Traffic Safety for Older People – 5-Year Plan

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LIST OF ACRONYMS AND ABBREVIATIONS

AAAM	Association for the Advancement of Automotive Medicine
AIS	Abbreviated Injury Scale
CAT	Computed Axial Tomography
CIREN	Crash Injury Research and Engineering Network
DMV	Department of Motor Vehicles
EMS	Emergency Medical Services
FARS	Fatality Analysis Reporting System
GTR	Global Technical Regulation
HSPG	Highway Safety Program Guideline
IARV	Injury Assessment Reference Values
NASS CDS	National Automotive Sampling System Crashworthiness Data System
NASS GES	National Automotive Sampling System General Estimates System
NCAP	New Car Assessment Program
NCSA	National Center for Statistics and Analysis
NEMSIS	National EMS Information System
PCAM	Pedestrian Crash Avoidance/Mitigation
PMHS	Post-mortem human subject
SAFETEA-LU	Safe, Accountable, Flexible, Efficient Transportation Equity Act – A Legacy for Users
SCI	Special Crash Investigation

EXECUTIVE SUMMARY

This document is intended to serve as the plan for National Highway Traffic Safety Administration activities to address traffic safety concerns of older people. Given the increasing proportion of older people in the population, NHTSA must work in conjunction with its partners to provide evidence-based countermeasures to reduce risk to older – and all – road users.

The plan is broken down into three time periods. The initial period covers current work and projects scheduled within the next 2 years. The second period covers work scheduled for 3 to 5 years from the initiation of this plan. The final and extended period of this plan covers the outputs occurring beyond 5 years from the initiation of this plan. NHTSA may, based on data, research findings and resources, modify its approach.

NHTSA recognized the need to define "older" in developing and executing a plan to improve the safety of older road users. The plan includes diverse efforts to evaluate ages at which risk increases in terms of injuries and of driver performance decrements associated with increased crash risk.

The plan also has four core elements, each with a set of issues -- data, vehicle, behavior and pedestrian safety. The plan first addresses data needs. NHTSA has a number of databases in place to support some of the problem identification or analyses related to older adults. This plan recommends leveraging the current safety databases to analyze the issues detailed in this plan. In addition, the plan recommends continuing to identify future data needs in the areas of crash causation, not-in-traffic surveillance, and adaptive equipment.

The plan's vehicle safety section emphasizes improvements to vehicle safety and defines what can be done to improve safety given the physical limits and capacities of older occupants. The main concerns that NHTSA identified are fragility and frailty. The plan addresses what can be done at the vehicle level to address these issues.

The behavior section emphasizes older drivers' age-related functional changes, including those in vision, strength, flexibility, and cognition that can undermine a driver's performance. This portion of the plan explores ways to identify risky drivers and either provide training or other support so that they can continue to drive safely despite their limitations or get them to stop driving while addressing their mobility needs and quality of life. This section also discusses providing older driver safety information to older adults, their family members, medical professionals, licensing agencies, and others who can promote safety in this population. The plan addresses what can be done at the behavioral level to address these issues.

Many of the issues and concerns discussed in the vehicle safety, data, and behavior sections of this plan apply to older pedestrians. Fragility and frailty are large concerns, so the core of this section is preventing crashes. NHTSA seeks to enhance older pedestrians' safety through approaches including technology interventions, improved data, and education for pedestrians as well as drivers.

With respect to crash avoidance technologies that may aid older drivers, NHTSA announced in its May 2013 Preliminary Statement of Policy Concerning Automated Vehicles that it is pursuing three distinct but related streams of technological change and development simultaneously for: (1) in-vehicle crash avoidance systems that provide warnings and/or limited automated control of safety functions; (2) Vehicle-to-Vehicle (V2V) Communications that support various crash avoidance applications; and (3) self-driving vehicles. While this research may result in technologies that have benefits for all drivers, there may be additional benefits for older drivers that further reduce their crash risk and/or reduce the forces from a crash that are more harmful to the older occupant or pedestrian given their increased fragility and frailty.

Specific to in-vehicle crash warning systems, NHTSA's research has focused on driver assistance systems that can help drivers of any age, including older drivers.   As a result we are now featuring two of the most promising crash warning systems, Forward Crash Warning (FCW) and Lane Departure Warning (LDW), in our New Car Assessment Program (NCAP).   NHTSA's also performing research on how drivers react and adapt to these crash warning systems.

Additional research is looking at even more advanced systems, such as automatic braking technology, which will assist any driver in certain circumstances and may prevent or reduce the severity of a rear-end crash and these may be particularly important for drivers whose reaction time may have slowed due to age or other causes.   Also, pedestrian crash avoidance technologies may significantly reduce the frequency of pedestrian fatalities, which will have benefits for both older drivers and older pedestrians.   Ultimately, if self-driving cars become a reality, they may greatly enhance the safety and mobility of older drivers.This strategic plan is intended to be a dynamic guide rather than a static statement. Concerns raised here will be addressed in accordance with NHTSA priorities and available resources. In the years ahead, NHTSA will revisit and adjust this approach in response to new information and emerging issues that impact the safety of older drivers, occupants, and pedestrians.

This strategic plan is intended to be a dynamic guide rather than a static statement. Concerns raised here will be addressed in accordance with NHTSA priorities and available resources. In the years ahead, NHTSA will revisit and adjust this approach in response to new information and emerging issues that impact the safety of older drivers, occupants, and pedestrians.

