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Why It's Impossible to Tell How Safe Self-Driving Cars Really Are

We'll never be able to test-drive autonomous cars like Google's enough to know for sure that they're safer, according to a new RAND study.



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By Eric Tegler Apr 12, 2016

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The case for self-driving cars rests largely on their propensity not to crash, and the generally accepted idea that they'd do better than harried, angry humans behind the wheel. For example, a 2012 study by KPMG and the Center for Automotive Research predicts that a self-driving fleet could eliminate 93 percent of crashes attributed to human error. Google isn't shy about noting that its self-driving cars have racked up more than 1.3 million miles of real-world testing since 2009 but have been involved in just 17 crashes, all but one caused by human error.

The practical question, however, is: Just how safe do these vehicles need to be before we'll let them intermingle at large with human-driven cars on the highway? And here there's big problem, at least when it come to proving the case for autonomous cars scientifically. According to a RAND study released today, autonomous cars would have to be driven hundreds of millions of miles and, under some scenarios, hundreds of billions of miles to create enough data to clearly demonstrate their safety. "Our findings demonstrate that developers of this technology and third-party testers cannot simply drive their way to safety," [the report says](#).

The study springs from a question its coauthor, RAND's Nidhi Kalra, asked herself while making a presentation on the question of how safe autonomous vehicles should be before we put them on the road. "My initial question was; If we assume

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they're perfect, how many miles do autonomous vehicles have to be driven to prove they're [safer] than human drivers?"

Nidhi recognized that no one knew. Nor did they know how many test-miles would be necessary to prove the safety of self-driving cars that, like Google's car, are very good but not quite perfect. She began making literal back-of-the-envelope calculations and then took the exercise to RAND's researchers and statisticians, who turned it into a full-on study. "We asked whether it was practical to answer these questions with test driving," Kalra says. "The answer is no."

The chief reason why this is so is that Americans drive like crazy. We rack up nearly 3 trillion miles every year, according to the Bureau of Transportation Statistics. In 2013, there were 2.3 million injuries reported, a rate of 77 injuries per 100 million miles driven. The 32,719 deaths from car crashes that year correspond to a rate of about one fatality per 100 million miles driven. "Even if you're not a statistician, you can say: if I want to prove through test driving that autonomous vehicles are safer than humans, I've got to drive them at least 100 million miles without a fatality," Kalra says.

RAND concludes that under even the most aggressive test driving schedule you could put out there, existing fleets of autonomous cars would need decades and even hundreds of years to log enough miles to adequately show their safety vs. human-driven vehicles.

"We know that Google has driven [theirs] 1.3 million miles without a fatality," Kalra says. "That's commendable, but it's two orders of magnitude shy of what one would need to do to make some statistical claim about their performance with respect to fatalities." The study's co-author, Susan M. Paddock, adds: "Even if autonomous vehicle fleets are driven 10 million miles, one still would not be able to draw statistical conclusions about safety and reliability."

So what to do? Kalra thinks that we may have to put the technology on the road before we're certain how safe it is. If there's no plausible way to establish their safety in a laboratory setting; she speculates that the alternative may actually be putting AVs on the road in a controlled setting. "So we can learn in a very intentional way rather than learning through tragedy or mistakes that have to be rolled backward."



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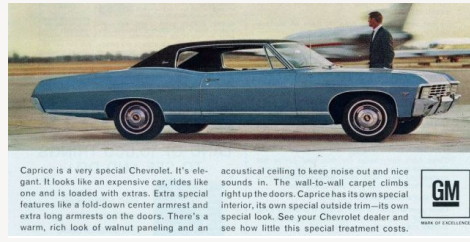


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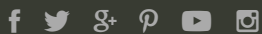
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