state alcohol control policies in the United States, 1999-2011. *Addiction*. 2015;110(1):59-68.

31. Zador PL, Krawchuk SA, Voas RB. Alcohol-related relative risk of driver fatalities and driver involvement in fatal crashes in relation to driver age and gender: an update using 1996 data. *J Stud Alcohol*. 2000;61(3):387-395.

32. World Health Organization. *Global Status Report on Road Safety 2015*. Geneva, Switzerland: World Health Organization; 2016.

33. Sauber-Schatz EK, Ederer DJ, Dellinger AM, Baldwin GT. Vital signs: motor vehicle injury prevention: United States and 19 comparison countries. *MMWR Morb Mortal Wkly Rep*. 2016;65(26):672-677.

Invited Commentary

Effective Alcohol Policies—Saving Lives on US Roadways

Mark R. Rosekind, PhD

Every day, almost 100 people die on US roadways going to work, school, health care appointments, and social and athletic events. In 2016, there were 37 461 lives lost on US roadways, with alcohol-impaired driving fatalities accounting for 10 497 (28.0%) of those lost lives.[1] These 2016 alcohol-impaired driving fatalities represent a 1.7% increase from 2015.

To decrease roadway deaths and enhance overall highway safety, the National Highway Traffic Safety Administration (NHTSA) uses an intervention model that incorporates the following 3 elements: strong laws, high-visibility enforcement, and education. This model has been effectively applied to alcohol-impaired driving, with significant outcomes through the 1980s and 1990s. For example, the NHTSA identified 5 critical drinking and driving laws, and 245 of the possible total 255 laws had been enacted by the 50 states and the District of Columbia by 2005. During that same period, both the number of alcohol-impaired driving deaths and the proportion of overall traffic deaths due to alcohol impairment dropped by more than one-third.[2]

Related article page 894

The Data: Policies Save Lives

The article by Naimi et al[3] in this issue of *JAMA Internal Medicine* significantly contributes to our understanding of the cumulative benefits associated with state alcohol policies. The main finding of their article is clear: lives are saved by enacting restrictive alcohol policies affecting both consumption and driving. More specifically, a 10-percentage point increase in the total restrictiveness of state policies was associated with a 10-percentage point decrease in odds that a crash fatality was alcohol related. Although caveats and study limitations apply, the authors have shown that the association between cumulative policy restrictiveness and lives saved holds across sex, age, race/ethnicity, and crash-related characteristics, including weekend and nighttime crashes. An important strength of the authors' approach is their examination of the total effect of a set of alcohol policies. Typically, alcohol policies are evaluated individually to control for confounding factors, such as other laws or programs. These evaluations of individual policy interventions help guide legislators and policy analysts in considering the incremental benefits of adding a specific intervention or policy. Efforts to determine an overall effect by combining the effectiveness estimates for individual interventions or policies have been hindered by methodological challenges, such as adjusting for double counting (ie, lives saved by one policy may reduce the potential lives saved by another). However, driver behavior is affected both by individual laws and by drivers' overall perception of the social environment. The more comprehensive approach used by Naimi et al adds critical understanding of how a strong overall policy environment can benefit safety.

Beyond the main findings, several other outcomes are worth noting in the article by Naimi et al.[3] A strong policy environment was found to be protective for crash fatalities associated with blood alcohol concentrations above and below the legal limit of 0.08%. Also, there was independent protection for consumption-oriented policies after accounting for the driving-oriented policies. Generally, the findings showed benefits across various relevant alcohol-related factors. The focus by Naimi et al on the overall alcohol policy environment provides substantial support for enacting a comprehensive set of state alcohol policies to reduce alcohol-impaired driving fatalities.

During the 16-year study period in the article by Naimi et al,[3] there were 505 614 alcohol-impaired driving fatalities. Given the variability among states related to alcohol consumption and driving policies, the authors' findings demonstrate a robust association between cumulative policy restrictiveness and lives saved on our roadways. Further research could extend this type of cumulative analysis beyond a state's policy foundation to include other effective countermeasures that reduce alcohol-impaired driving fatalities. Such analyses could examine the added value of roadway design features (eg, rumble strips) and vehicle technologies, such as electronic stability control and (in the future) the Driver Alcohol Detection System for Safety (DADSS) that would prevent an alcohol-impaired driver from operating a vehicle (through touch and breath sensors).[4]

The Opportunity: Zero Roadway Deaths

Our health care system has eradicated a number of once-deadly diseases, and commercial aviation has experienced 9 consecutive years of zero crash fatalities. It is time for a comprehensive, coordinated, and sustained effort to eliminate roadway deaths. In 2016, with 2 consecutive years of increased roadway fatalities, a "Road to Zero" coalition was established to pursue this objective.[5] This coalition has grown to more than 600 collaborating organizations and is focused on the near-term and long-term efforts needed to reach zero

roadway fatalities. This differs from more traditional activities that pursue incremental improvements over the short-term to improve safety. The Road to Zero coalition is pursuing a 30-year horizon to reach zero fatalities.

The Road to Zero coalition is incorporating the Safe System approach, the human-centered design theory that underlies the international Vision Zero road safety movement. This approach integrates the most effective behavior change methods, innovations in roadway design, and advanced vehicle technology to create a transportation system that accommodates human error and prevents serious injury and death.[6]

An integral element of an effective Safe System will be policies, including those focused on new and emerging innovative technologies. The study by Naimi et al[3] is an excellent example of the critical role that strong empirical research can have to identify and quantify policies that will save lives and advance our society to a comprehensive Safe System with zero roadway deaths.

ARTICLE INFORMATION

Author Affiliation: Zoox Inc, Foster City, California.

Corresponding Author: Mark R. Rosekind, PhD, Zoox Inc, 1149 Chess Dr, Foster City, CA 94404 (nhtsa15@gmail.com).

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REFERENCES

1. US Department of Transportation. *2016 Fatal Motor Vehicle Crashes: Overview*. Washington, DC: National Highway Traffic Safety Administration; 2017. Publication DOT HS 812 456.

2. US Department of Transportation. *Statistical Analysis of Alcohol-Related Driving Trends, 1982-2005*. Washington, DC: National Highway Traffic Safety Administration; 2008. Publication DOT HS 810 942.

3. Naimi TS, Xuan Z, Sarda V, et al. Association of state alcohol policies with alcohol-related motor vehicle crash fatalities among US adults [published online May 29, 2018]. *JAMA Intern Med*. doi:10.1001/jamainternmed.2018.1406

4. Hök B, Ljungblad J, Andersson AK, Ekström M, Enlund M. Unobtrusive and highly accurate breath alcohol analysis enabled by improved methodology and technology. *J Forensic Invest*. 2014;2(4):8.

5. Hersman DAP, Rosekind MR. The Road to Zero deaths from motor vehicle crashes. *JAMA Intern Med*. 2017;177(12):1717-1718.

6. Kim E, Muennig P, Rosen Z. Vision Zero: a toolkit for road safety in the modern era. *Inj Epidemiol*. 2017;4(1):1.