INTRODUCTION AND BACKGROUND

The post-World War II baby boom generation in the United States is now revealing itself as an increasing population of older adults. Shifts in the age distribution of the population in the coming decades will result in more drivers, passengers, and pedestrians who are 65 and older (see Figure 1). With current life expectancy in this country nearing 80 years on average, and advances in medical science, older Americans are staying mobile and active longer. Those who will reach 65 in the coming decade have been projected to drive more miles and are expected to continue driving later in life than previous generations. This increasingly active and mobile older population gives rise to the need to enhance their safety, and the safety of all road users, while addressing their mobility needs and quality of life.
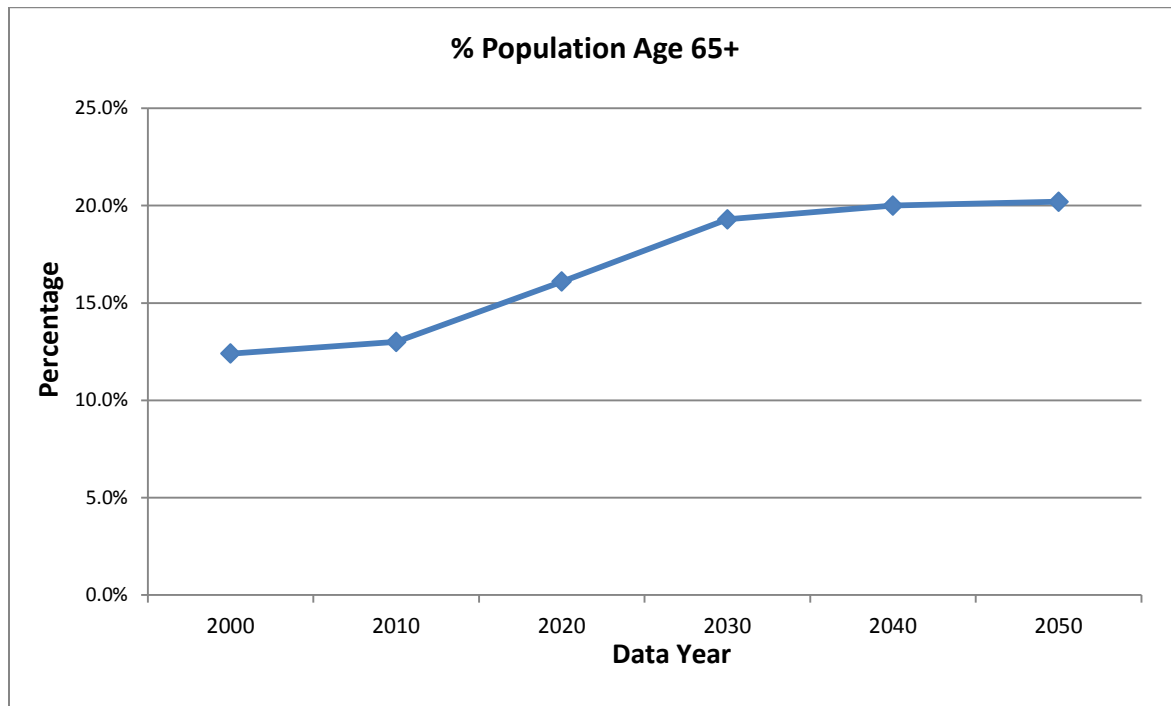

Figure 1. Increasing percentage of the population 65 and older, based on Census Bureau data.

Although older people of today are more mobile than past generations, they are still at a disadvantage compared to younger people when it comes to their ability to tolerate injury. Aging results in increased fragility and frailty. Fragility in this report refers to the increased likelihood of being injured in a crash, or one's ability to tolerate a physical insult. Frailty is the diminished ability to recover from injuries and resume the level of daily life activity one enjoyed prior to being injured. As Figure 2 illustrates, people 65 and older represented about 12 percent to 13 percent of the population between 2000 and 2011; however, they represented 14 percent to 17 percent of crash fatalities. Further, vehicle improvements that have reduced crash fatalities overall may not provide equal benefits for the oldest occupants.

Figure 3 shows that, while the total fatal crash count declined a great deal between 2005 and 2011, the decline was quite modest for people 65 and older and has plateaued since

approximately 2009. Taken together, Figures 1, 2, and 3 suggest that we can expect an increase in both the percentage and number of fatalities among older people in the coming years as the proportion of older people rises within the overall population.
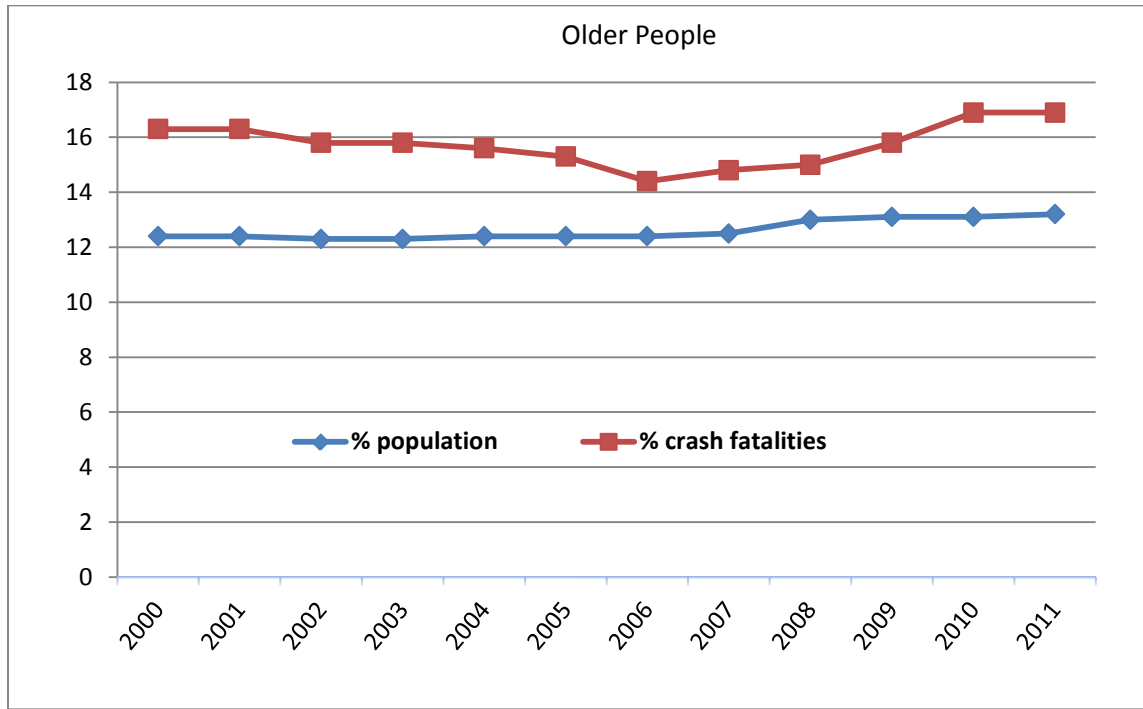

