fare worse in crashes, particularly heavier women compared to heavier men.

But the Hybrid III crash test dummy only uses a single chest sensor, which may not accurately reflect all the forces experienced by elderly occupants during an impact. As a 50th-percentile dummy, it does not accurately represent individuals with a high body mass index. A 95th-percentile dummy exists but is not used in either the FVMSS or NCAP crash tests, despite the fact that 42 percent of the US population is considered obese, according to the GAO report. (The report also notes that the 95th-percentile dummy is not obese, so it may not even accurately simulate occupants with higher body mass indices.)

Similarly, the child-size dummies don't accurately reflect the physiological differences between children and adults, and their smaller size means a lack of room for instrumentation.

More technically advanced dummies with greater biofidelity (called THOR) have been under development for some time and are even used in the European version of NCAP, but NHTSA has yet to finalize a rule requiring their use in the US.

To fix this situation, NHTSA should come up with a plan to address the various crash test dummy limitations, the GAO says, a recommendation NHTSA agreed with.

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