



Report to the Ranking Member,
Committee on Commerce, Science, and
Transportation, U.S. Senate

May 2021

PEDESTRIANS AND CYCLISTS

Better Information to
States and Enhanced
Performance
Management Could
Help DOT Improve
Safety

GAO@100 Highlights

Highlights of [GAO-21-405](#), a report to the Ranking Member, Committee on Commerce, Science, and Transportation, U.S. Senate

Why GAO Did This Study

In 2019, over 7,000 pedestrians and cyclists—about 20 per day—died in collisions with motor vehicles in the United States, up from about 4,800 in 2009. Road users' behaviors can affect pedestrian and cyclist safety, along with other factors like vehicle and road design. NHTSA provides states with over \$500 million annually to address the behavioral aspects of safety.

GAO was asked to review pedestrian and cyclist safety and road users' behaviors. This report examines: (1) what is known about how road users' behaviors affect pedestrian and cyclist safety; (2) the extent to which NHTSA's countermeasure guide provides information to help states select effective projects; and (3) the extent to which DOT has used key performance management practices to help ensure activities are improving safety. GAO analyzed pedestrian and cyclist fatality data, state safety plans, and relevant literature; interviewed researchers and officials from states selected based on recent fatality trends; and compared relevant DOT strategic plans and practices to standards for effective performance management.

What GAO Recommends

GAO recommends that (1) NHTSA collect, analyze, and share information on states' pedestrian and cyclist safety behavioral countermeasures; and (2,3) FHWA and NHTSA develop and use performance measures to monitor pedestrian and cyclist safety efforts. DOT concurred with the first recommendation and partially concurred with the others. GAO believes DOT should fully implement all three recommendations.

View [GAO-21-405](#). For more information, contact Elizabeth Repko at (202) 512-2834 or repkoe@gao.gov.

May 2021

PEDESTRIANS AND CYCLISTS

Better Information to States and Enhanced Performance Management Could Help DOT Improve Safety

What GAO Found

The behavior of drivers, pedestrians, and cyclists—including driving speed, impairment due to alcohol or drug use, and distracted driving—affect pedestrian and cyclist safety. Some aspects of these road users' behaviors are well understood. For example, higher driving speeds are linked to increased crash risk and severity. In 2019, over 80 percent of pedestrian and cyclist fatalities occurred where speed limits were 35 miles per hour or higher, according to GAO's analysis of Department of Transportation (DOT) data. Other aspects of road users' behaviors are less understood. For example, there is little research on how pedestrian and cyclist impairment affects crash risk, in part because impairment research has focused on drivers. DOT has several efforts under way to improve knowledge of these behavioral aspects of highway safety.

DOT's National Highway Traffic Safety Administration (NHTSA) provides grants and other support to help states implement projects, or countermeasures, to encourage safer behaviors. While NHTSA's *Countermeasures That Work* guide has useful information on a range of pedestrian and cyclist safety countermeasures, only 3 of 26 countermeasures were demonstrated to be effective (see figure). NHTSA has worked to advance research and monitor efforts to improve safety on a state-by-state basis, but has not analyzed information on states' use of countermeasures more broadly, such as by evaluating available information to identify national trends. Taking this step and sharing the results with states could help NHTSA and states identify promising efforts for study and advance knowledge of countermeasures' effectiveness.

Countermeasures Demonstrated to Be Effective in Improving Pedestrian and Cyclist Safety in the National Highway Traffic Safety Administration's Guide

Effectiveness rating	Effectiveness definition	Countermeasure description
★★★★★	Demonstrated to be effective by several high-quality evaluations with consistent results	• Bicycle helmet laws for children
★★★★	Demonstrated to be effective in certain situations	• Bicycle helmet laws for adults • Pedestrian safety zones (targeted measures in geographic areas with high crashes)

Source: NHTSA's *Countermeasures That Work*, 9th edition. | GAO-21-405

DOT has not fully incorporated performance management practices into its pedestrian and cyclist safety efforts. These practices call for agencies to define goals and measure performance. DOT has established an overall departmental goal and an associated performance measure for pedestrian and cyclist safety. However, the Federal Highway Administration (FHWA) within DOT and NHTSA have not established performance measures to monitor their efforts to achieve DOT's pedestrian and cyclist safety goal. For example, DOT released a pedestrian safety plan in 2020 that lists 90 activities of FHWA and NHTSA but no performance measures to assess their progress. Performance measures at the FHWA and NHTSA level could help DOT understand how its different efforts are contributing to safety improvements, identify shortcomings, and make adjustments as warranted.

Contents

Letter		1
	Background	4
	Research Has Shown That Various Road Users' Behaviors Can Affect Pedestrian and Cyclist Safety, and DOT Is Working to Address Data and Research Gaps	9
	Selected States Implemented a Range of Behavioral Safety Projects, but NHTSA Could Take Steps to Provide Additional Information on Project Effectiveness	22
	DOT Has Not Fully Used Performance Management Practices to Monitor Departmental Efforts to Improve Pedestrian and Cyclist Safety	33
	Conclusions	41
	Recommendations for Executive Action	42
	Agency Comments and Our Evaluation	42
Appendix I	Objectives, Scope, and Methodology	45
Appendix II	Comments from the Department of Transportation	49
Appendix III	GAO Contact and Staff Acknowledgments	52
Tables		
	Table 1: Examples of the Department of Transportation's (DOT) Data Improvement and Research Efforts Aimed at Better Understanding Behavioral Factors That Influence Pedestrian and Cyclist Safety	21
	Table 2: Examples of Current and Planned U.S. Department of Transportation (DOT) Pedestrian and Cyclist Safety Activities Identified in <i>USDOT Action Plan for Pedestrian Safety</i> , by DOT Component	36
Figures		
	Figure 1: Pedestrian and Cyclist Share of Total Highway Fatalities (2009-2019)	5
	Figure 2: Pedestrian and Cyclist Fatalities by Lighting Condition at Time of Crash, 2019	12

Figure 3: Pedestrian and Cyclist Fatalities by Posted Speed Limit at Site of Crash, 2019	14
Figure 4: Percentage of Road Users Involved in Fatal Pedestrian or Cyclist Crashes That Were Tested for Alcohol Use, 2019	17
Figure 5: Pedestrian and Cyclist Fatalities by Whether the Driver Was Reported As Distracted, 2019	18
Figure 6: Community Outreach on Pedestrian and Cyclist Safety	23
Figure 7: Media Campaigns to Promote Pedestrian and Cyclist Safety	24
Figure 8: Enforcement of Pedestrian and Cyclist Safety Laws	24
Figure 9: Skills Education for Cyclists	25
Figure 10: Law Enforcement Training for Pedestrian and Cyclist Safety	25
Figure 11: Effectiveness Ratings of Behavioral Countermeasures for Pedestrian and Cyclist Safety in the Most Recently Published Version of <i>Countermeasures That Work</i>	28
Figure 12: Key Steps of Results-Oriented Performance Management	35

Abbreviations

<i>Action Plan</i>	<i>Pedestrian Safety Action Plan</i>
DOT	Department of Transportation
FARS	Fatality Analysis Reporting System
FHWA	Federal Highway Administration
HSIP	Highway Safety Improvement Program
NHTSA	National Highway Traffic Safety Administration
NTSB	National Transportation Safety Board
OST	Office of the Secretary of Transportation
<i>Strategic Agenda</i>	<i>Strategic Agenda for Pedestrian and Bicycle Transportation</i>

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May 20, 2021

The Honorable Roger F. Wicker
Ranking Member
Committee on Commerce, Science, and Transportation
United States Senate

Dear Mr. Wicker:

Walking and cycling are essential transportation options in communities throughout the United States and can contribute to policy goals including human health, environmental stewardship, mobility, and economic development. However, ensuring the safety of road users such as pedestrians and cyclists is an ongoing challenge. On average, about 20 pedestrians and cyclists were killed each day on our nation's roadways in 2019, up from about 13 in 2009.¹ Moreover, pedestrian and cyclist fatalities comprise an increasing share of total highway fatalities.

Many factors have contributed to these trends. For example, the design of infrastructure and vehicles can affect pedestrian and cyclist safety, and we recently reported on federal efforts related to pedestrian safety and vehicle design.² Another important factor in safety is the behavior of road users, including drivers, pedestrians and cyclists. Understanding behavioral factors is essential to developing effective responses, or "countermeasures" such as educational programs or enforcement initiatives that promote safer behaviors among drivers, cyclists, and pedestrians. State and local governments implement these countermeasure projects with their own resources as well as federal funds. The Department of Transportation (DOT), primarily through the National Highway Traffic Safety Administration (NHTSA), provides funds, guidance, and other resources to states to help improve safety behaviors among all road users.

You asked us to examine pedestrian and cyclist safety and road user behaviors. This report: (1) describes what is known about how road users'

¹According to our analysis of data from the National Highway Traffic Safety Administration's Fatality Analysis Reporting System (FARS).

²GAO, *Pedestrian Safety: NHTSA Needs to Decide Whether to Include Pedestrian Safety Tests in Its New Car Assessment Program*, [GAO-20-419](#) (Washington, D.C.: Apr. 23, 2020).

behaviors affect pedestrian and cyclist safety; (2) describes selected states' efforts to influence road users' behaviors to improve pedestrian and cyclist safety and evaluates the extent to which NHTSA's countermeasure guide provides information to help states select effective pedestrian and cyclist behavioral safety projects; and (3) assesses the extent to which DOT used key performance management practices to help ensure its activities contribute to pedestrian and cyclist safety improvements.

To describe how road users' behaviors affect pedestrian and cyclist safety, we analyzed 2019 data (the most recent year of data available at the time of our review) from NHTSA's Fatality Analysis Reporting System (FARS), reviewed literature, and interviewed a range of stakeholders and DOT officials. We analyzed FARS data to determine the total number of pedestrian and cyclist fatalities that involved behavioral factors. We focused on behaviors—driver speed, alcohol or drug use, and distraction—that were identified in prior work as influencing pedestrian and cyclist safety.³ We reviewed relevant documentation and spoke to agency officials, and determined that FARS data were sufficiently reliable to provide an overview of pedestrian and cyclist fatality characteristics. In addition, we also focused our analysis on the prevalence of walking and cycling, which was likewise identified in prior work. To describe the estimated number of people walking or cycling to work from 2010 through 2019, we analyzed data from the U.S. Census Bureau's American Community Survey. We reviewed relevant survey documentation and determined that the data were sufficiently reliable for the purposes of our review. We also reviewed relevant documents, reports, and studies to better understand research related to the road users' behaviors affecting pedestrian and cyclist safety. In addition, we interviewed NHTSA and Federal Highway Administration (FHWA) officials as well as 10 academic researchers, associations, and advocates, among others, to gather additional information about pedestrian and cyclist safety data and research. These stakeholders were selected based on referrals and the relevance of the organization's mission to this topic.

To describe selected states' efforts to improve pedestrian and cyclist safety, we reviewed federal grant programs, as well as federally required Highway Safety Plans—which show how states plan to use NHTSA

³See GAO, *Pedestrians and Cyclists: Cities, States, and DOT Are Implementing Actions to Improve Safety*, [GAO-16-66](#) (Washington, D.C.: Nov. 19, 2015) and [GAO-20-419](#).

funds—for fiscal year 2020 for 50 states, the District of Columbia, and Puerto Rico. We specifically analyzed the countermeasures identified in the Highway Safety Plans of the 26 states, the District of Columbia, and Puerto Rico (28 plans in total) in which pedestrian and cyclist fatalities made up 15 percent or more of highway fatalities.⁴ We interviewed NHTSA and FHWA officials in headquarters and in offices that support four states we selected for interviews with state transportation officials to provide illustrative examples of state actions. We selected California, Florida, Maryland, and Washington because they were among those with the highest numbers and rates of fatalities by state population from 2015 through 2017, among other considerations.⁵

To evaluate the extent to which NHTSA’s countermeasure guide provides information to help states select effective pedestrian and cyclist behavioral safety projects, we reviewed NHTSA’s *Countermeasures That Work* guide, which is intended to help states select effective behavioral countermeasures including for pedestrian and cyclist safety.⁶ We focused on *Countermeasures That Work* because it is a longstanding reference guide for states on a wide-range of behavioral safety countermeasures that are eligible for NHTSA safety grants. According to NHTSA officials, it is one of their most requested and downloaded guides, among other highway safety guides NHTSA has published. We interviewed state transportation officials in the four selected states about their use of the guide. We also interviewed NHTSA officials about how they update *Countermeasures That Work* and compared relevant information in the guide to federal internal control standards.⁷ We determined that the information and communication and monitoring components of internal controls were significant to this objective, along with the underlying

⁴These are also the states eligible for NHTSA grants to improve the safety of nonmotorized road users, including pedestrians and cyclists, known as NHTSA 405(h) grants. 23 U.S.C. § 405(h).

⁵Data for 2018 were not available at the time of our state selection. We used data from the most recent 3 years available to get more accurate understanding of the prevalence of pedestrian and cyclist fatalities since the numbers of these fatalities, especially in less populated states, could be very small (i.e., less than 10 in single year) and data from a single year could be skewed by a major one-time event.

⁶C. M. Richard, K. Magee, P. Bacon-Abdelmoteleb, and J.L. Brown, National Highway Traffic Safety Administration, *Countermeasures That Work: A Highway Safety Countermeasure Guide for State Highway Safety Offices, Ninth Edition, 2017*, Report No. DOT HS 812 478 (Washington, D.C.: Apr. 2018).

⁷GAO, *Standards for Internal Control in the Federal Government*, [GAO-14-704G](#) (Washington, D.C.: September 2014).

principles that management should use quality information and monitor its activities to achieve the entity's objectives. We assessed NHTSA's guide to determine whether it helps to achieve objectives. We also compared information in NHTSA's guide to NHTSA's Enterprise Risk Management Risk Register for 2020, which identifies potential risks to achieving NHTSA's goals and objectives and strategies to mitigate these risks.

To assess the extent to which DOT used key performance management practices to help ensure its activities contribute to pedestrian and cyclist safety improvements, we reviewed relevant DOT documentation, including DOT, FHWA, and NHTSA strategic plans; annual performance plans and reports; and plans specific to pedestrian and cyclist safety and activities. We interviewed officials from DOT's Office of the Secretary, NHTSA, and FHWA to understand how these plans were developed and are used. We compared the information we gathered to key performance management steps identified in our prior work.⁸ These steps help ensure that an organization has a defined mission and goals, measures performance, and uses performance information to achieve results. For further information on our objectives, scope, and methodology, see appendix I.