Figure 2. People 65 and older as a proportion of the population and of crash fatalities, based on Census Bureau and FARS data.
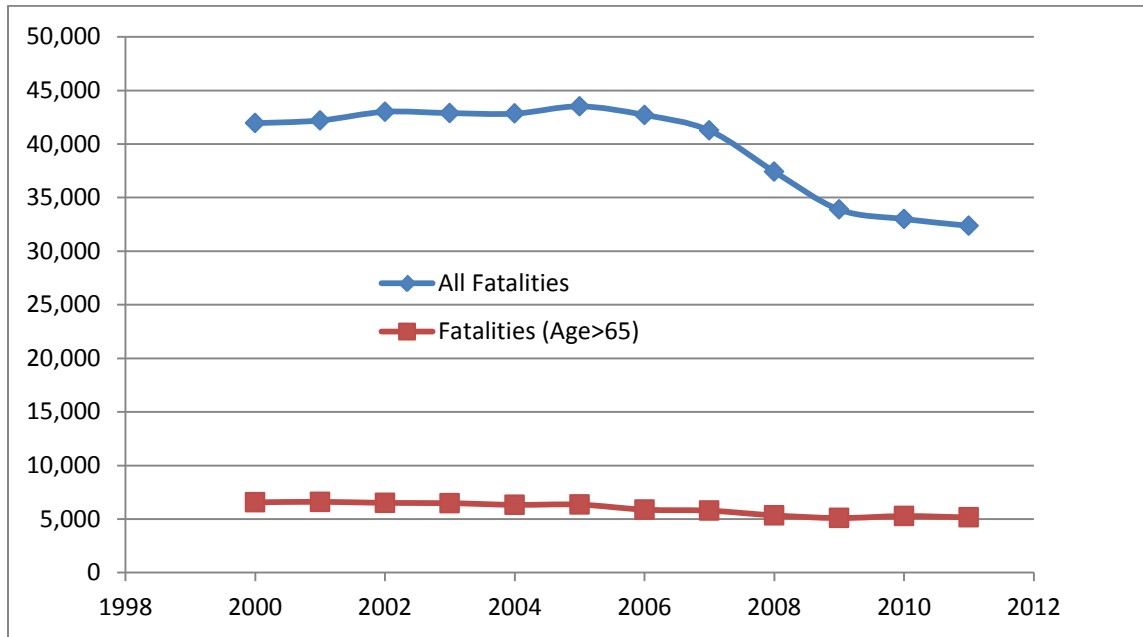

Figure 3: Total fatalities for all ages, and for those 65 and older, based on FARS data.

According to the National Automotive Sampling System Crashworthiness Data System, a representative sample of U.S. towaway crashes, in 2001 to 2011, about 6.3 percent of the 39 million occupants involved in on-trafficway passenger vehicle towaway crashes received at least moderate injuries, where moderate injury is defined using the Abbreviated Injury Scale (AIS) developed by the Association for the Advancement of Automotive Medicine (AAAM). The AIS has a severity scale of 1 to 6, with a score of 1 indicating a minor injury such as a contusion or abrasion to the skin, a score of 2 indicating a moderate injury such as the fracture of a bone or contusion of an internal organ, and so on, up to a score of 6 that indicates an injury that is maximal in severity. The highest percentage of the injured occupants in these crashes were teens and young adults (Figure 4).
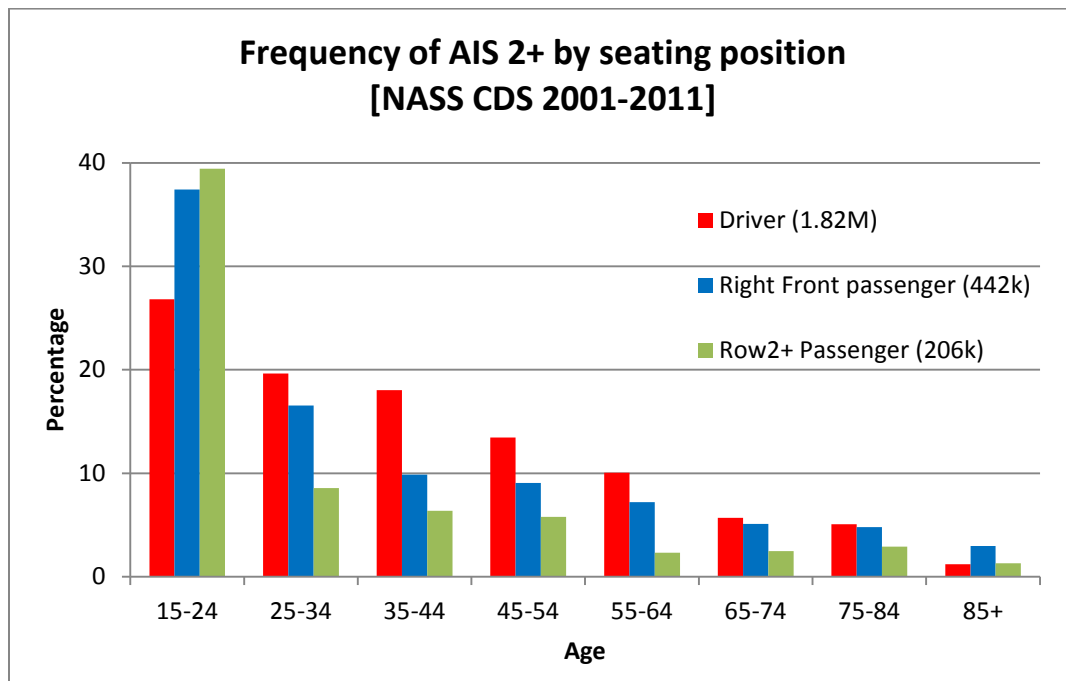
Figure 4. Proportion of moderately injured occupants in each seating position by age based on NASS CDS data.

However, when looking at occupants 35 and older, as Figure 5 shows, the relative risk of moderate or serious injury increased for older occupants. For this chart the relative risk was computed with respect to the 35- to 54-year-old age group. It is the ratio of the percentage of moderately or more severely injured in a given age group to the percentage of moderately or more severely injured in the 35-to-54 age group. A driver 85 or older was 1.77 times more likely to get this level of injury in a crash compared to a 35-to-54-year-old driver. The relative risk of this level of injury for 85-year-old and older right front seat *passengers* was 5 times greater than for passengers in the 35-to-54 age group.

Figure 5. Relative risk of moderate or more severe injury by seating position and age, based on NASS CDS data.

