

# Public health, autonomous automobiles, and the rush to market

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## Abstract

The USA has the worst motor vehicle safety problem among high-income countries and is pressing forward with the development of autonomous automobiles to address it. Government guidance and regulation, still inadequate, will be critical to the safety of the public. The analysis of this public health problem in the USA reveals the key factors that will determine the benefits and risks of autonomous vehicles around the world.

# Background

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Automated vehicles have the potential to save thousands of lives, driving the single biggest leap in road safety that our country has ever taken. *U.S. Transportation Secretary Anthony Foxx, September 20, 2016.*<sup>1</sup>

Automakers aim to market fully self-driving cars, but stay tuned. Assuming that the first wave will be an autonomous vehicle that needs human monitoring, what will happen along the way, when all that day-to-day driving skill goes away? And will the driver take the monitoring role seriously when he or she thinks the car is in charge? What does driver education look like when the car is sometimes driving itself, but at other times needs human intervention? *U. S. National Transportation Board Chairman Christopher Hart, April 1, 2016.*<sup>2</sup>

Public health and the motor vehicle are inextricably linked. The personal automobile has become essential to modern life for hundreds of millions of households across the world.<sup>3</sup> But due to the energy it generates and depends upon, it is also a threat to life and health.<sup>4</sup> The energy released in a motor vehicle crash translates into impact forces. When experienced at intolerable levels by vehicle occupants or others—pedestrians, cyclists, etc—these forces result in severe or fatal injuries.

Injury, of which motor vehicle injury accounts for a major share, remains “a hugely neglected public health problem.”<sup>5</sup> Worldwide, road travel is associated with 1.25 million deaths per year.<sup>6</sup> The majority of these deaths occur in crashes involving (but not necessarily caused by) “driver behavior,” a responsibility-implying catchall that for years has been analyzed, parsed, and categorized in the interest of finding ways to modify driver conduct to prevent crash injuries. The diversity and imprecision of behaviors thus identified is demonstrated by the following: “Behavioral factors can be distinguished as (i) *those that reduce capability on a long-term basis* (inexperience, aging, disease and disability, alcoholism, drug abuse), (ii) *those that reduce capability on a short-term basis* (drowsiness, fatigue, acute alcohol intoxication, short-term drug effects, binge eating, acute psychological stress, temporary distraction), (iii) *those that promote risk-taking behavior with long-term impact* (overestimation of

capabilities, macho attitude, habitual speeding, habitual disregard of traffic regulations, indecent driving behavior, non-use of seat belt or helmet, inappropriate sitting while driving, accident proneness), and (iv) *those that promote risk-taking behavior with short-term impact* (moderate ethanol intake, psychotropic drugs, motor vehicle crime, suicidal behavior, compulsive acts).”<sup>7</sup>

Traditionally, manufacturers of motor vehicles have been vocal in blaming the driver for crashes and crash injuries. A 1965 article in *Consumer Reports* maintained that the automobile industry was attempting to shift the responsibility for accidents and crash injuries from the automobile to the driver and was using National Safety Council statistics for that purpose; the manufacturers had “blamed most accidents on the driver and have largely ignored the well-established fact that technically feasible modifications of their cars could substantially reduce both the number and severity of accidents caused by driver inadequacies.”<sup>8</sup>

As a result of pioneering research and conceptual work by William Haddon, Hugh DeHaven, and others, laws and regulations that took effect in the USA starting in the late 1960s recognized the role of the motor vehicle in causing, aggravating, or ameliorating injuries when crashes occurred, as seemed inevitable.<sup>9</sup> Haddon’s groundbreaking contributions to public health’s understanding of injury causation and control included the identification of strategies for determining sources of injury and ranges of effective countermeasures.<sup>10</sup> Despite heavy resistance from auto companies, seat belts<sup>11</sup> and then air bags<sup>12</sup> were mandated for new cars – mandates which took hold not only in the USA, but in various forms, across European and other developed countries, and more slowly in less developed regions.<sup>13</sup> Their aim was to increase the crashworthiness of motor vehicles, i.e., the vehicle’s ability to protect occupants from severe injury even in high-speed collisions. Some, like seat belts, that had to be buckled by the wearer, were “active” because they required user cooperation. Others, like air bags, were “passive” because they deployed automatically when triggered by crash forces.<sup>14</sup> In the USA alone, seat belts, child restraints, and airbags prevented an estimated 383,472 deaths in the 1975–2014 period.<sup>15</sup>

More recently, automated crash prevention features have increasingly become available on newer vehicles, marking the beginning of a movement toward the transformation of the modern motor vehicle into an automated vehicle (AV). An early example of such features is Electronic Stability Control (ESC), which intervenes to overcome driver missteps that can lead to rollovers. The USA, under Federal Motor Vehicle Safety Standard (FMVSS) 126, now mandates ESC.<sup>16</sup> It and other self-actuating driver-assist systems are sometimes provided as standard equipment under government mandates or as industry practice. Otherwise they are sold as options, often introduced on higher-priced luxury models. Such systems are able to provide drivers with automatic emergency braking, forward collision warning, rearview video (more commonly known as backup cameras), lane-keeping support, and pedestrian automatic emergency braking.<sup>17</sup>