We conducted this performance audit from December 2019 to May 2021 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

Background

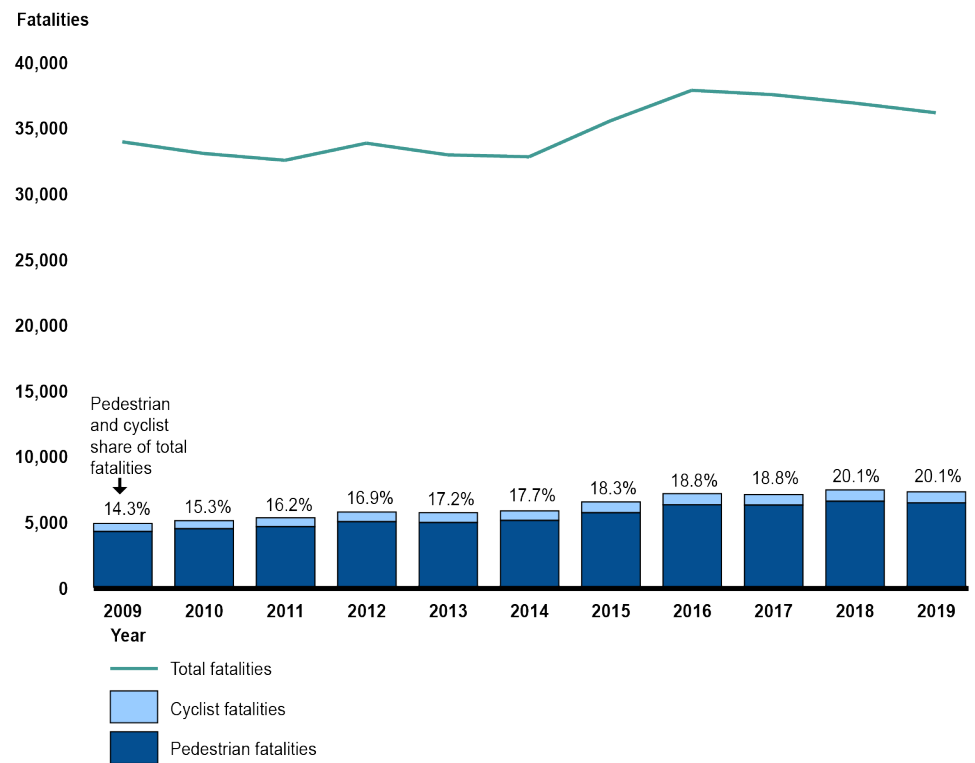
Pedestrian and Cyclist Fatality Trends

Since 2009, both the number of pedestrian and cyclist fatalities and the share of pedestrian and cyclist fatalities as a percentage of total highway fatalities have increased, according to our analysis of FARS data (see fig. 1). Pedestrian and cyclist fatalities increased nearly 50 percent, from about 4,800 in 2009, to over 7,200 in 2019. Pedestrian and cyclist fatalities as a share of total highway fatalities increased from about 14

⁸GAO, *Executive Guide: Effectively Implementing the Government Performance and Results Act*, [GAO/GGD-96-118](#) (Washington, D.C.: June 1996).

percent to 20 percent in that same timeframe. Most of these fatalities are pedestrians, accounting for about 18 percent of total fatalities in 2019.

Figure 1: Pedestrian and Cyclist Share of Total Highway Fatalities (2009-2019)



Source: GAO analysis of DOT data. | GAO-21-405

Fatalities were more prevalent among certain groups of people, according to NHTSA data.⁹ In 2019, the largest share of pedestrians and cyclists killed in traffic crashes were male (72 percent), while the age group with the largest share of pedestrian and cyclist fatalities was 50 to 59 years old (19 percent). In the same year, Whites made up the majority of fatalities.¹⁰ However, Blacks accounted for a disproportionately large share of fatalities relative to the population—19 percent of pedestrian and cyclist

⁹NHTSA officials stated that due to gaps in states' reporting of race and ethnicity data for pedestrian and cyclist fatalities, there are limitations to the FARS data that may not provide a complete picture of fatalities by race and ethnicity.

¹⁰In 2019, 61 percent of pedestrians and cyclists killed in motor vehicle traffic crashes were White, while representing 72 percent of the overall U.S. population.

fatalities, while representing about 13 percent of the overall U.S. population. Fatal crashes in 2019 occurred most often in urban rather than rural settings, and in conditions with low light as discussed in detail below.

Federal Roles and Responsibilities

Safety—reducing transportation-related fatalities and serious injuries—has consistently been DOT’s top priority. DOT’s Office of the Secretary of Transportation (OST) sets overall departmental priorities and coordinates activities across DOT. For example, in 2010 OST issued a policy, still in place in 2021, to encourage the inclusion of safe and convenient walking and cycling facilities in transportation projects. OST also coordinates activities, such as research, across the department to help ensure efforts are not overlapping or duplicative.

Within DOT, NHTSA and FHWA carry out a wide range of programs and projects related to pedestrian and cyclist transportation safety. Both NHTSA and FHWA are charged with reducing fatalities and serious injuries on the nation’s highways by collecting and analyzing data, conducting research, and providing technical assistance and guidance to states to implement countermeasures, among other efforts. For example, NHTSA’s Office of Behavioral Safety Research studies behaviors and attitudes in highway safety to develop and refine countermeasures to deter unsafe behaviors and promote safe alternatives. Likewise, FHWA issues guides to help states select projects to improve safety for all road users, including pedestrians and cyclists. FHWA has also led multiple department-wide planning efforts intended to organize the various pedestrian and cyclist activities across the department.

In addition, NHTSA and FHWA provide funding to states to help mitigate the causes of vehicular crashes related to behavior and infrastructure, respectively. Specifically, NHTSA provides grants to states’ highway safety offices to improve traffic safety behaviors through projects designed to educate road users and enforce traffic laws, among other things. For example, NHTSA’s State and Community Highway Safety Grants program provides funding to states to improve driver behavior and reduce deaths and injuries from motor vehicle-related crashes.¹¹ In fiscal year 2020, this grant program provided about \$280 million to states to implement countermeasures to reduce speeding, improve traffic records data, and improve pedestrian and bicycle safety, among others. In

¹¹23 U.S.C. § 402.

addition, NHTSA's National Priority Safety Program provided about \$260 million in grants to states for national highway safety priorities in fiscal year 2020.¹² Within this program, NHTSA provides Nonmotorized Safety grants to eligible states for pedestrian and cyclist safety activities.¹³ In fiscal year 2020, Nonmotorized Safety grants provided about \$14 million to 26 states, the District of Columbia, and Puerto Rico for education and enforcement countermeasures aimed specifically at pedestrian and cyclist safety.

FHWA supports states' efforts to improve pedestrian and cyclist safety through infrastructure programs that, in part, encourage walking and biking and otherwise influence behaviors. For example, FHWA provided about \$2.4 billion to state departments of transportation through the Highway Safety Improvement Program (HSIP) for projects to improve safety on all public roads in fiscal year 2020.¹⁴ HSIP funds can be used for infrastructure projects, such as improving crosswalks, aimed at enhancing pedestrian and cyclist safety.

Over the last decade, the federal government has taken steps to move toward a performance-based framework for traffic safety funding. The Moving Ahead for Progress in the 21st Century Act, enacted in 2012, required the Secretary of Transportation to establish performance measures to enhance accountability for federal traffic safety funding provided to states.¹⁵ In response, NHTSA and FHWA have established performance management frameworks through which states use performance measures to track traffic fatalities and serious injuries—including those for pedestrians and cyclists—and establish targets annually for those performance measures to evaluate progress.

¹²23 U.S.C. § 405.

¹³States are eligible for Nonmotorized Safety grants under 23 U.S.C. § 405(h) if the state's pedestrian and cyclist fatalities exceed 15 percent of the state's total annual crash fatalities. Nonmotorized Safety grants may generally be used for training of law enforcement, enforcement of pedestrian and cyclist traffic laws, or public education and awareness programs.

¹⁴23 U.S.C. § 148, 23 C.F.R. Part 924. HSIP is one of five core formula programs under the larger Federal-Aid Highway Program. The Federal-Aid Highway Program supports state highway systems by providing financial assistance for the construction, maintenance and operations of the nation's highway network.

¹⁵Pub. L. No. 112-141, § 1203, 126 Stat. 405, 524 (July 6, 2012).

To receive NHTSA grants, each state must submit an annual Highway Safety Plan to NHTSA that describes the specific projects to be funded for the upcoming year and sets performance targets for the state safety goals. States are also required to provide FHWA with a Strategic Highway Safety Plan at least every 5 years that identifies a state's key safety needs and long-term goals to guide investment decisions to reduce fatalities and serious injuries.¹⁶ States are required to establish numeric targets annually for pedestrian and cyclist performance measures, among other safety areas, that are specified by NHTSA and FHWA.¹⁷ States must also submit annual reports to NHTSA and FHWA that assess progress toward achieving state targets in the previous reporting year.¹⁸

State and Local Government Roles

States and localities play an important role in implementing pedestrian and cyclist safety programs and are responsible for tailoring their programs to the specific needs and context of their area. States and local governments can also enact laws and policies designed to protect pedestrians and cyclists. State agencies—such as state DOTs, highway safety offices, and police—plan, design, and construct transportation facilities, and implement education and enforcement efforts. Local agencies—such as city DOTs and local police departments—can use federal, state, and local funding to design and construct pedestrian and cyclist facilities, enforce traffic laws, and educate the public on traffic safety.

Prior GAO Work

In our prior work, we have found that while DOT has a broad range of activities to improve pedestrian and cyclist safety,¹⁹ it has not made timely decisions on specific efforts to improve pedestrian safety with regard to vehicle design. Specifically, in 2020, we found that NHTSA had proposed pedestrian safety tests in 2015 for its New Car Assessment Program—which provides consumers with comparative information on the safety of new vehicles to assist in vehicle purchasing—but had not yet made a decision about whether to include pedestrian safety tests in the

¹⁶23 C.F.R. § 924.9. According to FHWA, a state's Strategic Highway Safety Plan provides direction for the HSIP, and states must ensure that funded HSIP projects are consistent with this plan.

¹⁷NHTSA requires states set two targets for cyclist fatalities and pedestrian fatalities, and FHWA requires states set one target for nonmotorized fatalities and serious injuries.

¹⁸23 C.F.R. § 924.15.

¹⁹[GAO-16-66](#).

program.²⁰ As a result, we recommended that NHTSA make and communicate a decision, and document the process for making changes to the program. DOT concurred with these recommendations, but as of April 2021, it had not yet decided whether to include such tests in the program and NHTSA had not documented a clear process for updating the program.

Research Has Shown That Various Road Users' Behaviors Can Affect Pedestrian and Cyclist Safety, and DOT Is Working to Address Data and Research Gaps

Some Road Users' Behaviors, Such as Drivers' Speed and Use of Alcohol, Have Been Shown to Affect Pedestrian and Cyclist Safety, but Gaps in Knowledge Remain

The behaviors of drivers, pedestrians, and cyclists can affect the risk and severity of crashes. We have previously reported on some of these behaviors, including (1) the prevalence of walking and cycling, which affects exposure to crash risk; (2) driving speed; (3) impairment due to alcohol or drug use; and (4) distracted driving, walking, and cycling.²¹ Due to the numerous potential factors involved in pedestrian and cyclist crashes, NHTSA data cannot be used to determine the cause of a particular crash. As a result, we could not compare these factors to determine which contributed most to fatalities.

While there are gaps in knowledge about all of these factors, the role that some play in pedestrian and cyclist safety is better understood than others. For example, driving speed and impaired driving have a well-established influence on pedestrian and cyclist safety. Other behaviors, such as pedestrian and cyclist distraction and impairment, may affect pedestrian and cyclist safety but the nature and extent of these effects are less well understood, according to stakeholders and researchers we spoke with. In addition, road user behaviors can be affected by the built

²⁰[GAO-20-419](#).

²¹See [GAO-16-66](#) and [GAO-20-419](#).

environment, such as roadway designs and development patterns. Moreover, according to NHTSA officials, these factors may affect crash risk individually or in combination with one another. For example, roadway design may affect driver speeds and impairment may affect distraction.

Prevalence of walking and cycling. According to research and stakeholders interviewed, the prevalence of walking and cycling affects exposure to crash risk, and can either improve or diminish safety, as discussed below. Our prior work has noted that a greater number of people walking or cycling can result in an increased potential for fatalities and injuries.²² While pedestrian and cyclist fatalities can be linked to when and where people walk and bike, there are gaps in understanding the prevalence of walking and cycling and how it affects crash risk.

The Census Bureau estimated that 4 million people regularly walked and 780,000 people biked to work in 2019, compared to 3.8 million pedestrians and 680,000 cyclists in 2010.²³ The rise in the estimated number of commuters may have resulted in increased exposure to crashes and thus increased potential for fatalities. However, according to stakeholders we interviewed, limited data on walking and cycling trips make it difficult to determine whether increases in pedestrian and cyclist fatalities are the result of increased exposure or other factors. Likewise, these data limitations hinder analysis of why some demographic groups, such as males, are disproportionately killed when walking or biking relative to the population. While some states and localities count pedestrians and cyclists, there are no national measures of walking or cycling trips. In addition, increased activity may actually improve safety in some environments. Some studies indicate that when the number of pedestrians or cyclists increases in a particular location—such as a city block—fatality rates in that area decrease, which may be because

²²[GAO-16-66](#).

²³The 90 percent confidence interval is (3,920,000, 4,240,000) for the 2019 pedestrian estimate, (630,000, 940,000) for the 2019 cyclist estimate, (3,700,000, 3,970,000) for the 2010 pedestrian estimate, and (550,000, 820,000) for the 2010 cyclist estimate. The American Community Survey collects information on social, economic, housing, and demographic characteristics of the nation's population. The survey may underestimate the number of people who walked or biked to work, since it asks respondents to select only the primary means of how they commuted to work the previous week and does not include recreation or other trips. If a respondent used more than one means of transportation, they are to select the mode used for most of the distance, and any walking or biking would be unaccounted for.

motorists are increasingly aware of the presence of people walking and cycling.²⁴ For example, motorists may drive at slower speeds or become more visually aware of pedestrians or cyclists.