The relative risk of this level of injury was much higher for passengers 85 and older than all other age groups and seating positions. This may result from the most fragile and frail older occupants being passengers as opposed to drivers.
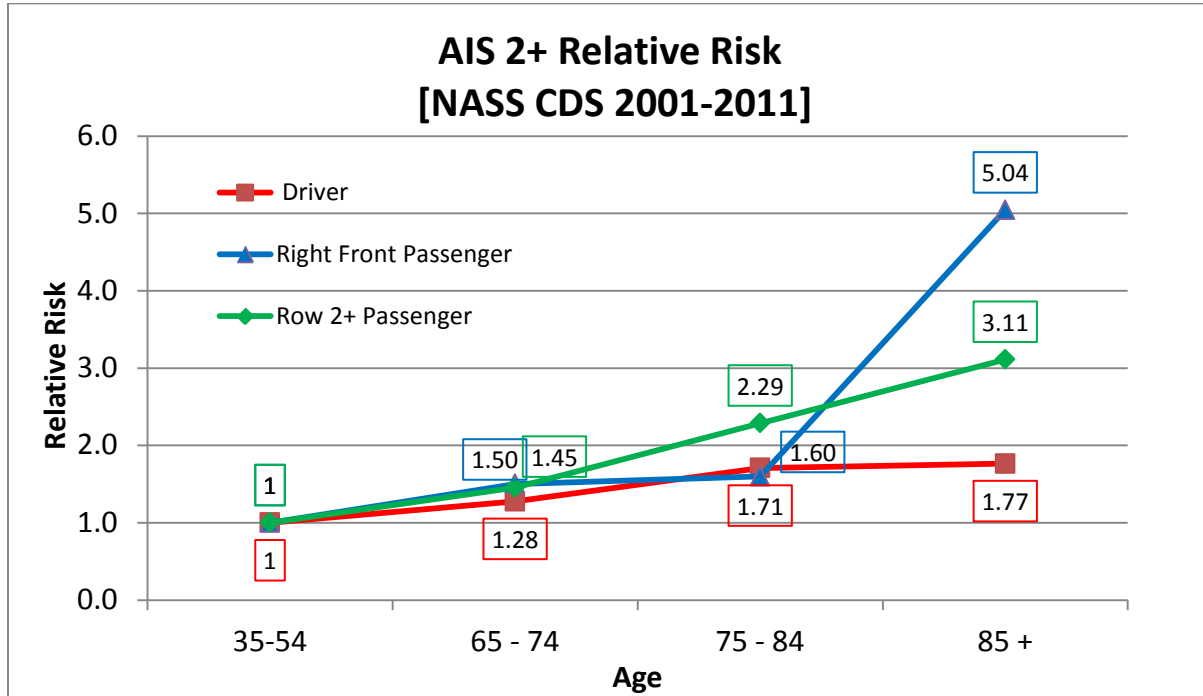
Increased age is associated with declining functional abilities. Older drivers are generally capable and conscientious, but changes in factors including strength, flexibility, vision, and cognition associated with normal aging or with age-related medical conditions may result in declines in some functional skills. These changes may undermine their ability to drive safely. Thus, some older drivers represent unacceptable risks to themselves and to other road users.

Higher risk of injuries and fatal outcomes for older people are not isolated to vehicle occupants. Pedestrian interactions with vehicles resulted in 4,432 fatalities in 2011. Figure 6 indicates 24 percent of the pedestrian fatalities in 2011 were older than 60. The same concerns that we have for older occupants -- fragility and frailty -- extend to pedestrians, suggesting that if an older person is struck by a vehicle, that person is more vulnerable to injury and death than a younger person. To address this segment of the population, it is likely that the most fruitful approaches will be crash avoidance through behavioral (education) activities and vehicle-based technologies. NHTSA expects the beneficiaries of these approaches will include other age groups as well.

**Pedestrian Fatality Distribution by Age Groups,
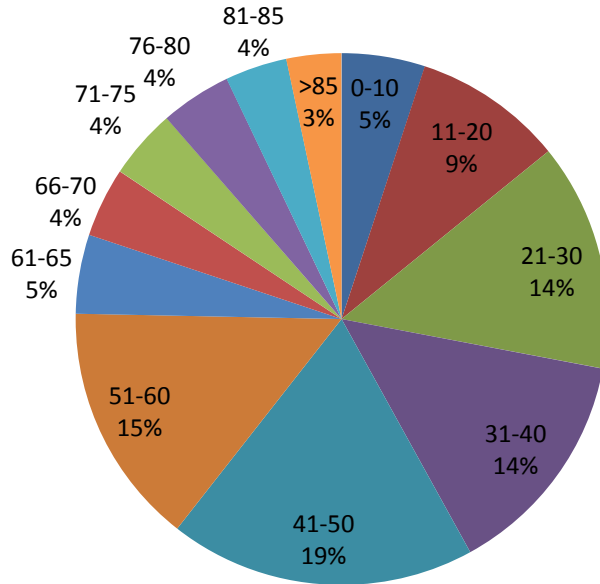FARS 2000-2011 (about 19% from age>65)**

Figure 6. Age distribution of pedestrian fatalities 2000-2011, based on FARS data.

NHTSA has been engaged in research and programs to improve older road user safety for many years. This document is intended to serve as the 5-year plan for NHTSA activities to address traffic safety concerns of older people. Given the increasing proportion of older people in the population, NHTSA must work internally and with our partners to provide evidence-based countermeasures to reduce risks to older – and all – road users.[1]

Plan Timing and Structure

This plan has five primary areas of focus. Four of the five areas are derived from the NHTSA/NTSB work (data, vehicle, behavior, and pedestrian). The remaining area (how to define "older") is simply an overarching issue that is related to all four of the other areas.

Projects in this plan are described as being near-term, short-term, and long-term. Near-term projects are scheduled for the next 2 years. NHTSA plans activities in the short-term for the next 3 to 5 years, based on the results of the related work completed in the near-term and on the availability of resources. These activities could be altered depending on the results of the near-term work or by changes in NHTSA priorities and the availability of resources. Activities described as long-term are more uncertain and are expected to be initiated in 5 or more years.

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[1] The Age Discrimination Act of 1975 (42 U.S.C. Sections 6101-6107) prohibits discrimination on the basis of age in programs or activities receiving Federal financial assistance. It is our intention to provide guidelines to our grantees that comply with this law.

Findings from NHTSA and other organizations' activities may make some of these activities unnecessary, and may require a redirection of the current plan.

This plan includes a number of abbreviations that may be unfamiliar to some readers. A glossary of these abbreviations is provided on page iii.

<u>Overarching Issue: Define "Older"</u>

What age constitutes being "older"? This very basic question has implications throughout this plan. The general public tends to consider people as "older" beginning around age 65. "Older" is a general description that masks the complexity of aging and risk – both of crashing and of sustaining injuries in a crash. There are many variables that need to be assessed when defining a person as "older." The variable requiring assessment will change based on changing scenarios. For example, a 75-year-old person with severe osteoporosis might be "older" from a tolerance or fragility standpoint while a 65-year-old suffering from dementia might be "older" from a functional standpoint. Proper assessment of age in relation to the issues being addressed is essential to robust solutions and the implementation of countermeasures. In most cases, increased injury or crash risk with age is curvilinear, with initially slight elevations that increase more sharply with age. Documenting the age at which risk increases based on the task and/or context requires efforts related to nearly all aspects of this plan.