The promise of fully fledged automated vehicle technology is to fill the roads with autonomous vehicles, i.e., vehicles “not subject to control from outside; independent.”<sup>18</sup> According to a new Brookings Institution analysis, this could prevent large numbers of deaths. “Fully autonomous vehicles may turn out to be safer than semiautonomous cars because they remove human error and bad judgment from vehicular operations altogether.” That promise is having a global impact, as is the marketplace lure of AVs. The Brookings analysis, titled “Moving Forward: Self-Driving Vehicles In China, Europe, Japan, Korea, and the United States,” concludes that AVs are “likely to improve highway safety, alleviate traffic congestion, and reduce air pollution.” But for that to happen, it cautions, “designers must overcome obstacles such as poor infrastructure, bad weather, inadequate spectrum, hacking threats, and public acceptance.”<sup>19</sup> Similarly, a European “roadmap” for the future of AV technology looks globally at both the promise and problems of AV’s advent.<sup>20</sup>

## US Government Response

In an effort to underscore the potential safety benefits of AVs, the US's auto safety regulatory agency, the National Highway Traffic Safety Administration (NHTSA), and its parent, the US Department of Transportation (DOT), are emphasizing the role of driver behavior in crash and crash injury causation. Commenting on large increases in US highway deaths, NHTSA Administrator Mark Rosekind said, "We're seeing red flags across the U.S. and we're not waiting for the situation to develop further. It's time to drive behavioral changes in traffic safety and that means taking on new initiatives and addressing persistent issues like drunk driving and failure to wear seat belts."<sup>21</sup>

But attempting to bring about changes in driver behavior is only NHTSA's interim approach toward stemming US road death increases. Its long-term approach is the AV. Rosekind has emerged as the point man, not only on the safety advantages of autonomous road vehicles, but also on their "clearly potential social benefits." (To some safety advocates, it is troubling that he appears to be wearing two possibly conflicting policy hats—one with a public health injury reduction commitment, the other with a business promotion tilt.)<sup>22</sup>

The commercial implications of AV manufacture and sales are stunning: "The allure of the [AV] sector has drawn in Silicon Valley leviathans, Google and Apple, as well as carmakers. Goldman Sachs estimated that the market for advanced driver assistance systems and autonomous vehicles could grow to \$96 billion in 2025 from only \$3 billion last year."<sup>23</sup>

In Rosekind's upbeat vision, AVs hold the promise of transforming highway commuters' "frustrating wasted time" into "productive moments... of turning the often chaotic freeways of Drive Time America into smooth, efficient operations. They may have environmental benefits. And they promise new mobility options to those who have missed out on the benefits of a century of automotive history, including people with disabilities, elderly drivers, and groups at an economic disadvantage."<sup>24</sup>

Ninety-four percent of crashes "can be tied back to a human choice or error," Rosekind says. "If there was a way to account for all those human choices or behaviors, we would be talking about a world where we could

potentially prevent or mitigate 19 of every 20 crashes on the road... That is the promise of automated vehicles, and that is, at its core, why NHTSA and the Department of Transportation have been so focused on doing what we can to accelerate the lifesaving promise of highly automated vehicles and connected vehicles. We see a future where vehicle automation and vehicle connectivity could cut roadway fatalities dramatically.”<sup>25</sup> At a September 20, 2016, press conference, the agencies released the US’s long-awaited Federal Automated Vehicles Policy, a policy intended to shepherd that future into reality.<sup>26</sup>

In his unabashed promotion of the AV, Rosekind speaks for the US government, which appears to be seeking to assert a leadership role in global AV policy development. Recently, President Obama, in a newspaper opinion piece, praised AVs similarly: “Safer, more accessible driving. Less congested, less polluted roads. That’s what harnessing technology for good can look like.”<sup>27</sup> Acknowledging the sales potential of AVs, Transportation Secretary Foxx told the *Detroit Free Press*, “The most important innovation this policy introduces is the department’s effort to open itself to the innovations that are about to occur in the marketplace.”<sup>28</sup>

## Automated vehicles

“AV” refers loosely, and somewhat misleadingly, to vehicles within a ranking that accommodates everything from simple driver-assist features to vehicles with automated systems that can “perform all driving tasks, under all conditions that a human driver could perform,” i.e., truly autonomous vehicles. In a six-level hierarchy developed by the International Society of Automotive Engineers and adopted by NHTSA, vehicles in the three higher levels are designated as highly automated vehicles (HAVs).<sup>29</sup> At Level 2, the driver controls most of the vehicle’s functions. Level 4 represents virtually full autonomous vehicle operation. US manufacturers plan to skip producing Level 3 vehicles, which they consider Tesla “Autopilot” models to be, “because it’s safer and less costly than pursuing a midway point of limited self-driving.”<sup>30</sup>

The safety of Tesla’s “Autopilot” system has been the subject of criticism within the industry: “It gives you the impression that it’s doing more than it is,” the senior technical leader of crash avoidance at Volvo told *The Verge*.<sup>31</sup> He described the Tesla system as “more of an unsupervised wannabe.” Volvo believes that Level 3

autonomy, where the driver needs to be ready to take over at a moment's notice, is an unsafe solution. "Because the driver is theoretically freed up to work on e-mail or watch a video while the car drives itself, the company [Volvo] believes it is unrealistic to expect the driver to be ready to take over at a moment's notice and still have the car operate itself safely."

