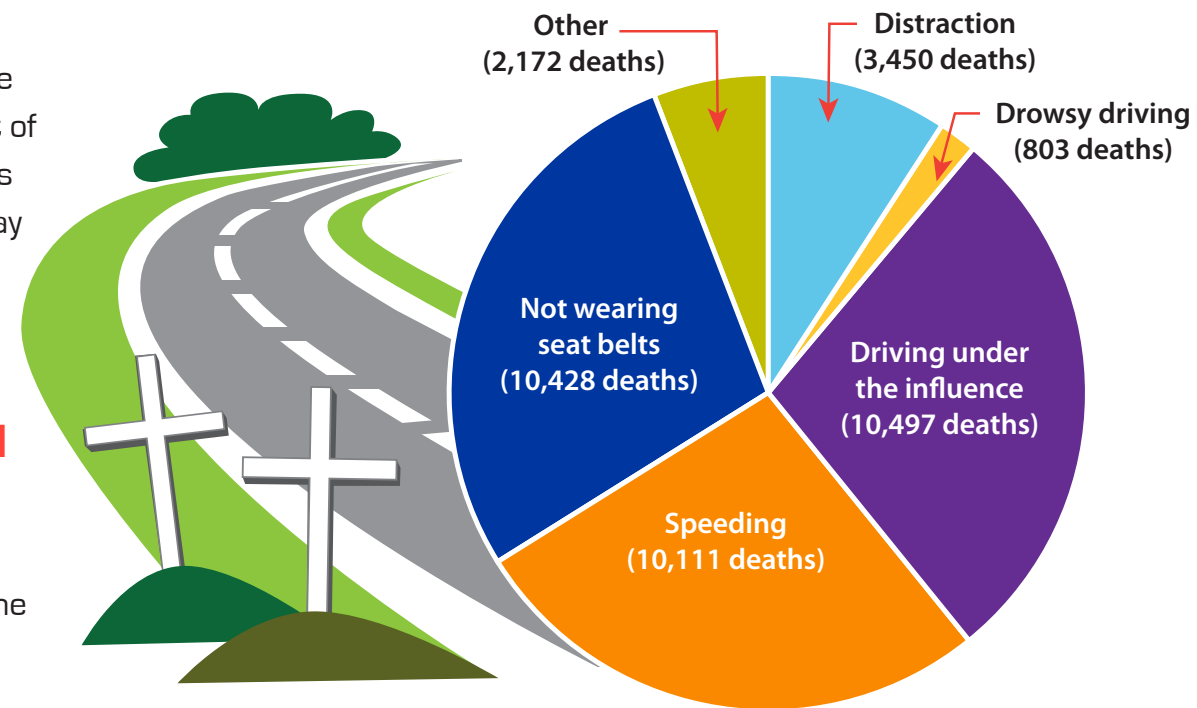


HUMAN ERROR MOST COMMON CAUSE OF TRAFFIC DEATHS

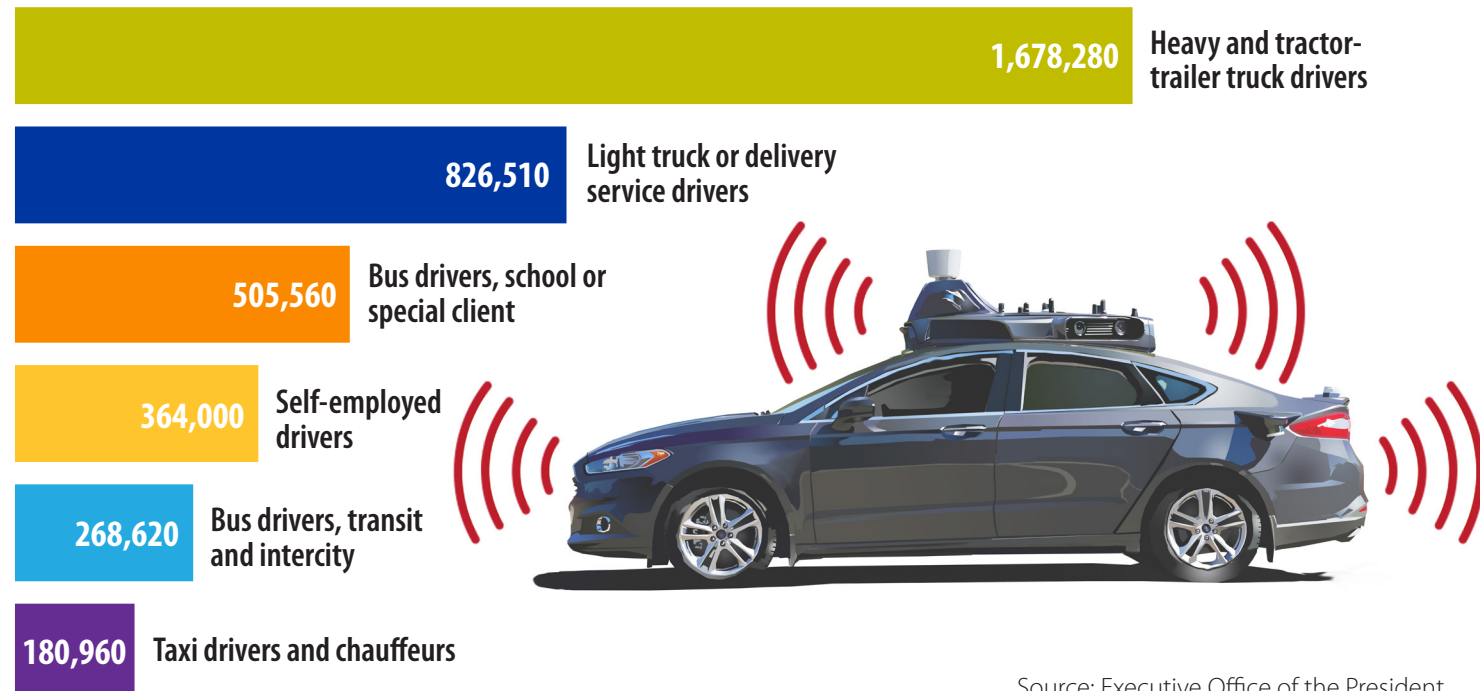
According to the US Department of Transportation's National Highway Traffic Safety Administration, **37,461 people died** on US roads in 2016. Human error is by far the most common cause.