Near Term:
- NHTSA collects and analyzes prospective data on real-world injury causation. This information supports development of more accurate computer modeling of the human body as well as other injury research. Understanding the relationship between aging human anatomy and tolerance to traumatic forces is essential to establishing clearer age-based criteria.
- NHTSA has ongoing projects assessing the effects of age and of age-related medical conditions on drivers' performance. An 85-year-old driver is likely to experience functional changes related to normal aging, as well as to medical conditions that are far less common in 65-year-old drivers. Assigning everyone over 65 to the same group could mask the effects of changes particular to the oldest people. Pooling these drivers' data may overstate risk for drivers in their 60s and may understate it for those in their 80s. The aim of these projects is to understand how specific physical, cognitive, and perceptual changes are associated with driver behaviors and the effect on crash rates. Project final reports will document the findings, and NHTSA material will be updated as appropriate to reflect new information.

Short Term:

- Building on outcomes from the near-term projects, NHTSA will focus on better understanding age effects through collecting and analyzing data for narrower age groups (e.g., those in their 60s, 70s and 80 and older). NHTSA will use the findings to document relationships between specific ages and outcomes, and develop specialized tools that incorporate the new information.

Long Term:
- NHTSA goals include refining age-specific issues and assessing process and data needs to improve implementation of programs and research.

DATA

The foundation of this plan is the focus on the collection and use of data to support vehicle safety and behavioral approaches to address issues related to older adults. In this area, NHTSA recognizes the value of the existing data and data systems that NHTSA has available. In addition, recent legislation authorized NHTSA to redesign the NASS crash data collection system. In response, NHTSA conducted an internal and external review of user data needs. NHTSA submitted a Data Needs Report to Congress in July 2011 and has an open Data Modernization docket (NHTSA Docket No. NHTSA-2012-0084).

Realizing that limited resources will make it impossible to meet all data needs, NHTSA has identified certain data areas that might support problem identification or analyses related to older adults. This plan recommends leveraging the variables and coverage in current data systems as to the impact on older occupants or pedestrians to address issues discussed below. Data needs in the areas of crash causation, NiTS and adaptive equipment will continue to be evaluated for feasibility of collection. NHTSA plans to conduct more analyses using existing data sets, and explore the extent to which other agencies have databases that address NHTSA's needs.

<u>Define What Data are Available</u>

NHTSA's current and ongoing databases:
- The Fatality Analysis Reporting System is a census of all on-trafficway fatal crashes in the United States and Puerto Rico. Variables are often not extensive enough to handle detailed research questions. FARS does not include occupants who die from crash injuries beyond the 30-day post-crash window required for inclusion in FARS.
- The National Automotive Sampling System General Estimates System is a nationally representative sample of trafficway crashes coded from police accident reports. It is good for general estimates but not detailed enough for more complex research questions.
- The National Automotive Sampling System Crashworthiness Data System collects a large number of detailed variables on passenger vehicle towaway crashes, is often suitable for research questions, but is limited to on-trafficway crashes.
- The Crash Injury Research and Engineering Network is a prospective research system conducting a convenience sample of in-depth crash and injury investigations on passenger vehicle crashes resulting in serious and/or disabling injury. CIREN uses a multidisciplinary approach for data collection, injury causation coding, problem identification, and research initiation.
- Special Crash Investigations are in-depth and detailed investigations and data collections for crashes that are of special interest to NHTSA. The cases are intended to be an anecdotal data set useful for examining special crash circumstances or outcomes from an engineering perspective.
- The National Emergency Medical Services Information System is the national repository that stores EMS data from more than 25 States.
- NiTS – Not-in-Traffic Surveillance collects information on off-trafficway crashes. Anecdotal evidence indicates that many older drivers' crashes occur in areas such as parking lots. Such

areas are considered off the trafficway and have not traditionally been under the purview of NHTSA. However, under recent requirements of SAFETEA-LU and the Cameron Gulbransen Kids Transportation Safety Act of 2007, NHTSA collects not-in-traffic crash data through the FARS and NASS GES infrastructures in the system called Not-in-Traffic Surveillance (NiTS). All NiTS crashes that come to NHTSA are coded into a standard database, but adjustment factors are necessary to make national estimates, due to lack of universal coverage. Variables of interest are limited to relevant variables from police accident reports as recorded in NASS GES. In some States, off-trafficway crashes may not be reported to police, or the police may not file standard crash reports.

NHTSA's other (non-active) databases:

- NMVCCS – National Motor Vehicle Crash Causation Survey was authorized under SAFETEA-LU to conduct a national survey to collect on-scene data pertaining to events and associated factors related to crashes. Through NMVCCS, NHTSA collected on-scene data from a probability sample of towaway crashes with EMS response from June 2003 to December 2005, with a focus on factors leading up to the crashes.
- PCDS – Pedestrian Crash Data Study is the last detailed study on pedestrian crashes conducted by NHTSA for 1994 to 1996. The PCDS was initiated to get detailed information on type of injuries incurred by pedestrians from crashes with model year 1990 to 1996 vehicles. The cases were initiated and investigated on-scene and within 24 hours of the crashes to obtain information on crash scene, vehicle, and pedestrian injury. The only current sources of pedestrian crash data are FARS and NASS GES, described above.

Issue: Crash Causation Data

Older drivers are often described as having diminished driving skills due to physical and/or cognitive limitations. Current NHTSA data systems do not assign culpability or "blame" for crashes. However, NMVCCS researchers did assign a critical event and associated factors to each vehicle in the crash, and assigned a critical reason for the critical event to one vehicle in the crash.

Near Term:

- NHTSA will conduct an assessment of data available in the completed NMVCCS database to be followed by possible recommendations or requests for future data collection. Data on risk factors would provide crash causation information and driver performance from real-world crashes that could allow researchers to link driver limitations to crashes. This information would help in problem identification. Better understanding the relationship between age and risk would help NHTSA and its external partners to tailor countermeasures to address older drivers' crash and injury risk.

Short Term:

- NHTSA will explore ways to build on outcomes from the near-term projects to identify high-risk subpopulations, vehicle properties that the data indicate are either risky or protective for older occupants, and driving environments that pose particular hazards to older drivers and

passengers. In particular, NHTSA will explore the possibility that external partners may have the needed data and may be interested in working together to address these issues.