To DOT and NHTSA, HAVs are the cars and trucks that promise a "revolutionary" reduction in road deaths and injuries. The language of the policy statement and guidelines released by Foxx and Rosekind at their September 20, 2016, press conference expresses the agency's booster-like view of the AV: "Today, the automobile industry is on the cusp of a technological transformation that holds promise to catalyze an unprecedented advance in safety on US roads and highways. The development of advanced automated vehicle safety technologies, including fully self-driving cars, may prove to be the greatest personal transportation revolution since the popularization of the personal automobile nearly a century ago." What is the gist of the 40,000-word policy guidelines? DOT and NHTSA will attempt to steer the development of AVs, and do so short of proposing hard-and-fast regulations, at least for the time being. "We do not intend to write the final word on highly automated vehicles here. Rather, we intend to establish a foundation and a framework upon which future Agency action will occur," the policy states.<sup>32</sup> At least for the time being, the government is depending on corporate volunteerism rather than regulation to make AVs adequately safe.

## Industry's Response and Safety Advocates' Concerns

The auto industry is, of course, pleased. The Alliance of Auto Manufacturers said, "Guidance is the right action... we look forward to working with NHTSA and state policymakers to produce a consistent, nationwide approach that ensures these vehicles are brought to market without unnecessary restrictions or delay."<sup>33</sup> The Association of Global Automakers said it welcomes the DOT–NHTSA policy.<sup>34</sup> And in a statement praising the

government policy, David Strickland, a former safety regulator who now heads the Self-Driving Coalition for Safer Streets, representing Ford, Volvo, Google, Uber, and Lyft, said, "We believe *guidance* from NHTSA is

crucial to achieving these goals as it recognizes the challenges specific to regulating a new technology. We support *guidance* that provides for the standardization of self-driving policies across all 50 states, incentivizes innovation, supports rapid testing and deployment in the real world.” (emphasis added) <sup>35</sup> In a later statement stressing the nonbinding nature of the federal guidelines, he said, “Firms can make the decision to not comply and be within their rights to do so.” <sup>36</sup>

Strickland, a former NHTSA administrator, left the agency at the end of 2013 in the midst of revelations about advocates’ concerns that a “revolving door” exists between the agency and the industry, promoting a pro-industry bias by the regulatory agency. The *Los Angeles Times*, reporting on Strickland’s job change, noted NHTSA’s “reputation for having a remarkably cozy relationship with its regulated industry.” <sup>37</sup> NHTSA’s recent interactions with Google were reported in a prominent magazine, *The Atlantic*, as a “tight relationship between the federal government and Google going back to at least 2011, with regular in-person meetings, repeated vehicle demonstrations, ongoing policy discussions, and several one-on-one e-mails between top leaders in government and in Silicon Valley.” <sup>38</sup> After revelations of Google–NHTSA intimacy, the Campaign for Accountability, a consumer watchdog group, called on NHTSA to “strengthen its ethics regime” to preclude such relationships; it noted that the Google’s director of safety for self-driving cars is a former NHTSA deputy director whose hiring Google viewed as giving it “a bureaucrat intimately familiar with the inner workings of the transportation administration.” <sup>39</sup>

For some time, safety advocates have been expressing concern over NHTSA’s intimate relations with car companies and its growing reluctance to set new federal motor vehicle safety standards while preferring instead to seek safety progress through non-binding cooperative agreements with industry players, as exemplified by the new AV guidelines. In January 2016, the Center for Auto Safety and others joined in a petition to NHTSA that, among other things, asserted that auto manufacturers are lobbying to “‘voluntarily’ establish safety standards in place of the mandatory safety regulation” required by law.” They urged NHTSA to reject that approach and



proceed through the formal process of adopting mandatory installation requirements for all vehicles: “Voluntary agreements [a]re developed behind closed doors, with no public involvement; are not binding on any company or particular vehicle or model at any given time and can be unilaterally (and secretly) abandoned; cannot be enforced by any members of the public, NHTSA or any other government agency; and often do not reflect objective, scientific, or empirical research. Indeed, they are typically the product of industry players seeking to maximize profit and marketing concerns at the expense of robust consumer protection, reflecting the lowest common denominator of industry practice.... As Congress said in 1966, when it created NHTSA: ‘The promotion of motor vehicle safety through voluntary standards has largely failed.’”<sup>40</sup>

Commenting on the DOT’s AV guidelines, Advocates for Highway and Auto Safety, a national alliance of consumer, health and safety groups, and insurance companies, warned that the guidelines’ lack of a mandate for AV development processes, including preproduction test protocols, could result in consumers becoming

...human crash test dummies in the rush to market [AVs]... federal oversight, minimum performance requirements, rigorous testing as well as transparent and verified data are essential in the development process. Consumers cannot be ‘human guinea pigs’ in this experiment and the federal government cannot be a passive spectator... This announcement should not be seen as an alternative to comprehensive safety standards, thorough oversight and strong enforcement... The improvements promised by AVs need to be framed and encouraged by federal safety standards which DOT has the authority to issue today. The DOT must ensure that the American public is not used to ‘beta test’ these new technologies. *Beta testing, to eliminate program flaws, can be used for computer simulations but not for real world situations impacting life and death.*” (emphasis added)<sup>41</sup>