Source: National Highway Traffic Safety Administration

ESTIMATED JOB LOSSES FROM AUTOMATED VEHICLES

The Council of Economic Advisers estimates that **2.2 to 3.1 million** existing part- and full-time US jobs are likely to be displaced or substantially changed by automated vehicle technology.



Source: Executive Office of the President

ABOUT DELIBERATIVE FORUMS

For most Americans, driverless vehicles are still in the future. But in many parts of society, they are already here and, in others, they are just around the corner. Deliberative forums on this subject will surface concerns about issues that go well beyond technology—among them, safety, economic security, and the role of human judgment.

In productive deliberation, people examine the advantages and disadvantages of different options for addressing a difficult public problem, weighing these against the things they hold deeply valuable.

The framework outlined in this issue advisory encompasses several options and provides an alternative means of moving forward in order to avoid the polarizing rhetoric now growing around many of the major policy options. Each option arises from a shared concern and proposes a distinct strategy for addressing the problem that includes roles for citizens to play. Equally important, each option presents the drawbacks inherent in each action. Recognizing these drawbacks allows people to see the trade-offs that they must consider in pursuing any action. It is these drawbacks, in large part, that make

coming to shared judgment so difficult—but ultimately, so productive.

One effective way to hold deliberative forums

1. Introduce the issue.
2. Ask people to describe how the issue may affect them or their families.
3. Consider each option, allowing equal time for each. Explore what is attractive about each option, and whether the drawbacks are acceptable.
4. Review the conversation as a group. What areas of common ground were apparent? What tensions and trade-offs were most difficult?

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Consortium for Science,
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at Arizona State University

ISSUE ADVISORY



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In the coming years, driverless vehicles promise to revolutionize how we get around. What seemed like science fiction only a few years ago is now a reality on the streets of many cities. Traditional carmakers, such as General Motors and Ford, along with newer technology companies like Waymo, Uber, and Tesla, are testing driverless cars and trucks around the nation.

Cars and trucks have shaped many aspects of American society, including the ways goods are transported, the places we choose to live, and the layout of our communities. Millions of people are employed in the transportation industry and related businesses, and transporting goods and people contributes hundreds of billions of dollars to the US economy every year. But the costs include air pollution and traffic congestion, as well as tens of thousands of deaths and millions of injuries in crashes every year.

Automated vehicles could change all of these things. Self-driving vehicles have the potential to reduce emissions, accelerating and braking more smoothly than human drivers can. They could safely travel much more closely together at speed, considerably relieving traffic congestion. Above all, automated vehicles would hugely cut down on death and injury: some 90 percent of traffic accidents have been attributed to human error.

The rapid advance of this experimentation, however, hit a snag in March 2018, when a self-driving car killed a pedestrian crossing the street in Tempe, Arizona. "While

automation provides predictable, consistent performance, it lacks judgment, adaptability, and logic," says Joel Haight of the Department of Energy and Geo-Environmental Engineering at Penn State University. His advice: optimize the strengths of each in the system.

Rapid advances in automation have improved many people's lives in recent years but, for many others, these developments have been far less welcome. Automation has cost them their jobs. A 2016 AP story, for example, pointed out that while General Motors "churns out more cars and trucks than ever," it "now employs barely a third of the 600,000 workers it had in the 1970s."