- NHTSA will assess the data currently available and, based on the findings, develop a set of data needs that would further help identify patterns in crash and injury causation.

Long Term:
- Goals include continuing to revise data capture as necessary, publishing trends based on the newly available data, influencing standardization of data elements as appropriate, and making the data more accessible to the public.

Issue: Not-in-Traffic Surveillance

Anecdotal evidence suggests that older adults are more susceptible than younger adults to incurring or causing injury during vehicle-to-pedestrian and other interactions that take place in parking lots, driveways, or other such places not on an official trafficway as defined by NHTSA systems. Some cases involving older adults have resulted in fatal outcomes.

Near Term:
- NHTSA will continue to collect and report cases that are captured in the current data systems.

Short Term:
- NHTSA will explore ways to identify high risk subpopulations, as well as vehicle properties and driving environments that the data indicate are either risky or protective for older drivers and/or passengers.
- NHTSA will work with the findings of the data assessment and recommendations to implement any agreed upon added data collections based on cost and feasibility.

Long Term:
- Goals include continuing to revise data capture as necessary, publishing trends based on the newly available data, influencing standardization of data elements as appropriate and making the data more accessible to the public.

Issue: Adaptive Equipment – Data

Data on adaptive equipment for drivers and other occupants with disabilities lacks detail in current NHTSA databases. The current and future data collection efforts related to adaptive equipment should improve the capture and detail of devices such as hand controls, left-foot accelerators, and pedal extenders. Information about the effects of such devices on crash risk would be valuable to clinicians who train drivers to use them and to other agencies interested in the safety of these devices.

Near Term:

- NHTSA will continue to capture and report injury cases where adaptive equipment was recorded as a physical component for injury causation. SCI, CDS, and CIREN all collect data regarding this type of injury causation. Based on this work, NHTSA will identify a set of data needs specific to adaptive equipment.

Short Term:

- NHTSA will build on outcomes from the near-term projects to identify high-risk subpopulations related to adaptive equipment. NHTSA will work with the findings of the data assessment and recommendations to implement any agreed upon added data collections based on cost and feasibility.

Long Term:

- Goals include continuing to revise data capture as necessary, publishing trends based on the newly available data, influencing standardization of data elements as appropriate, and making the data more accessible to the public.

VEHICLE SAFETY

Most older people still use passenger vehicles as their primary source of everyday transportation. NHTSA promulgates the Federal Motor Vehicle Safety Standards to which vehicle manufacturers must conform. These safety standards can influence safety component design such as seat belts and air bags. They can also influence less obvious structures such as chassis design and interior component padding. This portion of the plan defines what can be accomplished to improve safety, knowing the physical limits and capacities of vehicle occupants who are older. The main concerns that the team identified are fragility and frailty. The plan addresses what can be done at the vehicle level to address these issues. The plan also addresses the potential for vehicle technology to help avoid or mitigate crashes, potentially reducing the influence of fragility and frailty in older drivers.

Issue: Fragility

The results of aging on human anatomy and decreased tolerance to blunt impact need to be studied systematically. Medical conditions like osteoporosis reduce the tolerance of an individual's musculoskeletal system to impact forces and increase the likelihood of that individual sustaining an injury or a more severe injury as a result of a motor vehicle crash. Research is required to improve our understanding of how anatomical changes over time influence an older person's ability to tolerate the types of loading forces experienced in vehicular crashes. Research on the performance of different restraint systems is needed to assess the influence of components such as belt load limiters and belt pretensioners commonly found in the front row of passenger vehicles, but not typically installed in other rows of vehicles.

Near Term:
- NHTSA will continue to develop and refine the current computational human models through combined internal and contracted research.
- Injury mechanisms as well as contributing factors related to age will be investigated via prospective field investigations on injury crashes.
- PMHS and crash dummy testing tools are being assessed for tolerance and sensitivity in crash conditions appropriate for older occupants.
- Additional PMHS testing will be conducted to specifically investigate brain motion during rotational acceleration.
- NHTSA will evaluate several new restraint technologies designed to adapt to loading conditions on occupants located in both front and rear seating positions in passenger vehicles.
- NHTSA will complete evaluation of comments related to the Federal Register notice seeking public comment on future initiatives for the New Car Assessment Program (NCAP), and determine the feasibility of a "Silver Car" rating for older occupants, which is included in that notice.

Short Term:

- Research to identify injury patterns in older occupants will be completed.
- Computational modeling based on real-world CAT scans is needed for body regions beyond the head and thorax for increased understanding of older occupant anatomy.
- Results derived from PMHS and crash dummy research in the near term will allow for initiation of work on IARVs for the older occupant population.
- NHTSA may propose a "Silver Car Rating" for incorporation into the NCAP 5-year plan.
- Near the end of this short term, NHTSA will evaluate the level of understanding related to injury causation in the older population to efficiently move ahead with related research.

Long Term:

- A "Silver Car Rating" for NCAP may be implemented if the need and feasibility are validated in earlier years. Paired with the implementation, NHTSA will provide public education on the vehicle-based technologies and their injury-prevention qualities.
- NHTSA will continue to improve the computational human model with new data and technologies.
- IARV criteria for the older population will be refined as new tools and research results are made available.
- A possible culmination of these efforts may lead to the development of advanced safety restraints.

Issue: Frailty

The human response to long-term health issues and resultant frailty is not well understood. Frail individuals lack the physiological stamina to adequately recover after physical injury. Pre- existing conditions such as atherosclerosis and cardiac disease that result in poor vascular and pulmonary compliance increase recovery time and decrease the possibility of recovery to pre-injury physical and mental ability.

Near Term:

- NHTSA will continue to capture and investigate the outcomes related to injury and frailty.
- Utilizing current data systems and new data linking methods NHTSA will research and attempt to identify the medical conditions and/or population segment(s) influenced by frailty.

Short Term:

- NHTSA will need to identify the populations most at risk.
- Public awareness and development of public information on frailty will be weighed as they relate to behavior change.

Long Term:

- Based on near- and short-term results NHTSA may develop recommendations for frail occupant awareness.
- Similar to the issue of fragility discussed earlier, NHTSA will review advanced restraint systems that might aid in avoiding injurious loads on frail occupants.

BEHAVIOR

This section of the plan emphasizes older driver behaviors. This portion of the plan defines better ways to identify risky drivers and either provide training or other support so that they can continue to drive safely despite their limitations, or get them to stop driving while addressing their mobility needs and quality of life. This section also involves providing older driver safety information to older adults, their family members, medical professionals, licensing agencies, and others who can promote safety in this population. The plan addresses what can be done at the behavioral level to address these issues.