Former NHTSA Administrator Joan Claybrook warned that DOT “must not shy away from assuring public safety with minimum federal vehicle safety standards. It should not rely instead on mere guidance, including for the initial elements of automatic vehicle operation such as Automatic Emergency Brakes (AEB) that currently is guided only with a useless

industry voluntary standard... The manufacturers always complain about new federal protections, but autonomous cars are a whole new technology with great promise but also with the potential for serious public harm.” She cited the highly publicized fatal crash of a Tesla Model S on May 7 in Florida as a demonstration of flaws in AV technology.<sup>42</sup>

## Lessons of Tesla Crash

The Tesla crash involved a vehicle equipped with the manufacturer’s “Autopilot” system. The term in ordinary usage is commonly defined as a device that steers a vehicle “in place of a person.”<sup>43</sup> Tesla’s Web site describes its “Autopilot” as a combination of interacting driver-assistance features that allows the vehicle to “steer within a lane, change lanes with the simple tap of a turn signal, and manage speed by using active, traffic-aware cruise control. Digital control of motors, brakes, and steering helps avoid collisions from the front and sides and prevents the car from wandering off the road.”

<sup>44</sup> According to Tesla, owners of models with the “Autopilot” feature are beta testing the system in the real world.

(Beta testing, a coinage of the computer era, is defined as “a quality control technique in which hardware or software is subjected to trial in the environment for which it was designed, usually after debugging by the manufacturer and immediately prior to marketing.”<sup>45</sup>) The safety of on-road beta testing of AV technology has been widely challenged. For example, an ethics educator asks:

... should companies beta-test autonomous driving technologies on public roads to begin with? That’s been a key concern in ethics for years, well before Tesla introduced its Autopilot feature. This is different than beta-testing, say, office software. If your office app crashed, you might just lose data and some work. But with automated cars, the crash is literal. Two tons of steel and glass, crashing at highway speeds, means that people are likely to be hurt or killed. Even if the user had consented to this testing, other drivers and pedestrians around the robot car haven’t.<sup>46</sup>

At the time of the Tesla crash, according to press reports, the vehicle was being controlled by its Autopilot system, not its driver.<sup>47</sup> The National Transportation Safety Board (NTSB) and NHTSA are conducting investigations into the crash and the Autopilot's role; a preliminary report from NTSB, an independent investigative agency with advisory but not regulatory authority, acknowledged the involvement of the automated system but not its responsibility for the crash, if any:

Tesla system performance data downloaded from the car indicated that vehicle speed just prior to impact was 74 mph. [The posted speed limit was 65 mph.] System performance data also revealed that the driver was operating the car using the advanced driver assistance features Traffic-Aware Cruise Control and Autosteer lane keeping assistance. The car was also equipped with automatic emergency braking that is designed to automatically apply the brakes to reduce the severity of or assist in avoiding frontal collisions.<sup>48</sup>

Meanwhile, a second fatal crash of a Tesla equipped with the Autopilot feature has been reported in China.<sup>49</sup>

Rosekind has downplayed the significance of the Florida crash. In June, he assured an industry audience that “no one incident will derail the Department of Transportation and NHTSA from its mission to improve safety on the roads by pursuing new lifesaving technologies.”<sup>50</sup> He characterized the crash as an “edge case—something [the vehicle] hasn't been programmed to deal with.” In a world of interconnected HAVs, he said:

...that data can be taken, analyzed, and then the lessons can be shared with more than the rest of that vehicle fleet. It could be shared with all automated vehicles. Whereas new drivers must learn on the road and make the same mistakes as thousands before them, automated vehicles will be able to benefit from the data and learning of all others on the road.

Amplifying his “no one incident” position and emphasizing the urgency he places on bringing an AV-dominated highway environment into reality, he told the *Wall Street Journal*, “We should be desperate for anything we can find to save people's lives.”<sup>51</sup>

## Who Is Liable?

The Tesla crash has also raised questions of manufacturer responsibility for injuries sustained in crashes of AVs and whether the civil justice system can effectively protect the rights of people harmed by unsafe AVs.

“Driverless cars essentially shift more of the responsibility from drivers to manufacturers and software designers,” a Brookings Institution paper states, adding that, “Manufacturers are responsible for defective conditions so their liability would hinge on whether there was a reasonable expectation that their products would operate as expected and not pose undue risks to passengers.”<sup>52</sup>

Given the hodgepodge of state laws and regulations governing liability and other aspects of AVs in the USA and the DOT guidelines’ lack of clarity on the matter, there is considerable uncertainty about how the courts will view injury litigation involving AVs.<sup>53</sup> To date, only three manufacturers—Mercedes-Benz, Volvo, and Google—have declared they will accept liability for crashes caused by their AVs.<sup>54</sup> Their position is consistent with the view of attorneys representing crash injury victims. One argues for “the simplest approach,” meaning “hold the manufacturers strictly liable for any damages caused by their vehicles. Strict liability is not based on a warranty and the manufacturer would be liable for any defects, even if its quality control efforts satisfy the standards of reasonableness.”<sup>55</sup> Another has criticized the DOT–NHTSA policy guidelines for failure to provide “one set of consistent, national regulations that prioritize transparency, safety, and accountability.” Instead, “NHTSA is pushing us into a patchwork of state-by-state rules that will create confusion when clarity is badly needed... Now, because of NHTSA’s failure, auto makers will be able to duck responsibility if their autonomous vehicles malfunction and cause injury or death.”<sup>56</sup>