Exposure to crash risk can vary based on when people walk and bike. For example, there is a linkage between safety and lighting conditions. According to our analysis of FARS data, most pedestrian fatalities and nearly half of cyclist fatalities in 2019 occurred in the dark (see fig. 2). Two of the studies we reviewed also noted a relationship between light conditions and safety. A 2017 study using data from crashes that occurred in Florida suggested that low light conditions can decrease the sight distance of drivers, making it more difficult to spot pedestrians, and are often compounded with other factors that increase risk.²⁵ For example, the study posited that lower traffic volumes at night may encourage higher speed and riskier driver actions, and alcohol and drug use may be more prevalent at night. Additionally, in 2019 the National Transportation Safety Board (NTSB) reported that travel survey data estimate that fewer than 20 percent of bicycle trips take place at night.²⁶ The overrepresentation of fatalities at night underscores the increased risk to cyclists in the dark.

²⁴P.L. Jacobsen, "Safety in Numbers: More Walkers and Bicyclists, Safer Walking and Bicycling," *Injury Prevention*, vol. 9, no. 3 (2003) 205-209; R. Elvik, "The Non-Linearity of Risk and the Promotion of Environmentally Sustainable Transport," *Accident Analysis and Prevention*, vol. 41 (2009) 849-855.

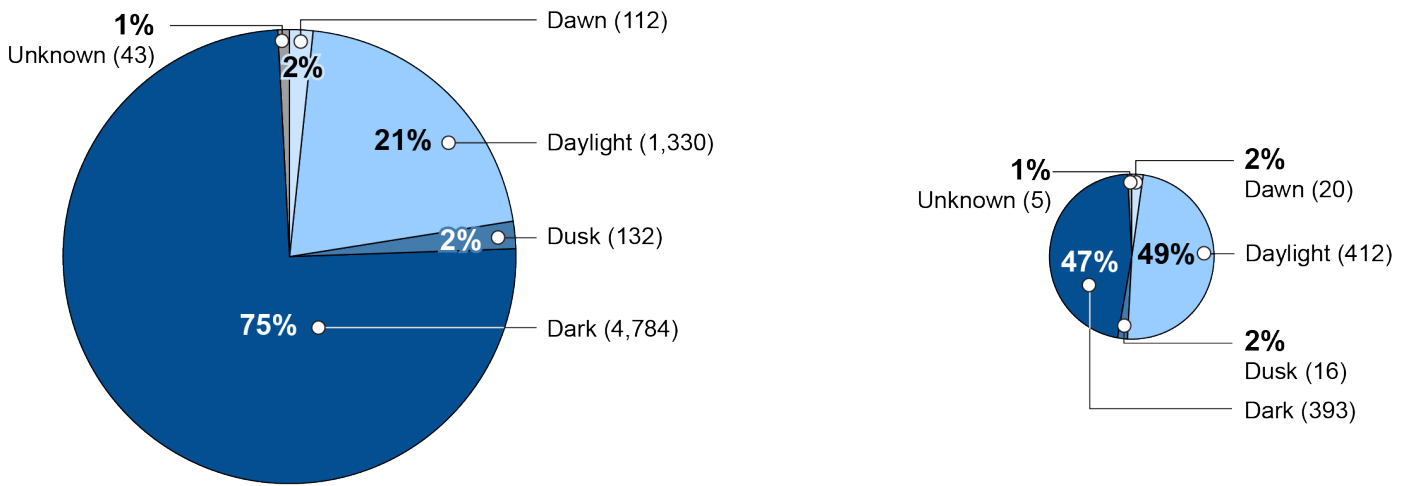
²⁵R. Guo, C. Xin, P. Lin, and A. Kourtellis, "Mixed Effects Logistic Model to Address Demographics and Neighborhood Environment on Pedestrian Injury Severity," *Transportation Research Record*, vol. 2659, no. 1 (2017) 174-181.

²⁶National Transportation Safety Board, *Bicyclist Safety on US Roadways: Crash Risks and Countermeasures*, NTSB/SS-19/01, PB2019-101397, Notation 59670 (Washington, D.C.: Adopted Nov. 5, 2019). NTSB is an independent federal agency dedicated to promoting aviation, railroad, highway, marine, and pipeline safety.

Figure 2: Pedestrian and Cyclist Fatalities by Lighting Condition at Time of Crash, 2019

Pedestrian (6,401 total)

Cyclist (846 total)



Source: GAO analysis of National Highway Traffic Safety Administration Fatality Analysis Reporting System data. | GAO-21-405

Note: Pedestrian and cyclist fatalities with a light condition are coded as other, not reported, or reported as unknown are summed as unknown.

The environment in which people walk and bike also affects safety. For instance, an increased prevalence of walking and biking may reduce safety in suburban areas, where roadway designs may prioritize motor vehicle traffic more than pedestrians and cyclists. DOT officials told us that changes in land use and housing prices may have prompted people who are dependent on transit to move to suburbs that are less accommodating of walking and cycling. Several stakeholders said this migration from more walkable, denser neighborhoods with lower speed limits to suburban areas with higher speed limits has increased crash risk. An Insurance Institute for Highway Safety study found that pedestrian fatalities were higher on interstates and freeways in areas that had residential and commercial or other land uses on opposite sides of the roadway as compared to locations where both sides were residential lands.²⁷ In addition, a city official we interviewed noted that recent increases in pedestrian deaths were not due to trends in the urban core—

²⁷Insurance Institute for Highway Safety, *Fatal Pedestrian Crashes on Interstates and Other Freeways in the United States* (December 2019).

where fatalities had decreased—but from increases in outlying communities with less pedestrian infrastructure.

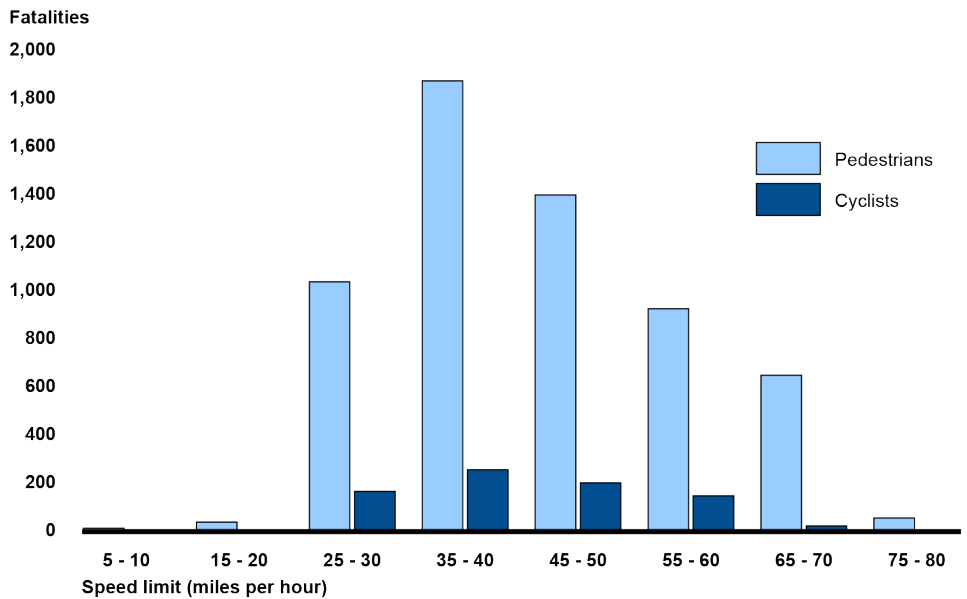
Driving speed. Research has established a clear connection between high driving speed and the likelihood and the severity of collisions with pedestrians and cyclists. Our analysis of available crash data in FARS found that in 2019:

- 79 percent of pedestrian fatalities and 74 percent of cyclist fatalities in which speed data were recorded involved vehicle speeds of 31 miles per hour or higher. However, the speed of the striking vehicle was not reported for almost 60 percent of all fatal pedestrian and bicycle crashes, partly because it is difficult for police officers to determine speed after a crash occurs.²⁸
- 81 percent of pedestrian fatalities and 78 percent of cyclist fatalities occurred on roads with posted speed limits of 35 miles per hour or higher (see fig. 3).
- 7 percent of pedestrian fatalities and almost 10 percent of cyclist fatalities involved drivers who were reported as speeding.²⁹ However, speeding is likely to be underreported due to the challenge of determining after the crash occurred whether or not a driver was speeding.

²⁸[GAO-20-419](#).

²⁹NHTSA considers a crash to be speeding-related if any driver in the crash was charged with a speeding-related offense or if a police officer indicated that racing, driving too fast for conditions, or exceeding the posted speed limit was a contributing factor in the crash.

Figure 3: Pedestrian and Cyclist Fatalities by Posted Speed Limit at Site of Crash, 2019



Source: GAO analysis of National Highway Traffic Safety Administration Fatality Analysis Reporting System data. | GAO-21-405

Note: Pedestrian and cyclist fatalities where the speed limit was missing or not reported are not shown in this figure.

Multiple studies we reviewed found that crash risk and crash severity increase with speed. For example, a literature review conducted for a 2006 National Cooperative Highway Research Program study reported that increased speed reduces the time available for the driver to receive and process information, and increases the stopping distance of a vehicle.³⁰ In addition, NTSB reported in 2017 that high crash speeds consistently result in more severe injuries.³¹ According to a 2019 report from the National Cooperative Highway Research Program based on a review of the literature, a pedestrian’s risk of fatality is 90 percent when

³⁰R. Srinivasan, M. Parker, D. Harkey, D. Tharpe, and R. Sumner, *Expert System for Recommending Speed Limits in Speed Zones* (2006).

³¹National Transportation Safety Board, *Reducing Speeding-Related Crashes Involving Passenger Vehicles*, NTSB/SS-17/01, PB2017-102341, Notation 56821 (Washington, D.C.: Adopted July 25, 2017).

struck by a vehicle travelling between 54 and 63 miles per hour, compared with 10 percent between 24 and 33 miles per hour.³²

Road design and speed limits can influence driver speed. We previously reported that some road designs, such as wide, straight roads, lend themselves to excess speed, regardless of the posted speed limit.³³ In addition, current practices for setting speed limits may encourage higher speeds. According to FHWA, a commonly used approach to set speed limits is the “85th percentile” method—the practice of setting speed limits to match the 85th percentile observed speed over a certain road segment.³⁴ However, FHWA reported in 2009 that speed limits based on the 85th percentile may lead to high operating speeds, and hence a higher 85th percentile speed, generating a cycle of increased speeds.³⁵

Impairment due to alcohol and drug use. Impaired driving is an established risk factor in traffic safety, according to NHTSA. However, the effect of alcohol use by pedestrians and cyclists, and of drug use by road users, on crash risk is less clear. Limited alcohol and drug testing of road users involved in fatal pedestrian and cyclist crashes hinders a better understanding of how impairment contributes to fatalities.

Our analysis of FARS data showed that in 2019, alcohol tests were administered to 25 percent of drivers involved in pedestrian and cyclist fatalities. Among the drivers tested, 12 percent had a blood alcohol concentration level of 0.08 or higher, which is considered alcohol impaired.³⁶ Impairment research has generally focused on drivers. According to NHTSA, the effects of alcohol impairment on driving ability

³²The National Academies of Sciences, Engineering, and Medicine, *Pedestrian Safety Relative to Traffic-Speed Management* (Washington, D.C.: 2019).

³³[GAO-16-66](#).

³⁴Federal Highway Administration, *Methods and Practices for Setting Speed Limits: An Informational Report*, FHWA-SA-12-004 (Washington, D.C.: 2012).

³⁵Federal Highway Administration, *Speed Concepts: Informational Guide*, FHWA-SA-10-001 (Washington, D.C.: 2009).

³⁶According to NHTSA, it is illegal in 49 states to drive with a blood alcohol concentration of 0.08 or higher. Utah has a lower blood alcohol concentration threshold of 0.05. Of drivers involved in pedestrian or cyclist fatalities who were tested for alcohol use in 2019, about 5 percent had a blood alcohol concentration level between 0.01 and 0.08. About 78 percent of these drivers had a blood alcohol concentration level of 0, while the remaining 5 percent of tests did not produce a blood alcohol concentration level.

include a decline in visual functions, such as rapid tracking of a moving target; poorer coordination; and reduced ability to maintain lane position, brake appropriately, and control the vehicle.

Among pedestrians and cyclists killed in motor vehicle traffic crashes in 2019, our analysis of FARS data found that over 60 percent were tested for alcohol use. Of the pedestrians and cyclists tested, almost 32 percent had a blood alcohol concentration level at or above 0.08.³⁷ However, according to NHTSA, there is generally no blood alcohol concentration level at which it is illegal for pedestrians to walk on or near public roads.³⁸ According to a researcher we interviewed, there is little research on how behavioral changes in impaired pedestrians and cyclists affect crash risk. Nevertheless, a 2016 study of injured bicyclists who went to a hospital found no association between impaired cycling and traffic violations, such as riding against traffic or crossing against a signal.³⁹

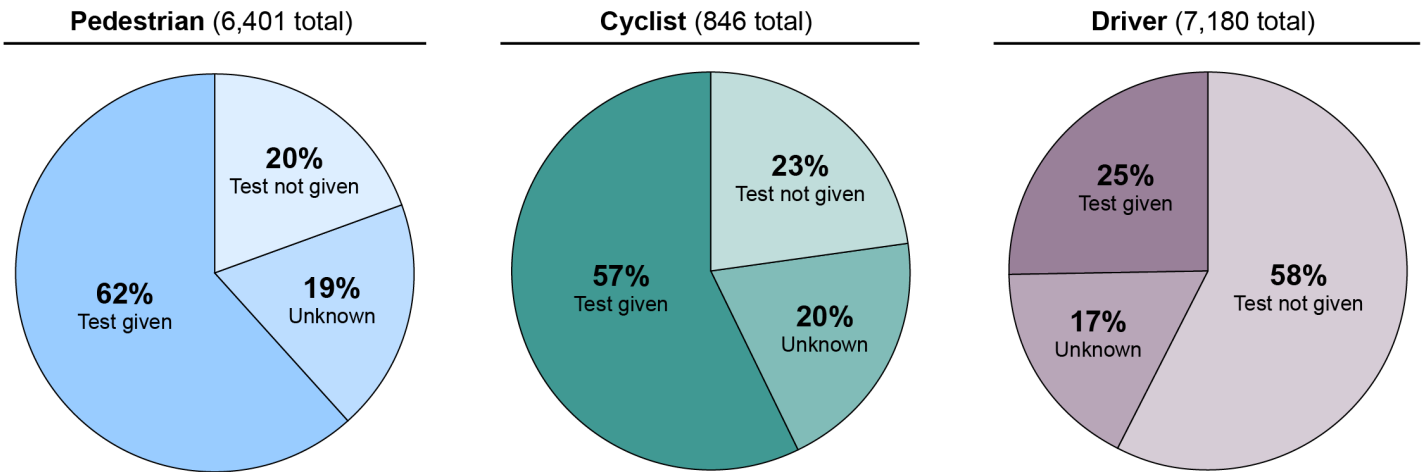
Alcohol and drug test procedures vary by state, and law enforcement does not uniformly administer them to all road users involved in traffic fatalities, according to NHTSA. As a result, road users are not tested for alcohol use at comparable rates. NHTSA officials explained this disparity may be due, in part, to states' practice of testing those killed (i.e., pedestrians and cyclists) more frequently than the driver who survived a fatal crash. In 2019, a quarter of drivers involved in a pedestrian or cyclist fatality were tested for alcohol use, while more than half of pedestrians and cyclists killed were tested (see fig. 4). To address this gap in the data, NHTSA uses a statistical model to estimate the blood alcohol concentration level of road users at the time of the crash.