About 1.8 million Americans, mostly men, drive heavy trucks for a living. Another 1.7 million people drive taxis, delivery trucks, and buses. US Transportation Secretary Elaine Chao has expressed concern about the impact of automated vehicles on US jobs. So has the Teamsters Union. In 2017, the US House of Representatives exempted vehicles more than 10,000 pounds from regulations, legislation intended to speed up the development of automated cars.

This technological push is not likely to be reversed. The question at issue is how to deal with it in ways that will best serve us, our communities, and our nation.

What should we prioritize in the development and use of driverless vehicles?

This issue advisory presents three options for deliberation. Each option offers advantages as well as drawbacks. Most people will find something to agree with in all three approaches, but each also has trade-offs, risks, or drawbacks that must be taken into account and worked through.



OPTION ONE: Promote human control behind the wheel.

However predictable and consistent automated systems are, they cannot be perfectly reliable 100 percent of the time. The most successful of these systems incorporate the oversight of humans to correct occasional errors, a job that would be especially important in high-speed traffic. This option calls for keeping humans behind the wheel of moving vehicles. Rather than attempting to completely control vehicles, autonomous driving features would focus on safety and convenience—including, for example, technologies that enable drivers to park automatically and avoid crashes.

A PRIMARY DRAWBACK

Keeping a human behind the wheel will greatly compromise the chief benefit that self-driving car advocates promise—far fewer accidents.

Examples of what might be done

- Enact laws requiring a licensed human behind the wheel of vehicles at all times.
- Communities can expand and improve public transportation to reduce the need for self-driving vehicles.
- Enforce traffic laws more rigorously with more police, higher fines, and photo and video monitoring.
- Increase the driving age, improve driver training, and require driving tests for license renewals.

Some consequences and trade-offs to consider

- With more than 90 percent of car accidents the result of human error, roads may not become any safer with humans in control.
- This may be impossible in many suburban or rural areas.
- This will feel to many like the intrusive activities of a police state.
- More citizens will find it difficult to get around.

“Humans are the last safeguard before automation errors propagate accidents.”

— National Center for Biotechnology Information



OPTION TWO: Preserve jobs and expand employment.

Automation has led to hundreds of thousands of unemployed workers in the past few decades. This option calls for slowing down the rush toward automation to prioritize consideration of the millions of American drivers and others who now earn their living in transportation. The focus should be on preserving jobs in this field and creating new ones. New jobs might include piloting autonomous vehicles in complex traffic conditions, upgrading and maintaining road infrastructure, monitoring the information communication systems that would be necessary for these vehicles to be networked, or managing vehicle fleets.

A PRIMARY DRAWBACK

The new jobs would not be created evenly. Wealthy urban areas could see job growth while rural regions suffer job losses.

Examples of what might be done

- Support unionizing transportation workers to promote human-centered design of automated vehicles.
- Develop worker retraining programs to help professional drivers transition to new careers.
- Policymakers can work with private companies to promote and maintain a mix of driverless and human-operated vehicles on the road.
- Individuals can lobby legislators to devote tax dollars to job-creating road upgrades, particularly in rural or underserved areas.

Some consequences and trade-offs to consider

- People cost more than software, so the costs of transporting goods and people could go up.
- Not everyone will be able to start a new career.
- Other drivers, knowing the self-driving vehicles are programmed to avoid collisions, might take advantage of them by cutting them off or speeding past them, causing new accidents.
- This may take funding away from other important uses, such as education, defense, or scientific research.

“The Long-Term Jobs Killer Is Not China. It’s Automation.”

— New York Times headline



OPTION THREE: Support development of driverless vehicles to improve safety and traffic on highways.

Close to 40,000 Americans died in traffic crashes in 2016. Millions more were injured. If most or all vehicles become fully autonomous within the next two or three decades—as some observers say is possible—there will be far fewer road accidents as well as much cleaner air, and greatly reduced traffic snarls. People would get around more easily, including the elderly, the very young, and those who can’t drive because of a physical or mental impairment. We should encourage widespread testing of autonomous cars and trucks to ensure optimum safety of the new vehicles and increase people’s confidence in them.

A PRIMARY DRAWBACK

Self-driving vehicles and their communication networks would be vulnerable to large-scale hacking or other security breaches, posing unforeseen safety and privacy concerns.

Examples of what might be done

- Reduce restrictive regulations on autonomous vehicles to speed their development and use.
- Require that all vehicles sold must be fully autonomous.
- Completely redesign vehicles to make them safer, for example by making all seats rear-facing.
- Provide tax rebates or other incentives for driverless vehicles to encourage adoption and ensure widespread use.

Some consequences and trade-offs to consider

- Fewer safety and security regulations could leave vehicles open to accidents or hacking.
- This means people would no longer be allowed to drive themselves.
- People will become wholly dependent on technology to transport them by losing their ability to drive.
- Subsidizing driverless vehicles may reduce tax revenue for needed services at all levels of government.

“Self-Driving Cars Could Save 300,000 Lives Per Decade in America.”

—The Atlantic headline