There is reason to question whether NHTSA, in its multiple roles as AV promoter, regulator, and safety “guideline” developer, is positioned to ensure that the AV’s “rush to market” does not result in a highway transportation system that is less safe and more hazardous than it could or should be, especially during the protracted period of transition to an HAV-dominated system. During that period and beyond, a key issue will be the problem of crash threats that may

arise from interactions between AV drivers—whose crash-causing behavior NHTSA believes will be minimized by AVs—and the new automatic, semiautonomous, and fully autonomous vehicle systems.

NTSB Chairman Hart notes that “motor vehicles are being rolled out as consumer electronics. Companies that are better known for Web sites and smartphones are making cars. Automobiles are merging with other technologies at a dizzying pace.” He cautions against assuming that drivers will be able to handle safely their new roles as monitors of autonomous operating systems in their cars. NTSB, he says:

has found that pilots were confused by what the automation was doing in a given situation. In still others, we found that pilots were over-reliant on automation and allowed their manual flying skills to deteriorate... Automakers aim to market fully self-driving cars, but stay tuned. Assuming that the first wave will be an autonomous vehicle that needs human monitoring, what will happen along the way, when all that day-to-day driving skill goes away? And will the driver take the monitoring role seriously when he or she thinks the car is in charge? What does driver education look like when the car is sometimes driving itself, but at other times needs human intervention? <sup>57</sup>

The Insurance Institute for Highway Safety has warned:

Appropriate driver responses and acceptance of crash avoidance technologies are critical to their success... If drivers find the systems annoying or not useful, they may disable them. Similarly, if drivers experience warnings but don't understand them, don't trust them, are overwhelmed by them, or don't take an appropriate corrective action, then the systems will be ineffective. <sup>58</sup>

Hart has called for federal regulations to set the “basic morals” of autonomous vehicles, as well as safety standards for how reliable they must be. “The government is going to have to come into play and say, ‘You need to show me a less than X likelihood of failure, or you need to show me a fail-safe that ensures that this failure won't kill people,’” Hart told the MIT Technology Review. He said, it reported,

...there would need to be rules for how ethical prerogatives are encoded into software. He gave the example of a self-driving car faced with a decision between a potentially fatal collision with an out-of-control truck or heading up on the sidewalk and hitting pedestrians. ‘That to me is going to take a federal government response to address,’ said Hart. ‘Those kinds of ethical choices will be inevitable.’<sup>59</sup>

## Failings of Policy ‘Guidelines’

The DOT–NHTSA policy guidelines discuss such issues, but fall short of setting, promising, or proposing specific standards, indicating instead that regulatory action, if any, will depend on what the agency learns from future inputs provided by industry and other stakeholders.<sup>60</sup> Meanwhile, the guidelines make this disturbing observation:

*The more effective use of NHTSA’s existing regulatory tools will help to expedite the safe introduction and regulation of new HAVs. However, because today’s governing statutes and regulations were developed when HAVs were only a remote notion, those tools may not be sufficient to ensure that HAVs are introduced safely, and to realize the full safety promise of new technologies. The speed with which HAVs are advancing, combined with the complexity and novelty of these innovations, threatens to outpace the Agency’s conventional regulatory processes and capabilities. (emphasis added)<sup>61</sup>*

NHTSA’s defects—lack of adequate funding and resources, undue industry influence in its decision making, and reluctance to set standards—already seriously impair its effectiveness.<sup>62</sup> Left uncorrected, they will impede its ability to ensure that the AV “revolution” will benefit crash injury prevention to the fullest extent possible. Despite its auto safety regulatory regime (or because of flaws in that regime), the USA lags significantly behind other advanced nations in controlling road crash fatalities. “Even when considering population size, miles travelled, and number of registered vehicles, the USA consistently ranked poorly relative to other high-income countries for crash deaths,” according to a

Centers for Disease Control and Prevention analysis. In CDC's ranking of ten high-income countries by crash death reductions in the 2000–2013 period, the USA placed at the bottom. In its ranking of those countries by crash deaths per population in 2013, the USA led the list.<sup>63</sup> This does not engender confidence in the adequacy of US policy, procedure, expertise, and approach to take the global lead in addressing the injury control implications of AVs.

Nor does the attitude of the US Congress toward NHTSA. It has starved the agency of funds, resources, and powers that might have made its “existing regulatory tools” sufficient to grapple with emerging safety issues in the AV era. There is little reason to think that the parsimonious treatment of auto safety regulation by Congress, a deeply dysfunctional branch of the US government,<sup>64</sup> will change to accommodate the new demands of AVs for timely, informed regulatory responses. Congress's mistreatment of auto safety regulation compounds the factors already working against the imperative to achieve optimum vehicle safety in the AV era.