³⁷Of pedestrians and cyclists killed in motor vehicle traffic crashes that were tested for alcohol use in 2019, about 7 percent had a blood alcohol concentration level between 0.01 and 0.08. About 60 percent of these pedestrians and cyclists had a blood alcohol concentration level of 0, while the remaining 2 percent of tests did not produce a blood alcohol concentration level.

³⁸In some states, such as Colorado and Georgia, blood alcohol concentration thresholds also apply to cyclists.

³⁹M. Sethi, J.H. Heyer, S. Wall, C. DiMaggio, M. Shinseki, D. Slaughter, and S.G. Frangos, "Alcohol Use by Urban Bicyclists is Associated with More Severe Injury, Greater Hospital Resource Use, and Higher Mortality," *Alcohol*, vol. 53 (2016) 1-7.

Figure 4: Percentage of Road Users Involved in Fatal Pedestrian or Cyclist Crashes That Were Tested for Alcohol Use, 2019



Source: GAO analysis of National Highway Traffic Safety Administration Fatality Analysis Reporting System data. | GAO-21-405

Note: Pedestrian and cyclist fatalities where road user impairment was unknown or not reported are summed as unknown.

There is limited research and data on the crash risk associated with drug impairment, use of specific drugs, and how drugs affect driving, walking, and cycling. As we reported in 2015, the lack of a clear link between impairment and drug concentrations in the body makes it difficult to define drug impairment.⁴⁰ In addition, we reported that various state and national-level data sources provide limited information on the extent of drug-impaired driving because of, in part, varying state practices. According to NHTSA, there are no commonly accepted impairment levels for drugs, and the presence of a drug in a person’s system does not indicate whether, or to what extent, that person was impaired by the drug. With regard to drug testing, approximately 17 percent of drivers involved in a pedestrian or cyclist fatality were tested for drug use in 2019, while 58 percent of pedestrians and 55 percent of cyclists killed were tested.

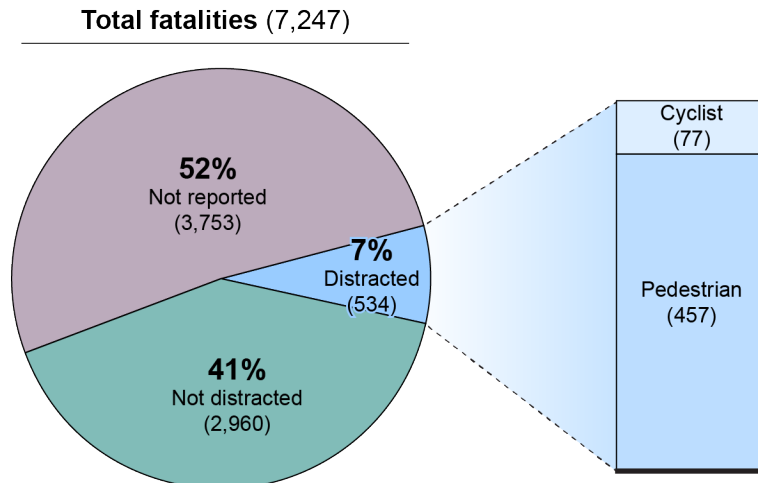
Distracted driving, walking, and cycling. Driver distraction, such as use of a cell phone while driving, is an established safety risk factor according to NHTSA, but limitations in crash data make it difficult to understand the extent to which it contributes to pedestrian and cyclist

⁴⁰GAO, *Drug-Impaired Driving: Additional Support Needed for Public Awareness Initiatives*, GAO-15-293 (Washington, D.C.: Feb. 24, 2015).

fatalities.⁴¹ The nature and extent that any distraction on the part of pedestrians and cyclists plays in fatal crashes is unclear.

Our analysis of FARS data showed that in 2019, 7 percent of pedestrian and cyclist fatalities involved a distracted driver (see fig. 5); and that almost 5 percent of pedestrians and cyclists killed were distracted. However, FARS data do not include information on distraction for more than half of fatal pedestrian or cyclist crashes. NHTSA officials we spoke to told us that distraction is likely underreported in crash reports. According to NHTSA, police crash reports vary across jurisdictions, which contributes to variation in the reported number of crashes involving distraction. In addition, NHTSA has identified potential reasons for underreporting of distraction-related crashes, including (1) self-reporting of distraction is lower than actual occurrence and (2) law enforcement may not have information to indicate distraction.⁴²

Figure 5: Pedestrian and Cyclist Fatalities by Whether the Driver Was Reported As Distracted, 2019



Source: GAO analysis of National Highway Traffic Safety Administration Fatality Analysis Reporting System data. | GAO-21-405

Note: Fatalities in which driver distraction is unknown are included in “not reported.”

⁴¹NHTSA states that driver distraction is inattention that occurs when drivers divert their attention from driving to focus on another activity, such as talking on a cellular phone, text messaging, or eating.

⁴²NHTSA, *Distracted Driving 2018*, Research Note Report No. DOT HS 812 926 (Washington, D.C.: April 2020).

Multiple studies have documented the general safety risks of distracted driving, but the extent to which it affects pedestrian and cyclist safety specifically is less clear. A 2016 study of serious crashes found that drivers were engaged in distracting activities more than 50 percent of the time, resulting in a crash risk that was two times higher than non-distracted driving.⁴³ The study also found that using a handheld cellphone resulted in a crash risk that was 3.6 times higher than non-distracted driving. In 2018, a study done by the American Automobile Association found that visual-manual tasks overall, and text messaging in particular, were associated with significantly elevated incidence of crash involvement relative to non-distracted driving.⁴⁴ However, NHTSA's 2016 review of electronic device use found that few studies have focused specifically on the association between driver distraction and crash involvement with pedestrians.⁴⁵ While the study found evidence of a relationship between driver distraction and safety, NHTSA reported that quantifying the nature of the relationship is not simple or straightforward.

Similarly, direct links between pedestrian and cyclist distraction and crashes have not been established in research. Some stakeholders we spoke with referenced a recently published report that discussed the mixed evidence on pedestrian distraction regarding behaviors such as crossing with the light, looking both ways, and identifying gaps in traffic.⁴⁶ For example, a 2010 laboratory study found that participants were less likely to identify available gaps in traffic when they were distracted while talking on a cell phone,⁴⁷ whereas a 2012 laboratory study found no

⁴³T.A. Dingus, F. Guo, S. Lee, J.F. Antin, M. Perez, M. Buchanan-King, and J. Hankey, "Driver Crash Risk Factors and Prevalence Evaluation Using Naturalistic Driving Data," *Proceedings of the National Academy of Sciences*, vol. 113, no. 10 (2016) 2636-2641.

⁴⁴American Automobile Association, Inc., *Crash Risk of Cell Phone Use While Driving: A Case-Crossover Analysis of Naturalistic Driving Data* (2018). The American Automobile Association is a not-for-profit organization that offers its members travel, insurance, financial, and automotive services and information. It also advocates for the safety of travelers.

⁴⁵NHTSA, *Effect of Electronic Device Use on Pedestrian Safety: A Literature Review*, Report No. DOT HS 812 256 (Washington, D.C.: April 2016).

⁴⁶K. Ralph and I. Girardeau, "Distracted by 'Distracted Pedestrians'?" *Transportation Research Interdisciplinary Perspectives*, vol. 5 (2020).

⁴⁷M.B. Neider, J.S. McCarley, J.A. Crowell, H. Kaczmariski, and A.F. Kramer, "Pedestrians, Vehicles, and Cell Phones," *Accident Analysis and Prevention*, vol. 42, no. 2 (2010) 589-594.

difference in the propensity to recognize safe crossing opportunities.⁴⁸ Several stakeholders said that while pedestrian and cyclist distraction, such as from earbud use, was potentially dangerous for pedestrians and cyclists, the extent to which it has contributed to the increase in fatalities in recent years is unknown. According to one researcher, pedestrian distraction could affect safety, but probably to a lesser extent than driver distraction.

Other behaviors. Multiple other factors—working separately or in combination—may also contribute to pedestrian and cyclist crash risk and severity. Other behavioral factors include violation of traffic laws, pedestrian and cyclist visibility, and cyclist helmet use. For example, traffic law violations (such as a driver’s failure to yield to pedestrians and cyclists) or whether a pedestrian or cyclist uses visibility enhancements (such as wearing reflective clothing) can affect crash risk. Although a cyclist’s use of a helmet does not reduce crash risk, it can mitigate the effects of a motor vehicle traffic crash. For example, a 2011 study found that helmet use resulted in about a 15 percent reduction in the risk of injury to the head, face, or neck.⁴⁹ Our analysis of FARS data found that of the cyclist fatalities in crashes for which helmet use was reported in 2019, 80 percent of cyclists were not wearing helmets.⁵⁰

DOT Has Taken Steps to Improve National Data and Address Research Gaps

DOT has a variety of data improvement and research efforts underway to address the data and knowledge gaps discussed above and improve understanding of the behaviors influencing pedestrian and cyclist safety. Among the data improvement efforts, NHTSA has a formal process to update FARS annually with new data elements and attributes, which includes those data related to pedestrians and cyclists.⁵¹ Most recently, in 2019, NHTSA updated FARS to include a data element to collect information on pedestrian and cyclist distractions. However, as noted

⁴⁸D.C. Schwebel, D. Stavrinos, K.W. Byington, T. Davis, E.E. O’Neal, and D. de Jong, “Distraction and Pedestrian Safety: How Talking on the Phone, Texting, and Listening to Music Impact Crossing the Street,” *Accident Analysis and Prevention*, vol. 45 (2012) 266-271.

⁴⁹R. Elvik, “Publication Bias and Time-Trend Bias in Meta-Analysis of Bicycle Helmet Efficacy: A Re-Analysis of Attewell, Glase and McFadden, 2001,” *Accident Analysis & Prevention*, vol. 43 (2011) 1245-1251.

⁵⁰FARS data reported whether a cyclist was wearing a helmet in 76 percent of cyclist fatalities in 2019.

⁵¹According to NHTSA officials, NHTSA also has quality assurance and control checks to ensure accuracy of the data received from states.

previously, there are challenges in collecting behavioral data, such as on impact speed, impairment, and distraction.

Among the research efforts, our review of DOT documentation found that it is currently conducting or sponsoring 15 relevant research projects examining how road user behaviors affect pedestrian and cyclist safety, with the majority of this research expected to be completed by 2022. For example, NHTSA is reviewing existing research literature to improve the understanding of how pedestrian and cyclist behaviors affect traffic safety. This review, according to NHTSA, will serve as a resource for other federal agencies, state governments, advocates, researchers, and the public. Table 1 provides examples of DOT’s current data improvement and research efforts.

Table 1: Examples of the Department of Transportation’s (DOT) Data Improvement and Research Efforts Aimed at Better Understanding Behavioral Factors That Influence Pedestrian and Cyclist Safety

Behavioral factor(s) ^a	Project name	Project description
Data improvements		
Speed, Impairment, and Distraction	Fatality Analysis Reporting System (FARS)	Continuous process to improve data collected, such as the addition in 2019 of information on distractions that affected non-motorists, such as pedestrians and cyclists, in fatal motor vehicle crashes.
Prevalence of Walking and Cycling	Travel Monitoring Analysis System	Expands the Traffic Monitoring and Analysis System, an established traffic volume data system, so that it can serve as a national repository for pedestrian and bicycle volume data.
Research projects		
All Factors	State of Knowledge on Pedestrian and Bicyclist Safety	Reviews research literature on road user behaviors such as pedestrian and cyclist counts, exposure, distraction, alcohol and drug impairment, and vehicle travel speeds, among others.
Prevalence of Walking and Cycling	Safety in Numbers	Examines the concept that as more people walk and bike, the corresponding crash rate decreases.
Speed	Impact of Lowering Speed on Pedestrian and Bicyclist Safety	Assesses whether vehicle speed-reduction efforts contribute to pedestrian and cyclist crashes and injury severity.
Impairment	Drug and Alcohol Prevalence in Road Users in Serious and Fatal Crashes	Examines the prevalence of legal and illegal drugs in the bodies of seriously or fatally injured drivers and other crash-involved road users.
Distraction	Effect of Electronic Device Use on Pedestrian Safety	Assesses the extent to which the use of electronic distractors was involved in pedestrian and motor vehicle traffic crashes.

Source: GAO analysis of DOT information | GAO-21-405

^aBehavioral factors represent road user behaviors that affect pedestrian and cyclist safety. The behavioral factors were identified from prior work and do not represent a complete list of all behaviors that affect pedestrian and cyclist safety.

Selected States Implemented a Range of Behavioral Safety Projects, but NHTSA Could Take Steps to Provide Additional Information on Project Effectiveness

Selected States' Projects to Improve Pedestrian and Cyclist Safety Commonly Included Community Outreach and Enforcement Projects

We found that 2020 Highway Safety Plans for the 26 states, the District of Columbia, and Puerto Rico in our review supported similar types of educational and enforcement projects to promote safer road user behaviors and improve pedestrian and cyclist safety. States' projects may relate to specific behavioral factors influencing pedestrian and cyclist safety previously discussed—such as enforcing state or local traffic safety laws for helmet use or speed limits—or be more generally designed to improve driver awareness of pedestrians and cyclists.⁵² Those projects include community outreach programs, media campaigns, enforcement of pedestrian and cyclist safety laws, cyclist skills education, and law enforcement training (see fig. 6 through 10 for more information on the projects in the 28 plans we reviewed). These planned projects were to be

⁵²States and localities also develop and implement roadway improvement projects that may address the behavioral aspects identified previously in this report. For example, states and localities may reconfigure roadways to reduce speeds or improve lighting to enhance the visibility of all road users to one another. Within DOT, FHWA is primarily responsible for the funding and other support provided to states for these projects. While these projects may affect behaviors, for the purposes of this report, we do not consider them behavioral safety projects, which are the focus of NHTSA.

funded through NHTSA safety grants, as well other state and local funding sources.⁵³

Figure 6: Community Outreach on Pedestrian and Cyclist Safety

Twenty-six of the 28 selected Highway Safety Plans included community outreach projects focused on pedestrian and cyclist safety. For example, Maryland planned to use funds from the National Highway Traffic Safety Administration for a traveling educational exhibit featuring an interactive, virtual reality experience. The Street Smart Virtual Reality Challenge lets participants experience traffic scenarios frequently associated with crashes involving pedestrians and cyclists. Another state's Highway Safety Plan included a program to educate children and others about the importance of pedestrian and cyclist skills, the rules of the road, and personal safety.