Issue: Highway Safety Program Guidelines

Highway Safety Program Guidelines (HSPG) are the baseline measures by which a State can evaluate its activities in a given area. Guidelines include sections on program management and the program elements, such as law enforcement, driver licensing, and data evaluation, that should be in place to address the overarching safety concern. Until this year, there has been no guideline for older driver safety. HSPG 13 – Older Drivers provides guidance for addressing older driver safety at the State level.

Near Term:
• NHTSA will promote the guidelines among States and other partners.

Short Term:
• NHTSA will continue to promote the guidelines and will highlight the potential availability of program assessments (a process by which a State's program activities are compared to the guideline document). NHTSA will conduct analysis and review the guidelines to identify weaknesses and challenges to implementation.

Long Term:
• NHTSA will consider updating and revising HSPG 13 so that State Highway Safety Offices are able to use it to address the changing safety needs of older road users.

Issue: Communications on Older Drivers

Fundamental to building communications about older drivers is the need to refocus the goal of older driver programs to emphasize the importance of keeping older drivers mobile and safe. Along with this reframing comes the need to promote the idea that, as they age, people must plan for eventual adjustments to their driving habits. NHTSA's development and promotion of communications for program planners and older drivers and their support networks will encourage changes in older adults' attitudes, perceptions, and social norms about driving. It is also important to begin communicating with the public on the issues related to fragility and frailty, so that individuals make informed decisions related to occupant protection and even vehicle purchases.

Near Term:

- NHTSA will revise its existing Web site section on "senior driving" to better serve the different audiences that use the site (researchers, medical providers, law enforcement, older drivers, and caregivers).

Short Term:

- NHTSA will work with national partner organizations to develop a broad strategy to emphasize the distinction between an older driver and a medically at-risk driver, thereby changing the tone of the conversation related to older drivers. A parallel effort will be to develop tools to help local and State-level organizations collaborate and develop partnerships on older driver safety, much like the tools and partnerships that already exist on child passenger safety.

Long Term:

- NHTSA will assess public response to the outreach activities and refine, update, and expand them as necessary.

Issue: Limits of Assessments

The public regularly asks NHTSA for a simple test to identify unsafe drivers. NHTSA has spent many years conducting research on screening and assessments. Based on the outcomes of many research projects, it is evident that no single test accurately and validly determines whether an individual driver is at risk for crashes on a population basis. It is possible, however, that individually assessing a person's functional capacities related to driving will be useful in both identifying at-risk drivers, and in identifying technologies that can be used to compensate for age-related deficits.

Near Term:

- NHTSA will review issues related to technological approaches to assessing driving performance. NHTSA will develop communications for States regarding strengths and limitations of office-based clinical testing of skills that support safe driving performance, as well as guidelines for DMVs to use in developing driver assessment protocols. The information provided to the States will include the most current evidence regarding the relationship between scores on clinical measures and driver safety. Where research evidence is not available, information would be based on accepted practice and expert opinion.

Short Term:

- In the short term NHTSA will conduct clinical and naturalistic driving studies to better understand the effects of age-related medical conditions, including dementia, and medications commonly prescribed to older adults, on their driving performance.

Long Term:
- NHTSA aims to identify performance measures that may predict crashes. This information would allow NHTSA to provide clearer communications regarding older adults' fitness to drive. Evidence-based recommendations would allow NHTSA to provide more detailed guidance related to older drivers on potentially risky medications and those with dementia.

Issue: Driver Licensing (DMV) Referrals and Communications

Getting good referrals of potentially medically at-risk drivers to the DMV is a challenge. NHTSA has created tools for different audiences, but their use tends to be narrow in scope, without direct involvement from the DMV. DMVs are uniquely positioned to positively influence safety through restricting or suspending licenses, but they are regularly challenged because such actions are seen as a threat to individual older drivers as opposed to a benefit to the general driving public. DMVs need tools and resources to overcome these challenges. It is also critically important that DMVs wisely use their resources by focusing on those who are most at risk.

Near Term:
- NHTSA will work with State and national partners to raise awareness of existing tools related to driver licensing and options to driving among medical providers, law enforcement personnel, and older adults' caregivers.

Short Term:
- NHTSA will promote training for DMV counter staff to allow them to better identify and refer potentially risky drivers for evaluation and medical review by the DMV. NHTSA will also develop and promote communications tools for DMVs to use to educate the public and specialized audiences such as medical providers and law enforcement on older driver safety, making referrals, and identifying options to driving.

Long Term:
- NHTSA will measure changes in referrals among States that incorporate licensing recommendations, and assess changes in State practices.

Issue: Pedal Application Errors

Crashes resulting from pedal application errors, with the driver activating the accelerator when he or she intended to brake, are common, and can be found through online searches on a daily basis. Estimating the frequency of these crashes and determining their costs in terms of fatalities, injuries, and property damage can be difficult. Developing effective countermeasures to prevent pedal error crashes requires a better understanding of characteristics of these crashes and the behaviors that contribute to them.

Near Term:

• NHTSA will continue to screen complaints alleging incidents of pedal misapplication to identify unusual trends and look for evidence of potential vehicle-based causes and will identify ways to characterize crashes associated with pedal errors, information that is critical to developing effective countermeasures. NHTSA will begin behavioral research on drivers' use of the pedals to explore ways to reduce pedal misapplication.

Short Term:

• NHTSA will initiate work on behavioral countermeasures to reduce the occurrence of pedal application errors.

Long Term:

• Assuming that the crash data systems can capture pedal misapplication-related crashes, NHTSA will evaluate countermeasures identified in the short-term projects.

Issue: Adaptive Equipment – Behavior

According to the Census Bureau, 19 percent of Americans have a disability. The aging population (and changes in disability related to age) suggests that there will be more vehicles modified and more drivers using adaptive equipment. NHTSA will continue its efforts to understand the manufacture, training, and installation of adaptive equipment.

Near Term:

• NHTSA will revise our estimates of the extent of modified vehicles within the vehicle fleet. Paired with this, NHTSA will develop projections on the future extent of vehicle modifications within the fleet. Pending results of the data assessment, NHTSA field data collection will need to improve the identification of adaptively equipped and modified vehicles. Crash and injury causation related to adaptive equipment will need improved collection and understanding, both from the general (NASS/GES) perspective and the specific perspectives allowed by CIREN investigations.