On October 5, 2016, DOT, NHTSA, and the National Safety Council announced the creation of a “Road to Zero Coalition.” Its goal is to end US highway fatalities “within the next 30 years.”<sup>65</sup> According to the coalition, “the rapid introduction of automated vehicles and advanced technologies” makes it “increasingly likely” that the goal can be achieved. (The US “Road to Zero” project is a belated acknowledgment of the successful “Zero Vision” approaches to highway crash injury prevention enacted in Sweden in 1997 with the aim of eliminating traffic fatalities by 2020.<sup>66</sup> “Zero Vision” programs have been established in many countries and, within the USA, a number of cities.<sup>67</sup>) Whether AVs and the “Road to Zero Coalition” can reverse the alarming trend in the USA toward increasing road deaths is doubtful.<sup>68</sup> The coalition appears to have excluded from its membership leading auto safety advocacy groups that have been critical of NHTSA policies, nor does that membership include public health organizations with an interest in injury reduction. Without their participation, it is questionable whether DOT and NHTSA, already hobbled by so many handicaps, can make a meaningful dent in the still-rising road death toll.

## About the Author

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## References

1. U.S. dot issues federal policy for safe testing and deployment of automated vehicles: four-part policy lays the foundation for the next revolution in roadway safety. <https://www.transportation.gov/briefing-room/us-dot-issues-federal-policy-safe-testing-and-deployment-automated-vehicles> . Last accessed October 12, 2016.
2. Keynote speech presented at the world traffic safety symposium in New York, NY [http://www.nts.gov/news/speeches/CHart/Pages/hart\\_20160401.aspx](http://www.nts.gov/news/speeches/CHart/Pages/hart_20160401.aspx). Last accessed October 12, 2016.
3. Pew Research “Fact Tank,” April 16, 2015, “Car, Bike or Motorcycle? Depends on Where You Live.” <http://www.pewresearch.org/fact-tank/2015/04/16/car-bike-or-motorcycle-depends-on-where-you-live/>. Last accessed October 12, 2016.
4. Robertson, L. (2007). *Injury epidemiology* (3rd ed., p. 8). Oxford: Oxford University Press.
5. Ibid



6. World Health Organization Global Health Observatory data: [http://www.who.int/gho/road\\_safety/en/](http://www.who.int/gho/road_safety/en/). See also WHO, Road Traffic Injuries Fact Sheet, September 2016 <http://www.who.int/mediacentre/factsheets/fs358/en/>. Both last accessed October 12, 2016).
7. Petridou, E., & Moustaki, M. (2000). Human factors in the causation of road traffic crashes. *European Journal of Epidemiology*, 16, 819. doi:10.1023/A:1007649804201.
8. Klein, D., & Haddon, W., Jr. (1965). *The prospect for safer autos: The proposed specifications for government-bought cars raise hopes and questions alike*. Consumer reports, April, 1965, cited in Eastman. (1973). *Styling v. safety: The American automobile industry and the development of automotive safety, 1900–1966*. University of Florida.
9. Eastman, J. (1973) *Styling v. safety: The American automobile industry and the development of automotive safety, 1900–1966*. Gainesville: University of Florida.
10. Haddon, W., Jr. (1970). On the escape of tigers: An ecologic note. *MIT Technology Review*, 72(7), 44–53.
11. Eastman, “Styling v. Safety,” op. cit.
12. Kelley, B., “GM and the Air Bag: A Decade of Delay,” (1980) *Business And Society Review*, No. 35 (54-9), 1980. See also “Air Bags: A Chronological History of Delay,” Insurance Institute for Highway Safety, Washington, D.C., revised and updated September 1984; Lemov, “Car Safety Wars: One Hundred Years of Technology, Politics, and Death” (chapters 9 and 10), Fairleigh Dickinson University Press. 2015.
13. Absent air bags: major automakers Chevrolet, Volkswagen sacrifice safety in poor countries. International Business Times, 11/18/15. <http://www.ibtimes.com/absent-air-bags-major-automakers-chevrolet-volkswagen-sacrifice-safety-poor-countries-2-188608>. Last Accessed October 12, 2016.

14. Kelley, A. B. (1975). *Passive vs. active = life vs. death*. SAE Technical Paper 750391, Feb. 1, 1975.
15. DOT HS 812262. Traffic Safety Facts 2014, Occupant Protection, table 6.  
<https://crashstats.nhtsa.dot.gov/Api/Public/ViewPublication/811892>. Last Accessed October 12, 2016.
16. <http://www.safetyresearch.net/blog/articles/brief-history-electronic-stability-controls-and-their-applications>. Last accessed October 12, 2016.
17. <http://www.safercar.gov/Safety+Technology>, also <http://www.iihs.org/iihs/topics/t/crash-avoidance-technologies/qanda>. Both last accessed October 12, 2016.
18. Random House Webster's Unabridged Dictionary
19. <https://www.brookings.edu/research/moving-forward-self-driving-vehicles-in-china-europe-japan-korea-and-the-united-states/>. Last accessed October 12, 2016.
20. <http://www.ertrac.org/index.php?page=ertrac-roadmap>: see ERTRAC automated driving roadmap, July 2015, also [http://www.europarl.europa.eu/thinktank/en/document.html?reference=EPRS\\_BRI\(2016\)573902](http://www.europarl.europa.eu/thinktank/en/document.html?reference=EPRS_BRI(2016)573902). All last accessed October 12, 2016.
21. U.S. DOT announces steep increase in roadway deaths based on 2015 early estimates and convenes first regional summit to drive traffic safety behavior changes. NHTSA Press Statement, Feb. 5, 2016.  
<https://ruralsafetycenter.org/resources/list/u-s-dot-announces-steep-increase-in-roadway-deaths-based-on-2015-early-estimates-and-convenes-first-regional-summit-to-drive-traffic-safety-behavior-changes/>. Last accessed October 12, 2016.