Source: GAO analysis of state documents and photo from the Maryland Department of Transportation. | GAO-21-405

⁵³We reviewed Highway Safety Plans for the 26 states, the District of Columbia, and Puerto Rico (28 plans total) where pedestrian and cyclist fatalities make up 15 percent or more of highway fatalities. These states are also the states that were eligible for NHTSA 405(h) grants that target nonmotorized users. States that received these funds in 2020 were Alaska, Arizona, California, Colorado, Connecticut, Delaware, Florida, Georgia, Hawaii, Illinois, Louisiana, Maryland, Massachusetts, Michigan, Minnesota, Nevada, New Jersey, New Mexico, New York, Oregon, Pennsylvania, Rhode Island, South Carolina, Texas, Virginia, and Washington. The District of Columbia and Puerto Rico also received these grants. Education countermeasures aim to (1) raise awareness of a particular law or safety issue or (2) motivate a change in attitude or behavior that will have a positive effect on pedestrian and cyclist safety. Enforcement countermeasures aim to promote compliance with laws and regulations, (e.g., speed limits, rights-of-way, and use of crosswalks and bicycle facilities).

Figure 7: Media Campaigns to Promote Pedestrian and Cyclist Safety

Twenty of the 28 selected Highway Safety Plans reported developing media campaigns to promote pedestrian and cyclist safety. For example, California planned to spend \$1.25 million in funds from the National Highway Traffic Safety Administration on media campaigns to improve public awareness of pedestrian and cyclist safety. According to California's 2019 annual report, the "Pedestrians Don't have Armor" campaign was shown 77 million times across radio, outdoor, and digital media. Additionally, an official from the Maryland Department of Transportation told us it hopes to see a reduction in the number of crashes in the locations where its campaign featuring a pedestrian safety character known as, "Signal Woman," appeared.



Source: GAO analysis of state documents and photo from the California Office of Traffic Safety. | GAO-21-405

Figure 8: Enforcement of Pedestrian and Cyclist Safety Laws

Seventeen of the 28 selected Highway Safety Plans included enforcement of state pedestrian and cyclist safety laws. For example, Florida planned to spend \$500,000 of National Highway Traffic Safety Administration Non-Motorized grant funds to contract with law enforcement agencies to implement High Visibility Enforcement. These enforcement efforts are designed to improve public awareness and compliance with state laws, such as requirements that motorists stop for pedestrians in crosswalks or school zones. According to Florida's plan, this program is focused on areas with high numbers of crashes resulting in serious and fatal injuries to pedestrians and cyclists.



Source: GAO analysis of state documents and photo from the Florida Department of Transportation. | GAO-21-405

Figure 9: Skills Education for Cyclists

Twelve of the 28 selected Highway Safety Plans identified bicycle skills education for adult and children cyclists, often called “bicycle rodeos.” For example, one state’s Highway Safety Plan included bicycle rodeos for elementary, middle, and high schools, and for community groups, to boost compliance with state laws, decrease injuries, and ensure bicycle helmets were properly fitted and distributed to children in need. According to a different state’s Highway Safety Plan, it planned to fund an eight-week summer bike camp and after school bike programs run by the League of American Bicyclists.



Source: GAO analysis of state documents and photo from Intercity Transit’s Walk N Roll program in Olympia, Washington. | GAO-21-405

Figure 10: Law Enforcement Training for Pedestrian and Cyclist Safety

Seven of the 28 selected Highway Safety Plans identified projects to train law enforcement on state pedestrian and cyclist safety laws and city ordinances. For example, one state’s plan indicates that law enforcement officers will be trained to conduct “decoy operations”—in which police officers in plain clothes pose as pedestrians crossing the street while other hidden uniformed officers stop motorists who do not yield.



Source: GAO analysis of state documents and photo from the Florida Department of Transportation. | GAO-21-405

NHTSA's Countermeasures Guide Provides Some Useful Information to States, but NHTSA Could Take Additional Steps to Collect, Analyze, and Share Information on Project Effectiveness

NHTSA's *Countermeasures That Work* provides some useful information to help states select effective, science-based behavioral countermeasures for major highway safety problem areas, including pedestrian and cyclist safety.⁵⁴ According to NHTSA, the guide, while not comprehensive of every potential project, describes major strategies and countermeasures relevant to states and summarizes their use, proven effectiveness, costs, and implementation time. To use the guide, NHTSA advises states to identify problem areas—such as pedestrian and cyclist safety—through systematic data collection and analysis, and select countermeasures that either have been proven to be effective or have shown promise. We found that 38 of 52 Highway Safety Plans we reviewed cited *Countermeasures That Work* as a resource used to inform project selection using NHTSA grants.

NHTSA's Office of Behavioral Safety Research is responsible for developing and updating *Countermeasures That Work*, and it has traditionally done so on a 2-year publication cycle. The guide, first published in 2005, was most recently updated in 2018—its 9th edition. The 2nd edition of the guide, published in 2007, was the first to include pedestrian and cyclist countermeasures. To develop new editions of the guide, NHTSA officials told us they conduct a literature review and interview researchers and safety stakeholders to update their knowledge about safety countermeasures since the previous edition was published. The officials stated that to demonstrate the effectiveness of pedestrian and cyclist safety, research must show that countermeasures are effective in changing the number of crashes and fatalities and the behavior of drivers, cyclists, and pedestrians. According to the officials, they evaluate the studies captured in the literature review in several ways, including reviewing the qualifications of the researchers, the appropriateness of the methodology, and the quality of data used, and generalizability of the findings. NHTSA then assigns star ratings to indicate what is known about the effectiveness of each of the countermeasures.

Although *Countermeasures That Work* provides states with useful information on the known effectiveness of a wide range of countermeasures, only a small portion of the countermeasures in the

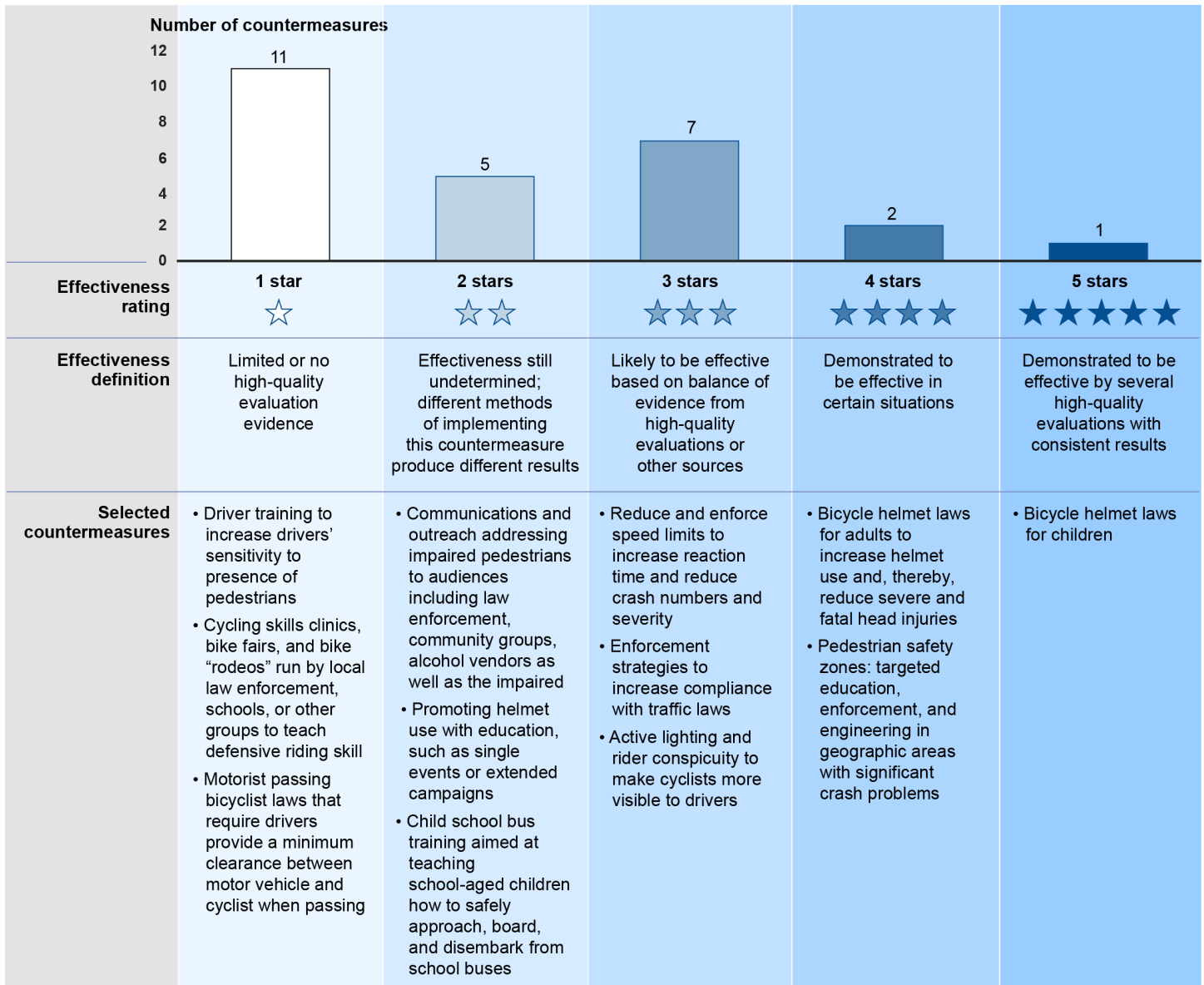
⁵⁴NHTSA helps states address behavioral factors that affect pedestrian and cyclist safety with a range of technical assistance, guides, and other resources. *Countermeasures That Work* is NHTSA's guide focused on identifying effective countermeasure projects states may consider including in Highway Safety Plans.

pedestrian and cyclist chapters of the guide are demonstrated to be effective.⁵⁵ The most recent edition of the guide includes a total of 26 countermeasures that are specific to pedestrian and cyclist safety and rates them on a scale from 1 to 5 stars, based on their demonstrated effectiveness (see fig. 11). These countermeasures are targeted to either pedestrian or cyclist safety and cover a range of issues known to affect safety such as reducing and enforcing driver speed limits or other traffic safety laws. However, only 3 of the 26 countermeasures achieve either a 4 or 5 star rating for their demonstrated effectiveness. Specifically, one countermeasure—bicycle helmet laws for children—was rated with 5 stars (demonstrated to be effective by several high-quality evaluations with consistent results). Two countermeasures—bicycle helmet laws for adults and pedestrian safety zones—were rated with 4 stars (demonstrated to be effective in certain situations).⁵⁶ The guide also includes seven countermeasures that are rated with 3 stars, indicating they are likely to be effective based on a balance evidence from high-quality evaluations or other sources.

⁵⁵The guide also includes chapters on topics such as speed management and impairment that are not specific to pedestrian and cyclist safety, but address factors that contribute to it.

⁵⁶The goal of pedestrian safety zones is to target education, enforcement, and engineering measures to the geographic areas and audiences where significant portions of the pedestrian crash problem exist, according to data.

Figure 11: Effectiveness Ratings of Behavioral Countermeasures for Pedestrian and Cyclist Safety in the Most Recently Published Version of *Countermeasures That Work*



Source: GAO analysis of NHTSA's *Countermeasures That Work*, 9th edition. | GAO-21-405

NHTSA has highlighted the importance of developing and refining effective countermeasures to meet its agency goals. Specifically, according to NHTSA's strategic plan, the highway safety grants programs

are designed to help states use evidence-based countermeasures to mitigate priority traffic safety issues in their jurisdictions by employing effective countermeasures with federal funding.⁵⁷ NHTSA's Office of Behavioral Safety Research directly supports this mission by providing the basis for the development of effective behavioral countermeasures to reduce traffic crashes through *Countermeasures That Work* and other research.⁵⁸ Furthermore, one important NHTSA activity is to develop and refine countermeasures to deter unsafe behaviors and promote safe alternatives. Specifically, NHTSA's 2020 Enterprise Risk Management Risk Register states that its safety programs should focus on areas where there have been increases in road deaths, including pedestrian fatalities, and that its efforts should be data-driven, evidence-based, timely, and complete, so it can develop and deploy effective countermeasures, among other actions.⁵⁹

We have also noted that federal agencies should communicate quality information to their stakeholders and monitor the effectiveness of agency activities to help achieve agency objectives. Specifically, *Standards for Internal Control in the Federal Government* state that entities should communicate the necessary quality information about its activities to external parties—such as Congress, states, and other stakeholders—so they can help the entity achieve its objectives and address risks. Quality information is appropriate, current, complete, accurate, accessible, and provided on a timely basis.⁶⁰ In addition, management should establish methods to monitor its activities to help achieve desired results and provide effective stewardship of public resources. Such methods include ongoing monitoring of regular management activities, as well as separate evaluations focused on the effectiveness of agency activities, at specific times depending on assessments of risks.

While NHTSA's guide provides some useful information for states, we found that information on pedestrian and cyclist safety countermeasures has limitations in several areas that could affect its usefulness to states in

⁵⁷NHTSA, *The Road Ahead; National Highway Traffic Safety Administration Strategic Plan, 2016-2020*, (Washington, D.C.: October 2016).

⁵⁸Department of Transportation, *NHTSA Annual Modal Research Plan* (April 2019).

⁵⁹Department of Transportation, National Highway Traffic Safety Administration, *Enterprise Risk Management Risk Register* (2020). This document identifies potential risks to achieving the agency's goals and objectives and identifies strategies to mitigate these risks.

⁶⁰[GAO-14-704G](#).

selecting effective countermeasures, as well as NHTSA's use of the guide as a tool to monitor the effectiveness of states' projects. Specifically:

- **Limited advancements in the known effectiveness of countermeasures over time.** Although NHTSA has refined and added to the information provided in *Countermeasures That Work* over the years, the number of pedestrian and cyclist safety countermeasures listed, as well as what's known about their effectiveness, has not substantially changed since they were first included in 2007. For example, the number of pedestrian and cyclist countermeasures rated 5-stars has not increased since the 2nd edition of the guide in 2007. NHTSA officials told us that there has not been substantial change because NHTSA's literature reviews are not finding new evaluations of countermeasures receiving 1 to 2 stars or evaluations of new countermeasures that would meet the criteria to receive 3 to 5 stars.
- **Limited or no information on some commonly implemented countermeasures.** *Countermeasures That Work* states that the guide attempts to provide information on countermeasures that are used most regularly by states. However, we found that the guide provides limited information about the effectiveness of some of the pedestrian and cyclist safety countermeasures commonly implemented by selected states. For example, although 20 of 28 selected states' Highway Safety Plans reported developing media campaigns, the guide does not include information on the effectiveness of such campaigns for pedestrians and cyclists or other information to inform states' selection of such projects.⁶¹ Several NHTSA regional officials told us they rely on *Countermeasures That Work* as a tool to assess the effectiveness of states' efforts. In their review of Florida's Highway Safety Plan, NHTSA regional officials noted that Florida spent a considerable amount of funds on media on pedestrian and cyclist safety. Recognizing the uncertain effectiveness of these efforts, the region suggested that some of these projects may need to be evaluated to ensure they improved highway safety behavior.
- **Limited contextual information on countermeasures' effectiveness.** *Countermeasures That Work* does not provide information on the circumstances in which the implementation of a countermeasure is most likely to be effective, or on how states could implement countermeasures concurrently with other projects to maximize effectiveness. Officials from California, Florida, Maryland,

⁶¹Additionally, the guide includes limited information on enforcement strategies for traffic safety laws aimed at improving cyclist safety.

and Washington told us that behavioral countermeasures are often most effective when they accompany infrastructure improvements. The guide acknowledges that effectiveness is likely to be increased when education is combined with appropriate infrastructure to facilitate safer interactions. However, the guide generally does not provide specific information to help states plan how to implement behavioral countermeasures with their infrastructure projects.⁶²

- **Delayed publication of revised editions.** NHTSA has previously revised *Countermeasures That Work* on a 1 to 2-year publication cycle, but the most recent revision with updated information has been delayed. NHTSA officials told us that they had planned on releasing the 10th edition of the guide in 2019 and that it would include strengthened introductions to the pedestrian and cyclist safety chapters as well as an updated countermeasure on motorists' safe-passing distances. However, officials told us that the 10th edition was in the final stages of review within DOT for much of 2020, and as of March 2021, the guide has yet to be released. NHTSA officials told us that while the 10th edition was under review, they were concurrently working on the 11th edition, intended for publication in 2021. While DOT has not provided information on when a 10th version will be released, the officials stated that they intend to revert to the 2-year cycle for future editions of the guide.

While some of these limitations are not directly attributable to NHTSA, the agency has efforts in place to begin to address them. For example, although NHTSA has a role in advancing behavioral safety research and supporting states in addressing safety issues, demonstrating the effectiveness of behavioral safety countermeasures requires substantial research that is often conducted by researchers outside of DOT. As such, NHTSA has an effort in place to synthesize existing pedestrian and cyclist safety research that could begin to address the limited advancements in countermeasures' effectiveness over time that we observed in *Countermeasures That Work*. Specifically, NHTSA officials told us they are developing a "State of Knowledge" report for pedestrians and cyclists that could help advance research on the known effectiveness of

⁶²NHTSA also published a document in 2016 called *A Primer for Highway Safety Professionals* that is intended to be a reference for an integrated and comprehensive effort to improve pedestrian and bicycle safety. This document provides some real world examples of how localities have combined engineering, education, and enforcement, but other than a discussion of the coordination of various entities and initiatives, it does not provide specific information on how to integrate infrastructure projects and behavioral countermeasures.

behavioral countermeasures, and potentially lead to more effective countermeasures over time. The *State of Knowledge* report is intended to be a comprehensive reference document for the federal government and states that objectively synthesizes existing research and provides a basis for sound policy decisions. According to NHTSA, this will be the first time NHTSA has catalogued the *State of Knowledge* for pedestrian and cyclist safety and the report is due to be complete in September 2021.⁶³

However, NHTSA has not taken other steps to collect and analyze information from states that could help NHTSA better monitor states' efforts, and lead to more useful information for states in selecting countermeasures. NHTSA has not taken these steps, in part, because it has focused efforts to review the effectiveness of states' implemented countermeasures on a state-by-state basis, rather than nationally. Specifically, although NHTSA's regional officials review and approve the countermeasures proposed in the highway safety plans for the states in their region, according to officials we interviewed, NHTSA has not taken the step to broadly track the range of pedestrian and cyclist safety projects implemented by states to identify which ones are most commonly implemented and what is known about their effectiveness. NHTSA officials told us that each state prepares an annual report of its highway safety activities that provides some information on the range of activities pursued by a state, but that NHTSA has not evaluated states' efforts more broadly to identify trends or patterns in which countermeasures states are commonly using. While NHTSA officials told us that its grant management software does not easily allow for this type of analysis, NHTSA regional office officials have more detailed knowledge of the countermeasure projects in the states in their region. This information could help NHTSA identify the range of countermeasures used by states and identify or share instances where states have innovated or successfully implemented countermeasures. Moreover, the information collected from states would be targeted and specific to the range of countermeasures used by states and could serve to complement the synthesis of pedestrian and cyclist safety research that the *State of Knowledge* report may provide.

In addition, NHTSA officials told us that NHTSA does not have a systematic process to identify which countermeasures should be focal points for NHTSA for future research or in updating the guide.

⁶³NHTSA has completed *State of Knowledge* reports in the past on other topics, such as alcohol impairment.

Specifically, NHTSA officials told us that while they focus their research on promising countermeasures, they do not maintain an inventory of countermeasures for future evaluation and research. NHTSA officials also told us that they cannot conduct research on all pedestrian and cyclist safety countermeasures due to staffing and funding constraints. Instead, NHTSA relies on states, localities, and researchers to conduct the research needed to show effectiveness of specific countermeasures, and provides states with guidance on how to do effective evaluations of its countermeasures. NHTSA officials stated that they encourage states to use and evaluate “innovative” countermeasures, as well as countermeasures receiving 3 stars, and if they are effective at changing behavior or safety outcomes, NHTSA will change the rating of the countermeasure in *Countermeasures at Work*. For example, a NHTSA official told us that the unreleased, draft 10th edition of *Countermeasures at Work* includes an updated countermeasure on motorist safe-passing distance for cyclists that was based on an evaluation conducted by one of the states. This suggests that states may have useful information on promising countermeasures for NHTSA to collect, analyze, and share more widely.

NHTSA has an opportunity to begin to address the limitations in the effectiveness of countermeasures aimed at improving pedestrian and cyclist safety. By taking steps to collect and analyze information on the range of behavioral safety countermeasures implemented by states, NHTSA would be better positioned to identify promising countermeasures for potential future research and advance what is known about behavioral countermeasures’ effectiveness. Moreover, by sharing the results of NHTSA’s information collection and analysis with states, states would have greater knowledge of the range of options available to them in selecting behavioral countermeasures to address their specific problem areas.

DOT Has Not Fully Used Performance Management Practices to Monitor Departmental Efforts to Improve Pedestrian and Cyclist Safety

We have previously reported that agency performance management is the ongoing monitoring and reporting of program accomplishments,

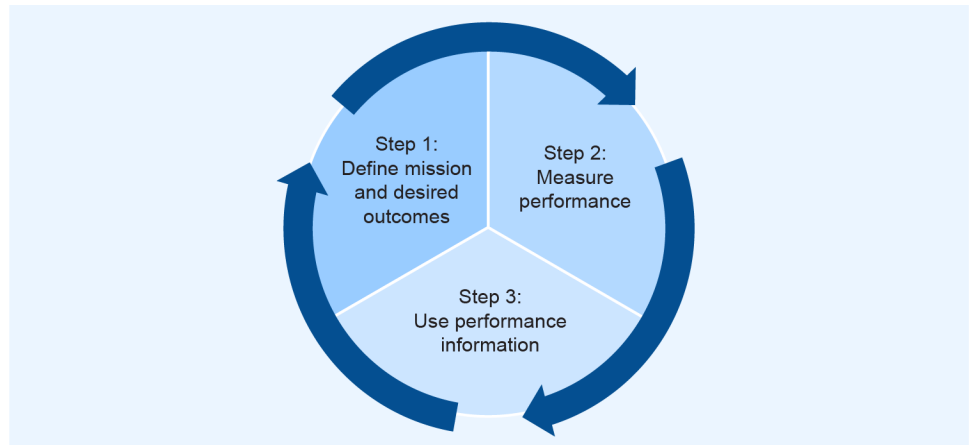
particularly toward pre-established goals.⁶⁴ Performance measurement allows organizations to track progress in achieving their goals and provides information to identify gaps in program performance and plan any needed improvements. We have also previously identified three key steps that help agencies achieve results.⁶⁵ These steps, and the practices agencies can use to effectively implement them, constitute an iterative process for managing performance (see fig. 12).

- **Step 1: Define Mission and Desired Outcomes.** Agencies' strategic plans, which serve as the starting point for performance-measurement efforts, should include mission statements, outcome-related strategic goals, and a description of how the agency intends to achieve those goals. Strategic plans, and associated management processes, are intended to be a starting point for an agency's performance measurement efforts and to help agencies effectively and efficiently alter activities and programs to meet their mission.
- **Step 2: Measure Performance.** Agencies should develop annual targets to measure performance at each organizational level, even when the link between federal efforts and desired outcomes may be difficult to establish. Performance measures should be linked directly to the offices that have responsibility for programs and provide a straightforward roadmap showing how daily activities contribute to strategic goals. Performance measures should tell each organizational level how well it is achieving its goals.
- **Step 3: Use Performance Information.** Agencies should use performance information to identify gaps between actual and expected performance, assess the effectiveness and efficiency of processes, and promote continuous improvement, in order to ensure that programs achieve their goals. Organizations that progress the farthest in results-oriented management apply the knowledge acquired when defining their mission and measuring performance to identify performance gaps and target resources to improve overall mission accomplishment.

⁶⁴GAO, *Executive Guide: Effectively Implementing the Government Performance and Results Act*, [GAO/GGD-96-118](#) (Washington, D.C.: June 1996). This guide defines a range of practices federal agencies can take to improve their overall performance.

⁶⁵[GAO/GGD-96-118](#). Within these three general steps, this guide provides additional key practices, such as stakeholder engagement, that help organizations achieve results.

Figure 12: Key Steps of Results-Oriented Performance Management



Source: GAO. | GAO-21-405

DOT's actions to improve pedestrian and cyclist safety incorporated some, but not all, of the performance management practices involved in implementing these steps. Specifically, DOT defined its safety mission and desired outcomes to improve pedestrian and cyclist safety. However, FHWA and NHTSA have not established performance measures to track the contributions of their efforts towards DOT's agency-wide goals. As such, DOT does not have complete performance information to help guide its actions to improve pedestrian and cyclist safety.

Define mission and desired outcomes. DOT has defined pedestrian and cyclist safety as a strategic part of its overall safety mission, set an associated overall goal, and described outcomes to achieve this goal in plans specific to pedestrians and cyclists. DOT's current strategic plan identifies safety as DOT's top mission, including for pedestrians and cyclists, and describes broad strategies related to addressing human behaviors, supporting infrastructure improvements, and conducting safety research, among others.⁶⁶ According to DOT officials, the plan is intentionally high-level and does not describe specific activities to provide flexibility for FHWA and NHTSA—where most pedestrian and cyclist activities are overseen—and other DOT modal administrations in carrying out their activities. DOT's annual performance plans set an outcome-

⁶⁶DOT, *U.S. Department of Transportation Strategic Plan for FY 2018-2022* (Washington, D.C.: February 2018).

related numeric goal for reducing pedestrian and cyclist fatalities.⁶⁷ Specifically, for 2020 and 2021, DOT set an annual performance goal of 2.10 pedestrian and cyclist fatalities per 100,000 population.⁶⁸ FHWA and NHTSA’s most recent strategic plans also reference pedestrian and cyclist safety and describe pursuing a systemic safety approach that integrates the interconnected factors that contribute to safety.⁶⁹

DOT has previously described how it intends to achieve its safety goals in plans specific to pedestrian and cyclist transportation. Most recently, DOT released a *USDOT Pedestrian Safety Action Plan (Action Plan)* in November 2020. The *Action Plan* lists current and near-term activities aimed at reducing pedestrian deaths and serious injuries (see table 2). DOT officials noted that the *Action Plan* focuses on pedestrians due to higher fatality numbers but includes activities that should improve cyclist safety as well.

Table 2: Examples of Current and Planned U.S. Department of Transportation (DOT) Pedestrian and Cyclist Safety Activities Identified in *USDOT Action Plan for Pedestrian Safety*, by DOT Component

DOT Component	Number of Activities Identified in Plan ^a	Examples of Activities
Federal Highway Administration	59	<ul style="list-style-type: none"> • Continue the Safe Transportation for Every Pedestrian program to help transportation agencies implement cost-effective countermeasures, such as pedestrian refuge islands and leading pedestrian intervals at crosswalks. • Conduct a global benchmarking study on pedestrian safety • Assess pedestrian and bicycle planning, design, and operations at certain intersection types

⁶⁷DOT, *FY2021 Performance Plan FY2019 Performance Report* (Washington, D.C.: 2020).

⁶⁸DOT’s overall agency priority goal relates to the overall highway fatality rate in terms of fatalities per 100 million vehicle miles traveled. For pedestrians and cyclists, DOT uses a different indicator, the fatality rate per 100,000 population. DOT officials noted that in the absence of better data on the prevalence of walking and biking, this indicator is the best available option. DOT officials also noted they have efforts underway to improve data on walking and biking that they hope will provide better options in the future.

⁶⁹FHWA, *Strategic Plan, 2019-2022* (Washington, D.C.: July 2018) and NHTSA, *The Road Ahead; National Highway Traffic Safety Administration Strategic Plan, 2016-2020* (Washington, D.C.: Oct. 2016). NHTSA’s strategic plan, developed in 2016, expired at the end of 2020. In January 2021, NHTSA officials said they expected to update the plan after the next DOT strategic plan is released in 2022.