22. <http://www.usatoday.com/story/opinion/2016/08/30/driverless-cars-nhtsa-center-for-automotive-safety-editorials-debates/89601112/>. Last accessed October 12, 2016.
23. <http://www.autonews.com/apps/pbcs.dll/article?AID=/20160914/OEM06/160919940/mobileye-poised-to-seal-more-marquee-deals-for-self-driving-cars>. Last accessed October 12, 2016.
24. Rosekind, remarks, “Autonomous Car Detroit” conference, March 16, 2016, Dearborn, Michigan. [http://www.nhtsa.gov/About-NHTSA/Presentations-&Speeches/mr\\_2016\\_av\\_symposium\\_07202016](http://www.nhtsa.gov/About-NHTSA/Presentations-&Speeches/mr_2016_av_symposium_07202016). Last accessed October 12, 2016.
25. Remarks, Mark R. Rosekind, Ph.D., Administrator, National Highway Traffic Safety Administration, U.S. Department of Transportation, Automated Vehicles Symposium 2016, San Francisco, July 20, 2016. <http://www.trb.org/Main/Blurbs/173877.aspx>. Last accessed October 12, 2016.
26. <https://www.transportation.gov/AV>. Last accessed October 12, 2016.
27. <http://www.post-gazette.com/opinion/Op-Ed/2016/09/19/Barack-Obama-Self-driving-yes-but-also-safe/stories/201609200027> see also <http://www.insurancejournal.com/news/national/2016/09/27/427561.htm>. Both last accessed October 12, 2016.
28. <http://www.freep.com/story/money/cars/2016/09/19/feds-issue-first-self-driving-vehicle-guidelines/90710650/>. Last accessed October 12, 2016.
29. [www.sae.org/misc/pdfs/automated\\_driving.pdf](http://www.sae.org/misc/pdfs/automated_driving.pdf). Last accessed October 12, 2016.
30. <http://www.autonews.com/apps/pbcs.dll/article?AID=/20160926/OEM06/309269995/detroit-3-will-skep-a-step-in-autonomy>. Last accessed October 12, 2016.

31. <http://www.theverge.com/2016/4/27/11518826/volvo-tesla-autopilot-autonomous-self-driving-car>. Last accessed October 12, 2016.
32. <http://www.autonews.com/article/20160925/OEM06/309269991/autonomous-policy-will-strengthen-regulators>. Last accessed October 12, 2016.
33. <http://www.autoalliance.org/index.cfm?objectid=F8EBA700-7EC1-11E6-85D0000C296BA163>. Last accessed October 12, 2016.
34. <https://www.globalautomakers.org/media/press-release/automated-vehicle-guidelines-are-an-important-step-to-advance-highway-safety>. Last accessed October 12, 2016.
35. <http://www.prnewswire.com/news-releases/self-driving-coalition-reacts-to-nhtsa-autonomous-vehicles-guidance-300330616.html>. Last accessed October 12, 2016.
36. <https://techcrunch.com/2016/10/04/what-the-new-nhtsa-guidelines-mean-for-self-driving-cars/>. Last accessed October 12, 2016.
37. <http://articles.latimes.com/2014/jan/26/business/la-fi-hiltzik-20140126>. Last accessed October 12, 2016.
38. <http://www.theatlantic.com/technology/archive/2016/09/google-uber-policy-white-house-driverless/499649/>. Last accessed October 12, 2016.
39. <http://campaignforaccountability.org/cfa-calls-on-highway-safety-agency-to-strengthen-ethics-regime-after-close-ties-to-google-revealed/>. Last accessed October 12, 2016.

40. <http://www.autosafety.org/consumer-advocates-ask-auto-safety-agency-make-new-technologies-standard-equipment/>. Last accessed October 12, 2016.
41. <http://saferoads.org/2016/09/20/statement-of-jackie-gillan-on-dot-release-of-federal-av-policy/>. Last accessed October 12, 2016.
42. <http://www.bloomberg.com/news/articles/2016-09-20/self-driving-car-policy-by-u-s-underscores-promise-and-peril>; <http://www.autonews.com/article/20160920/OEM01/160929971/what-the-auto-world-is-saying-about-new-u.s.-policy-on-self-driving> . Both last accessed October 12, 2016.
43. <http://www.merriam-webster.com/dictionary/autopilot>. Last accessed October 12, 2016.
44. <https://www.tesla.com/models>. Last accessed October 12, 2016.
45. Random House Webster Unabridged Dictionary
46. Patrick Lin, director of the Ethics + Emerging Sciences Group, California Polytechnic State University, writing in Forbes. <http://www.forbes.com/sites/patricklin/2016/07/01/is-tesla-responsible-for-the-deadly-crash-on-auto-pilot-maybe/#753de3ff5bbc>. Last accessed October 12, 2016.
47. <http://www.nytimes.com/2016/07/01/business/self-driving-tesla-fatal-crash-investigation.html>. Last accessed October 12, 2016.
48. <http://www.nts.gov/investigations/AccidentReports/Pages/HWY16FH018-preliminary.aspx>. Last accessed October 12, 2016.
49. <https://www.ft.com/content/80c45ad6-7ef0-11e6-bc52-0c7211ef3198>. Last accessed October 12, 2016.