DOT Component	Number of Activities Identified in Plan ^a	Examples of Activities
National Highway Traffic Safety Administration	31	<ul style="list-style-type: none"> Update <i>Countermeasures That Work</i> Develop a “National Pedestrian Safety Partnership Plan” targeted at reducing pedestrian fatalities in the next 10 years Identify discrepancies in how new pedestrian and cyclist facilities are designed to be used and actually used
Office of Secretary and other operating administrations within DOT	7	<ul style="list-style-type: none"> Develop and implement a data analytics and visualization dashboard using mobile device location data to understand exposure and risk Support <i>Our Roads, Our Safety</i> campaign to educate drivers, cyclists, and pedestrians on operational challenges of large trucks and buses

Source: GAO analysis of DOT documentation | GAO-21-405

^aDOT issued a plan in 2020 listing DOT pedestrian and cyclist safety activities either underway or planned for the near-term. Because some activities involve multiple DOT components, the sum of activities in this table exceed the total activities in the plan.

DOT has also described how it intends to achieve its pedestrian and cyclist safety goal through a prior plan and has another plan in development. In September 2016, in collaboration with NHTSA, FHWA published a *Strategic Agenda for Pedestrian and Bicycle Transportation (Strategic Agenda)*. This plan established a framework that described how FHWA’s and NHTSA’s pedestrian and cyclist activities aligned with defined goals.⁷⁰ The *Strategic Agenda* was intended to guide DOT’s efforts over 3 to 5 years (i.e., through 2021). FHWA and NHTSA officials said they did not implement all aspects of the *Strategic Agenda* after the presidential transition in 2017, but said they continued the elements related to safety and used the agenda as a point of reference. Looking to the future, FHWA officials told us they are now revisiting the *Strategic Agenda* and are considering next steps. Likewise, officials with FHWA’s Office of Safety and Office of Safety Research and Development said they are developing a strategic plan covering the pedestrian and cyclist activities within these offices’ purview.⁷¹ Officials expected this plan would be completed early 2021 and cover the next 5 years. These plans provide

⁷⁰FHWA, *Strategic Agenda for Pedestrian and Bicycle Transportation* (Washington, D.C.: Sept. 2016). FHWA organized the activities listed in the agenda into four categories—networks, safety, equity, and trips—to cover a range of topics related to building national capacity and promoting multimodal outcomes. The *Strategic Agenda* set an 80 percent reduction in pedestrian and cyclist fatalities and serious injuries within 15 years, and zero fatalities within 30 years, as goals.

⁷¹The Office of Safety manages the Safe Transportation for Every Pedestrian program and develops tools and technologies to improve pedestrian and cyclist safety including a guide for risk assessment and crash analysis.

DOT with a starting point to measure performance and, as warranted, make adjustments.

Measure Performance. Although DOT measures overall performance related to the department's pedestrian and cyclist safety goal, FHWA and NHTSA have not established performance measures for their pedestrian and cyclist safety efforts, including for the offices that are responsible for implementing programs and activities, as called for in performance management practices.

DOT has practices to measure overall performance toward its pedestrian and cyclist safety goal, and monitor states' progress toward their goals. Through its annual performance reports, DOT measured its performance and reported that it achieved its overall goal of 2.15 pedestrian and cyclist fatalities per 100,000 people in 2017, but, did not meet this target in 2018 when fatalities increased to 2.25 per 100,000 people, the most recent years for which reporting is available. DOT is also in the first years of requiring states to set goals and report progress pursuant to the Moving Ahead for Progress in the 21st Century Act.⁷² As previously noted, states are required to establish numeric targets annually for pedestrian and cyclist performance measures and submit annual reports to FHWA and NHTSA that assess progress toward achieving state targets in the previous reporting year. While this process is intended to measure an individual state's overall performance toward its defined goal, it does not measure the performance of specific FHWA and NHTSA activities to improve pedestrian and cyclist safety in DOT's *Action Plan*. DOT officials noted the department can support and encourage states to deploy countermeasures, but is limited in its ability to direct such deployments.

FHWA and NHTSA have not established performance measures in either their strategic plans or in the plans they have developed specific to pedestrians and cyclists that monitor their progress and provide a roadmap between their efforts and DOT's overall goal. For example, the *Action Plan* included near-term milestones for completion of activities, but does not include performance measures that define expected

⁷²MAP-21, Pub L. No. 112-141, §§ 1203, 31102(f), 126 Stat. 405, 524, 736 (2012).

outcomes.⁷³ Specifically, the plan identifies eight different elements of DOT's systemic safety approach—elements such as law enforcement, speed management, and roadway design—but does not delineate a way to measure whether FHWA, NHTSA, or the responsible program offices are producing results within each area. Similarly, the *Strategic Agenda* did include defined goals, but it did not establish a methodology to measure performance relative to these goals. While officials indicated they were revisiting the *Strategic Agenda* in 2021, this does not include efforts to develop such measures. Likewise, officials with FHWA's Office of Safety indicated there are no defined plans to include performance measures in their strategic plan under development.

FHWA and NHTSA have not defined performance measures because of difficulties attributing outcomes to any one activity and because pedestrian and cyclist plans were not developed based on performance management guidance. FHWA and NHTSA officials said that it is difficult to attribute safety outcomes (e.g., number of lives saved) to any one activity and that some activities may serve multiple purposes. For example, FHWA efforts to encourage the development of pedestrian and cyclist transportation networks are intended to improve mobility, and, by providing pedestrians and cyclists space separate from motor vehicles, increase safety. However, officials explained that it is hard to know the extent of these improvements. As a result, officials stated that they focus on broadly promoting countermeasures they understand to be effective to states and local governments rather than measuring the outcomes of their efforts. While it may be difficult to establish such links, we have previously noted that performance measures can take different forms, including output measures to assess the products and services delivered by a program or outcome measures to assess the results of those products and services.⁷⁴ Establishing the links between program activities and results can reinforce accountability and ensure managers keep in mind the outcomes the organization is striving to achieve. For example, FHWA's Safe Transportation for Every Pedestrian program seeks to help

⁷³In January 2021, DOT officials indicated that 25 of 30 activities were completed by the end of 2020, as expected in the *Action Plan*. These officials explained that incomplete projects had been affected by the COVID-19 pandemic or contractor issues, but were moving forward for completion in 2021. Further, they said that NHTSA and FHWA leadership are beginning planning for quarterly meetings that will include status updates and strategic decisions, but did not provide information on any performance measure approach.

⁷⁴GAO, *Performance Measurement and Evaluation: Definitions and Relationships*, [GAO-11-646SP](#) (Washington, D.C.: May 2011).

transportation agencies implement cost-effective countermeasures. By establishing measures to monitor states' use of these countermeasures or related outcomes, FHWA would have useful information to identify where to focus efforts to best help states achieve results.

Further, DOT did not establish its current *Action Plan* based on performance management practices. FHWA officials told us that they started developing the *Action Plan* in 2019 at the request of the FHWA administrator to provide a comprehensive picture of activities across DOT, particularly those expected to be completed in the near-term. The process to develop the plan was driven by input from FHWA and NHTSA leadership, according to officials involved in the process. FHWA officials stated that the plan's development was not guided by any formal guidance or standards, such as performance management practices. Consequently, the *Action Plan* does not articulate a method for measuring how well FHWA and NHTSA execute their responsibilities as delineated in the plan and, in turn, producing results in accordance with DOT's goals. The absence of performance measures for FHWA and NHTSA offices that are responsible for implementing pedestrian and cyclist safety programs and activities leaves managers without an important means to judge the efficacy of their programmatic efforts and the relative importance of each, and then link these outcomes to DOT's overall goal. Moreover, without performance measures for FHWA and NHTSA, DOT leadership does not have all the information needed to assess FHWA's and NHTSA's effectiveness and decide what to prioritize or modify to better meet DOT's mission.

Use Performance Information. DOT has used performance information to identify the need to improve pedestrian and cyclist safety and initiate high-level initiatives. However, because FHWA and NHTSA have not established their own performance measures, they have not used performance information to guide or make changes to these activities and promote continuous improvement, as called for in performance management practices. DOT has used some available performance information to understand the effects of federally-funded projects. For example, FHWA officials indicated that the *Action Plan* finalized in 2020 was initiated, in part, because the FHWA Administrator saw the deterioration in pedestrian safety reflected in DOT's missing the annual pedestrian and cyclist safety goal in 2018. Additionally, FHWA and NHTSA receive annual reports from states on their progress meeting state goals, as described above. Officials in FHWA division offices and NHTSA regional offices indicated they review this information to assess individual state performance and identify areas for improvements in those

states. However, because FHWA and NHTSA have not established performance measures for their efforts to improve pedestrian and cyclist safety, they cannot use the resulting information to assess the relative contributions of these efforts to improving safety. Given the range of different efforts underway and multi-faceted challenge of improving pedestrian and cyclist safety, such an approach does not enable DOT to make decisions about how to adapt or change activities and promote continuous improvements across the range of activities underway.

Conclusions

Reducing transportation-related fatalities and injuries is DOT's top priority, setting the strategic direction for NHTSA, FHWA, and DOT's other modal administrations. The continued increase in pedestrian and cyclist fatalities in recent years emphasizes the importance of understanding the many behavioral factors influencing this trend and identifying effective countermeasures to improve safety. However, limitations in the information on pedestrian and cyclist safety in NHTSA's *Countermeasures That Work* leave states and the NHTSA regions that support them without many demonstrated options to address behavioral safety in an increasingly challenging safety area. Nonetheless, due to its mission to advance safety knowledge through research and fund states' behavioral safety projects, NHTSA can act to address this challenge. By taking steps to collect and analyze information on states' use of behavioral safety countermeasures, NHTSA would have greater insight to help identify promising countermeasures for potential future research and advance knowledge on their effectiveness. In sharing the results of these analyses, NHTSA could help states make more informed decisions to improve safety.

The wide range of actions that FHWA and NHTSA have undertaken to address pedestrian and cyclist safety demonstrates DOT's commitment to improving the safety of road users. DOT's recently released *Action Plan* is a first step toward organizing the many activities underway into a coherent whole that works together to improve safety. However, the effectiveness of these efforts remains unclear because FHWA and NHTSA have not established performance measures for their efforts that demonstrate progress toward improved pedestrian and cyclist safety. Performance measures at the FHWA and NHTSA level would help ensure their efforts are aligned with and contributing to the department's overall safety goal. Without enhanced performance management practices to monitor the contributions of these efforts, DOT will continue to lack thorough performance information necessary to improve its efforts and ensure their various pedestrian and cyclist safety activities are resulting in expected improvements in safety.

Recommendations for Executive Action

We are making three recommendations, including two to NHTSA and one to FHWA:

The NHTSA Administrator should take steps to collect information on the range of countermeasures implemented by states and analyze that information to help advance what is known about countermeasures' effectiveness and then share results with states. (Recommendation 1)

The NHTSA Administrator should more fully use performance management practices to guide its pedestrian and cyclist safety activities, such as (1) by developing performance measures for NHTSA and the program offices responsible for implementing pedestrian and cyclist safety activities to demonstrate how these activities contribute to safety goals, and (2) by using performance information to make any necessary changes to advance pedestrian and cyclist safety efforts. (Recommendation 2)

The FHWA Administrator should more fully use performance management practices to guide its pedestrian and cyclist safety activities, such as (1) by developing performance measures for FHWA and the program offices responsible for implementing pedestrian and cyclist safety activities to demonstrate how these activities contribute to safety goals, and (2) by using performance information to make any necessary changes to advance pedestrian and cyclist safety efforts. (Recommendation 3)

Agency Comments and Our Evaluation

We provided a draft of this report to DOT for comment. We received written comments from DOT, which are reproduced in appendix II and summarized below. DOT concurred with the first recommendation and partially concurred with the two other recommendations. DOT also separately provided technical comments, which we incorporated as appropriate.

In its written comments to our draft report, DOT concurred with our first recommendation and stated that FHWA and NHTSA will collect information on state and local use of countermeasures and assess smaller-scale changes in safety outcomes that could demonstrate the level of effectiveness. We are encouraged by this response, and note that by sharing the results of these analyses with states, as we have recommended, DOT could help states make more informed decisions to improve safety.

Nonetheless, in its written comments, DOT expressed concern that our analysis emphasized 4 and 5 star countermeasures and not 3 star countermeasures. However, our draft report noted that the most recent version of *Countermeasures That Work* included seven countermeasures rated as 3 stars, which NHTSA defines as “likely to be effective based on balance of evidence from high quality evaluation of other sources.” In response to DOT’s comment, we included additional information provided by DOT in its technical comments which stated that NHTSA encourages states to use and evaluate innovative countermeasures, as well as countermeasures receiving 3 stars, and if they are effective at changing behavior or safety outcomes, NHTSA will change the rating of the countermeasure in *Countermeasures That Work*. In addition, DOT’s written comments expressed concern that some contents of our draft report may inadvertently suggest that pedestrians were to blame for being struck by vehicles. We revised the final report to more clearly focus on how the behaviors of pedestrians, cyclists, and drivers affect crash risk, which is distinct from questions of culpability.

In its written comments, DOT partially concurred with our second and third recommendations. DOT agreed that performance management is important to the department’s pedestrian and cyclist safety programs but also highlighted the difficulty of directly linking federal efforts, such as training, with safety improvements. As such, DOT stated that it will review available evaluation metrics and data and explore their use as part of a comprehensive performance management framework. According to DOT, this framework will consider output measures that are directly linked to DOT’s national pedestrian and bicyclist safety efforts, and use safety outcome data to inform how to shape pedestrian and cyclist safety programs. As noted in our report, we recognize the difficulty in attributing safety outcomes (e.g., number of lives saved) to any one activity and that some activities may serve multiple purposes. We also note that performance measures can take different forms, and that establishing the links between program activities and results can reinforce accountability and ensure managers keep in mind the outcomes the organization is striving to achieve. DOT’s stated plan for FHWA and NHTSA to examine the use of a performance measurement framework focused on leveraging and refining effective program activities could be a useful first step in developing performance measures that demonstrate how their activities contribute to safety goals. Without such measures, FHWA and NHTSA will continue to lack performance information necessary to improve their efforts and ensure their various pedestrian and cyclist safety activities are resulting in expected improvements in safety. As such, we believe FHWA and NHTSA should fully implement our recommendations.

We are sending copies of this report to the appropriate congressional committees, the Secretary of Transportation, and other interested parties. In addition, the report is available at no charge on the GAO website at <http://www.gao.gov/>.

If you or your staff have any questions about this report, please contact me at (202) 512-2834 or RepkoE@gao.gov. Contact points for our Offices of Congressional Relations and Public Affairs are on the last page of this report. GAO staff who made major contributions to this report are listed in appendix III.

Sincerely yours,

A handwritten signature in black ink that reads "Elizabeth Repko". The signature is written in a cursive style and is followed by a long horizontal line that extends to the right.

Elizabeth Repko
Acting Director, Physical Infrastructure

Appendix I: Objectives, Scope, and Methodology

Our objectives were to (1) describe what is known about how road users' behaviors affect pedestrian and cyclist safety; (2) describe selected states efforts to influence road users' behaviors to improve pedestrian and cyclist safety, and evaluate the extent to which the National Highway Traffic Safety Administration's (NHTSA) countermeasure guide provides information to help states select effective pedestrian and cyclist behavioral safety projects; and (3) assess the extent to which the Department of Transportation (DOT) used key performance management practices to help ensure its activities contribute to pedestrian and cyclist safety improvements.

To describe what is known about how road users' behaviors affect pedestrian and cyclist safety, we analyzed 2019 data (the most recent year of data available at the time of our review) from NHTSA's Fatality Analysis Reporting System (FARS). FARS provides uniformly coded, national census data on police-reported fatal motor vehicle traffic crashes within the 50 states, Puerto Rico, and the District of Columbia. Our analysis focused on pedestrian and cyclist fatalities, rather than injuries, because NHTSA's data on pedestrian and cyclist injuries is less comprehensive than its data on fatalities.¹ We analyzed FARS data to determine the total number of pedestrian and cyclist fatalities that involved behavioral factors. We focused our analysis on behaviors that were identified in prior work as influencing pedestrian and cyclist safety: driver speed, alcohol or drug use, and distraction.² However, we also included additional behaviors that may affect pedestrian and cyclist safety—such as helmet use—as identified through academic research and knowledgeable stakeholders we interviewed, as described below. We also analyzed FARS data on the number of pedestrian and cyclist fatalities by victims' demographic attributes—such as age, sex, and race. To assess the reliability of the FARS data, we reviewed relevant documentation and spoke with agency officials about data quality control procedures. We determined that the data were sufficiently reliable to provide an overview of pedestrian and cyclist fatality characteristics. In addition to the behaviors identified above, we also focused our analysis on the prevalence of walking and cycling; this factor was likewise identified in prior work. To describe the estimated number of people

¹For additional information on pedestrian injury data collected by NHTSA see GAO, *Pedestrian Safety: NHTSA Needs to Decide Whether to Include Pedestrian Safety Tests in Its New Car Assessment Program*, [GAO-20-419](#) (Washington, D.C.: Apr. 23, 2020).

²See GAO, *Pedestrians and Cyclists: Cities, States, and DOT Are Implementing Actions to Improve Safety*, [GAO-16-66](#) (Washington, D.C.: Nov. 19, 2015) and [GAO-20-419](#).

walking or cycling to work from 2010 through 2019, we analyzed data from the U.S. Census Bureau's American Community Survey. To assess the quality of the survey data, we reviewed relevant documentation. We determined that the data were sufficiently reliable to provide a high-level overview of the reported prevalence of people walking and biking.

We also reviewed relevant documents, reports, and studies to better understand research related to the road users' behaviors affecting pedestrian and cyclist safety. This information was selected based on a literature search and interview referrals, among other sources. We used this information to provide context to the behavioral factors previously identified. In addition, we interviewed NHTSA and Federal Highway Administration (FHWA) officials to gather additional information about pedestrian and cyclist safety data and research. We also interviewed 10 academic researchers, associations, safety organizations, and advocacy groups, and officials from 4 states, discussed below, with expertise in pedestrian and cyclist safety for additional information on road user behaviors. These stakeholders were selected based on referrals from DOT and initial interviewees, and the relevance of the organization's mission to this topic. To determine the actions taken by DOT to help improve understanding of how road users' behaviors affect pedestrian and cyclist safety, we reviewed documentation of DOT's current and planned research. Additionally, we interviewed officials from FHWA and NHTSA about actions to improve data and research in this area.

To understand selected states' efforts to improve pedestrian and cyclist safety, we reviewed federal grant programs, as well as federally required Highway Safety Plans—which show how states plan to use NHTSA funds—for fiscal year 2020 for 50 states, the District of Columbia, and Puerto Rico. We specifically analyzed the countermeasures identified in the Highway Safety Plans of the 26 states, the District of Columbia, and Puerto Rico (28 plans in total) in which pedestrian and cyclist fatalities made up 15 percent or more of highway fatalities.³ We interviewed NHTSA officials at headquarters and in four regional offices supporting the four states we selected for interviews with state transportation officials: California, Florida, Maryland, and Washington. We also interviewed officials from the FHWA Division Offices in the four selected states. We selected these states because they were among those with

³These are also the states eligible for NHTSA grants to improve the safety of nonmotorized road users, including pedestrians and cyclists, known as NHTSA 405(h) grants. 23 U.S.C. § 405(h).

the highest numbers and rates of fatalities by state population from 2015 through 2017, as well as due to geographic diversity considerations.⁴ The four selected states provide illustrative examples of state actions but are not intended to be representative of all state or local efforts.

To evaluate the extent to which NHTSA's countermeasure guide provides information to help states select effective pedestrian and cyclist behavioral safety projects, we reviewed DOT documents, including the 2017 (most recent) and previous editions of NHTSA's *Countermeasures That Work* guide, which is intended to help states select effective behavioral countermeasures for major highway safety problem areas, including pedestrian and cyclist safety.⁵ We interviewed state transportation officials in the four selected states about their use of the guide. We also interviewed NHTSA officials to discuss how NHTSA updates *Countermeasures That Work* and compared information in the guide related to pedestrian and cyclist safety to federal internal control standards.⁶ We determined that the information and communication and the monitoring components of internal controls were significant to this objective, along with the underlying principles that management should use quality information and perform monitoring activities to help achieve desired results. We assessed NHTSA's guide to determine whether it helps to achieve objectives. We also compared information in NHTSA's guide to NHTSA's Enterprise Risk Management Risk Register for 2020, which identifies potential risks to achieving NHTSA's goals and objectives and strategies to mitigate them. We also interviewed state transportation officials in the four states noted above about their use of *Countermeasures That Work*. We interviewed NHTSA regional officials about how NHTSA works with states to develop required Highway Safety Plans and on pedestrian and cyclist safety efforts. We reviewed

⁴The 2018 data were not available at the time of our state selection. We used data from the most recent 3 years available to get more accurate understanding of the prevalence of pedestrian and cyclist fatalities since the numbers of these fatalities, especially in less populated states, could be very small (i.e., less than 10 in a single year) and data from a single year could be skewed by a major one-time event.

⁵C. M. Richard, K. Magee, P. Bacon-Abdelmoteleb, and J.L. Brown, National Highway Traffic Safety Administration, *Countermeasures That Work: A Highway Safety Countermeasure Guide for State Highway Safety Offices, Ninth Edition, 2017*, Report No. DOT HS 812 478 (Washington, D.C.: April 2018).

⁶GAO, *Standards for Internal Control in the Federal Government*, [GAO-14-704G](#) (Washington, D.C.: September 2014).

documentation of NHTSA reviews of selected states Highway Safety Plans for fiscal year 2020.

To assess the extent to which DOT used key performance management practices to ensure its activities contribute to pedestrian and cyclist safety improvements, we reviewed relevant DOT documentation, including DOT, FHWA, and NHTSA strategic plans; annual performance plans and reports; and plans specific to pedestrian and cyclist safety and activities. We also reviewed reports provided by states to DOT on the results of federally supported state activities. To understand how DOT developed and used these plans, we interviewed officials from DOT's Office of the Secretary, NHTSA, and FHWA. We compared the information we gathered to key steps and practices for effective performance management identified in our prior work.⁷ These steps and practices help ensure that an organization has a defined mission and goals, measures performance, and uses performance information to achieve results.

We conducted this performance audit from December 2019 to May 2021 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

⁷GAO, *Executive Guide: Effectively Implementing the Government Performance and Results Act*, [GAO/GGD-96-118](#) (Washington, D.C.: June 1996).

Appendix II: Comments from the Department of Transportation



U.S. Department of
Transportation
Office of the Secretary
of Transportation

Assistant Secretary
for Administration

1200 New Jersey Avenue, SE
Washington, DC 20590

May 3, 2021

Elizabeth Repko
Director, Physical Infrastructure Issues
U.S. Government Accountability Office (GAO)
441 G Street, NW
Washington DC 20548

Dear Ms. Repko:

Reducing traffic fatalities and serious injuries is the top priority for the National Highway Traffic Safety Administration (NHTSA) and the Federal Highway Administration (FHWA). Working jointly, NHTSA and FHWA developed the *USDOT Pedestrian Safety Action Plan* using a safe system approach to create a framework for the Department's comprehensive efforts to address the safety of people who walk and bike. The action plan lays out a clearly defined path that encompasses infrastructure design to reduce conflicts between vehicles and pedestrians and provide safe places for people to walk, vehicle safety, research, enforcement and judicial solution, data collection and analysis, and education and outreach. The breadth and scope of these actions will result in a safe system that incorporates safer roads, safer speeds, safer vehicles, and safer road users.

NHTSA and FHWA continue their efforts to improve pedestrian and bicyclist safety by:

- Continuing to update the *Countermeasures That Work* in accordance with the available scientific knowledge and to promote the countermeasures to assist States and communities in addressing their traffic safety needs;
- Prioritizing and emphasizing noteworthy practices with the help of Federal, State and local partners and safety advocates to develop innovative countermeasures;
- Conducting in-depth research to enhance the state of the knowledge for the safety of people who walk and bike, including exposure on people who walk and bike;
- Performing research and demonstration projects to explore promising methods to improve safety for people who walk and bike;
- Collecting data, leveraging new technologies and resources, providing outreach and education, and identifying additional needs to enhance the safety of people who walk and bike;
- Assisting State Offices of Highway Safety and State Departments of Transportation in establishing annual data-driven and evidence-based performance targets for pedestrian and bicyclist fatalities, requiring States to make adjustments in upcoming Highway Safety Plans if they do not meet those targets, and providing ongoing technical assistance to States to ensure that activities are based on State and community-specific problem identification;

Appendix II: Comments from the Department of Transportation

- Ensuring States' annual pedestrian and bicyclist performance targets are more accessible and transparent to the public by posting this information on NHTSA.gov¹ and FHWA.DOT.gov;² and
- Revising and strengthening the Strategic Agenda for Pedestrian and Bicycle Transportation.

The Department wishes to express concern over some of the report contents that may inadvertently suggest that pedestrians are to blame for being struck by vehicles. For example, the report's statement, "Exposure to crash risk can vary based on when people choose to walk or bike" suggests that people have a choice between safety and mobility. While it might not be the report's intention, we believe that characterization is counter to a safe system approach.

Upon review of the GAO's draft report, we concur with Recommendation 1 that NHTSA "take steps to collect information on the range of countermeasures implemented by states and analyze that information to help advance what is known about countermeasure effectiveness, and then share results with states." However, we remain concerned that in its analysis of NHTSA's *Countermeasures That Work*, GAO emphasized 4 and 5-star effectiveness ratings of performance and cyclist safety behavioral countermeasures. The definition of the 3-star effectiveness rating is "likely to be effective based on balance of evidence from high quality evaluation of other sources." NHTSA considers these 3-star countermeasures as highly promising in potentially preventing pedestrian and bicyclist crashes, and they should be considered effective countermeasures.

We partially concur with Recommendations 2 and 3, to NHTSA and FHWA respectively, to "more fully use performance management practices to guide its pedestrian and cyclist safety activities." GAO recommends that NHTSA and FHWA and the Agencies' program offices responsible for implementing pedestrian and cyclist safety activities more fully use performance management practices to guide pedestrian cyclist safety activities, such as developing performance measures to demonstrate how activities contribute to safety goals, and using performance information to make changes that advance agency efforts. We agree that a performance management system is important to guide the Department's pedestrian and bicyclist safety programs. As noted in the report, the link between federal efforts and desired outcomes may be difficult to establish, and program outcomes are strongly influenced by State, local, and other safety stakeholders, as well as external factors beyond transportation such as the economy. The direct causal relationships linking federal efforts such as training delivery with desired safety outcomes, reducing pedestrian and bicyclist fatalities and serious injuries, are therefore hard to measure. The Department is committed to improving the safe mobility of people who walk and bike and we will continue to act in support of this portion of our safety mission. Because of the difficulties in measuring exposure and the direct association of agency deployment of individual projects to a measurable safety outcome, we wish to move forward in a way that helps us improve safety.

For example, NHTSA and FHWA will collect information on State and local use of

¹ <https://www.nhtsa.gov/highway-safety-grants-program/state-performance-targets>

² https://safety.fhwa.dot.gov/hsip/spm/state_safety_targets/

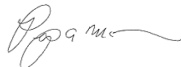
**Appendix II: Comments from the Department
of Transportation**

countermeasures and will assess smaller-scale changes in safety outcome that could demonstrate the level of effectiveness. In addition, NHTSA and FHWA will examine the use of a performance measurement framework focused on leveraging and refining effective program activities, and use safety outcome data to inform how to shape pedestrian and cyclist safety programs.

Such an approach would add value and enhance existing mechanisms to promote State decision making and accountability. To do so we will review the evaluation metrics and data that are currently available and explore how we can use them meaningfully as part of a comprehensive performance management system. The framework will consider measures of output that are directly linked to our national pedestrian and bicyclist safety efforts, which include areas within our statutory and programmatic authorities: training activities, peer exchanges, technical assistance, implementation guides for proven safety countermeasures, and other resources to facilitate implementation of our programs. National safety outcome information and State performance targeting data will also serve as an input to how to modify activities and Agencies' outputs to more effectively advance safety. This approach will allow NHTSA and FHWA to continue to evaluate promising practices and improve the science behind their programs as they consider how best to implement effective performance measures.

We will provide a detailed response to each recommendation within 180 days of the final report's issuance. We appreciate the opportunity to respond to the GAO draft report. Please contact Madeline M. Chulumovich, Director, Audit Relations and Program Improvement, at (202) 366-6512 with any questions or if you would like to obtain additional details.

Sincerely,



Philip A. McNamara
Assistant Secretary for Administration

Appendix III: GAO Contact and Staff Acknowledgments

GAO Contact

Elizabeth Repko, at (202) 512-2834 or RepkoE@gao.gov

Staff

Acknowledgments

In addition to the contact named above, Matt Barranca (Assistant Director); John Stambaugh (Analyst in Charge); Carl Barden; Sharon Dyer; Michelle Everett; Gina Hoover; Andrea Levine; Regina Morrison; Natasha Oliver; Josh Ormond; Cheryl Peterson; Laurel Voloder; Michelle Weathers; and Chris Zakroff made key contributions to this report.

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