50. <http://www.autoblog.com/2016/07/20/nhtsa-self-driving-autonomous-cars/>. Last accessed October 12, 2016.
51. Tesla autopilot crash shouldn't slow self-driving development, regulator says. *Wall Street Journal*, July 22, 2016. <http://www.wsj.com/articles/tesla-autopilot-crash-shouldnt-slow-self-driving-development-regulator-says-1469200956>. Last accessed October 12, 2016.
52. <https://www.brookings.edu/research/securing-the-future-of-driverless-cars/>. Last accessed October 12, 2016.
53. [http://cyberlaw.stanford.edu/wiki/index.php/Automated\\_Driving:\\_Legislative\\_and\\_Regulatory\\_Action](http://cyberlaw.stanford.edu/wiki/index.php/Automated_Driving:_Legislative_and_Regulatory_Action) See also <http://spectrum.ieee.org/transportation/advanced-cars/selfdriving-cars-will-be-ready-before-our-laws-are>. Both last accessed October 12, 2016.
54. <http://www.digitaltrends.com/cars/automaker-responsibility-in-self-driving-car-accidents-news/>. Last accessed October 12, 2016.
55. Wayne Cohen, George Washington University Law School. <http://blog.legalsolutions.thomsonreuters.com/current-awareness-2/potential-liability-ramifications-of-self-driving-cars/>. Last accessed October 12, 2016.
56. Larry E. Coben, Chief Legal Officer, Attorneys Information Exchange Group <http://blog.anapolweiss.com/federal-regulators-dropping-the-ball-on-autonomous-vehicle-safety>. Last accessed October 12, 2016.
57. Keynote Speech presented at the World Traffic Safety Symposium in New York, NY [http://www.nts.gov/news/speeches/CHart/Pages/hart\\_20160401.aspx](http://www.nts.gov/news/speeches/CHart/Pages/hart_20160401.aspx). Last accessed October 12, 2016.

58. <http://www.iihs.org/iihs/topics/t/crash-avoidance-technologies/qanda>. See also <https://www.technologyreview.com/s/513531/proceed-with-caution-toward-the-self-driving-car/>. Both last accessed October 12, 2016.

59. <https://www.technologyreview.com/s/602292/top-safety-official-doesnt-trust-automakers-to-teach-ethics-to-self-driving-cars/>.

60. U.S. dot issues federal policy for safe testing and deployment of automated vehicles: four-part policy lays the foundation for the next revolution in roadway safety. <https://www.transportation.gov/briefing-room/us-dot-issues-federal-policy-safe-testing-and-deployment-automated-vehicles>. Last accessed October 12, 2016.

61. U.S. dot issues federal policy for safe testing and deployment of automated vehicles: four-part policy lays the foundation for the next revolution in roadway safety. <https://www.transportation.gov/briefing-room/us-dot-issues-federal-policy-safe-testing-and-deployment-automated-vehicles>. Last accessed October 12, 2016.

62. Statement of Sen. Bill Nelson (D.-Fla), NHTSA Oversight Hearing, Senate Commerce, Science and Transportation Committee, June 23, 2015. See also Kelley, “Miles to go on traffic safety,” Fairwarning, Sept. 7, 2016. <http://www.fairwarning.org/2016/09/miles-go-highway-safety/>. Last accessed October 12, 2016.

63. <http://www.cdc.gov/vitalsigns/motor-vehicle-safety/index.html>. Last accessed October 12, 2016. See also Kelley. (2010). Viewpoint: Why the united states lags in auto safety and lessons it can import. *Journal of Public Health Policy*, 31(3), 369–377.

64. Mann, T. E., & Ornstein, N. J. (2006). *The broken branch: How congress is failing America and how to get it back on track*. Oxford: Annenberg Public Policy Center/Oxford University Press.

65. <http://www.nhtsa.gov/About+NHTSA/Press+Releases/nhtsa-zero-deaths-coalition-10052016>. Last accessed October 12, 2016.
66. <https://www.cga.ct.gov/2007/rpt/2007-R-0635.htm>. Last accessed October 12, 2016.
67. [https://en.wikipedia.org/wiki/Vision\\_Zero#United\\_States](https://en.wikipedia.org/wiki/Vision_Zero#United_States). Last accessed October 12, 2016.
68. <http://www.reuters.com/article/us-usa-traffic-idUSKCN1251GZ>. Last accessed October 12, 2016.