Short Term:

• In the short term, the growing population of older occupants must be well informed on the subject of adaptive equipment. NHTSA has existing material related to adapting vehicles, which will be updated to reflect any improved understanding of injury related to adaptive equipment. NHTSA will continue to collaborate with organizations such as the National Mobility Equipment Dealers Association (NMEDA) to educate and enable installers and prescribers of adaptive equipment to limit the potential for injuries among the users of any installed devices. As the percentage of occupants with disabilities increases, their use of adaptive equipment is likely to increase as well. The new knowledge gained from improved field data would allow NHTSA to initiate new work with external partners on improving the safety of adaptive equipment.

Long Term:
- NHTSA will monitor changes in the design of adaptive equipment and in the prevalence of such devices in the fleet and plans to explore the extent to which such products improve driving performance.

Issue: Seat Belts

Seat belts remain an effective injury prevention tool for occupants of all ages, including older occupants. The consequences of being unbelted are worse for older occupants because of the fragility and frailty issues discussed earlier. Older adults may misuse seat belts, for example, put the shoulder strap behind their backs, due to discomfort; this may be a particular problem for those who have pacemakers. It is possible that second row belts could be improved to be more comfortable for older people, and could be adapted to address the effects of fragility associated with increasing age to make older occupants safer. It is imperative that we identify measures to increase belt use in this population.

Near Term:
- NHTSA will explore older adults' belt use and document reasons older adults opt not to use their seat belts. Based on these findings, NHTSA will pilot test messages aimed at increasing seat belt use among the older population.

Short Term:
- NHTSA will incorporate messages for older occupants into its general communications approach to occupant protection. NHTSA will also provide education about vehicle-based adjustments that individuals may use to increase comfort and fit of seat belts, thus increasing the likelihood of belt use among this population.

Long Term:
- NHTSA will review the progress of activities in this area, and will revise them based on changes in observed belt use among older occupants.

Issue: Other Behavioral Safety Concerns

There are other areas that touch on the older population. Some of these, such as the effects of alcohol on driving performance, have been studied in other age groups, but have received less attention in the older population. In other instances, it is not clear whether characteristics such as physical fitness or activity levels that have been shown to improve older adults' overall functional capabilities extend to driving performance. On a different note, many newer vehicle models are equipped with systems designed to reduce demands on the driver, provide hazard alerts, or assist the driver in responding to a hazard. While these systems are intended to make driving easier and safer, there has been little study of the effects of these systems on performance of older drivers, particularly those in their 70s and older. It will be critically important to understand how these systems can be optimized to support drivers with cognitive changes associated with normal aging.

Near Term:

- NHTSA will assess older drivers' behaviors relative to in-vehicle technologies, including those designed to promote safety.
- NHTSA will also document blood alcohol concentrations in older drivers who are injured in crashes in order to explore the extent to which these drivers exhibit even low concentrations of blood alcohol.

Short Term:

- Research based on findings from near term projects will focus on the effects of aging on fragility and frailty, as well as the extent to which regular physical activity moderates those effects and improves crash outcomes.

Long Term:

- Assistive technologies such as navigation devices are marketed to reduce driving's cognitive demands. NHTSA will explore the extent to which such devices facilitate older drivers' ability to drive safely as opposed to providing a distraction that increases the driver's cognitive load.

PEDESTRIAN

Many of the same issues and concerns discussed in the Vehicle Safety, Data, and Behavior sections of this plan apply to the older pedestrian. Fragility and frailty are large concerns. Because of this, the center of the plan as it relates to pedestrians is preventing the crash from occurring. The approaches that NHTSA will take in addressing these issues to enhance older pedestrians' safety include technology interventions, improved data, and education for pedestrians as well as drivers. NHTSA is active in Global Technical Regulation activities related to injury mitigation (such as improved bumper and hood design). We expect that those efforts will continue, however, we anticipate greater benefits for the older pedestrian to come from preventing the crash from occurring. For this plan and for the older population, preventing the crash will be a key strategy.

Issue: Technology Interventions

In this area in particular, the mission must be to prevent the crash from occurring because older pedestrians are much more likely to be seriously injured or die when struck. If we are to prevent crashes involving older pedestrians, technology interventions will be an important safety countermeasure. With technology interventions, there is no need to specifically identify the age of the pedestrian. It only matters that there is a pedestrian in the path of a motor vehicle, and the vehicle-based technology will reduce the probability of a crash.

Near Term:
- NHTSA will continue work on Pedestrian Crash Avoidance/Mitigation (PCAM) technologies, with particular emphasis on pedestrian detection and avoidance.
- Work on quieter cars (electric and hybrid vehicles) will include efforts by the administration to complete the rulemaking required under the Pedestrian Safety Enhancement Act of 2010.

Short Term:
- NHTSA will analyze the findings on these initial studies to determine whether the technologies should be refined or improved to address pedestrian safety.
- If NHTSA determines PCAM technologies are beneficial and effective, NHTSA will decide on regulatory action.

Long Term:
- NHTSA will conduct analyses of existing PCAM technologies within the fleet to identify further opportunities to enhance pedestrian safety.

Issue: Behavioral Influence on Pedestrians

Initial analyses suggest that older people are over-involved in parking lot crashes both as drivers and as pedestrians. In addition, changes in functional abilities, in particular hearing and seeing, might point to quieter cars presenting extra challenges to older pedestrians. Specific data analyses need to be conducted to develop and refine countermeasures.

Near Term:

- NHTSA will continue to promote the tools that are on the Web site that promote the safety of older pedestrians.
- NHTSA will continue to review existing data on parking lot crashes.
- NHTSA will analyze data from 2010 and later involving pedestrians, with emphasis on pedestrian crash types that involve older drivers and older pedestrians. These analyses will be used in countermeasure identification and development.

Short Term:

- NHTSA will explore the possible role of distraction in pedestrian crashes involving older people. Based on the analyses conducted in the near term, NHTSA will generate educational materials to promote safe walking behavior among older pedestrians, focusing on the most common crash types. In parallel, NHTSA will consider conducting a special crash investigation on older pedestrians, should the near term data analysis point out the need.
- As the data from FARS and GES on pedestrian crash types accumulate (post 2010), NHTSA will develop and disseminate educational materials for different audiences, including older pedestrians, based on the prevalent crash types for those audiences. NHTSA will also develop drop-in material that can be used for locations that have a high density of crashes or of older people. Evaluation of the deployment of this material, paired with investigation of any observed behavior change, will be included in this activity.
- NHTSA will explore the potential need for a special crash investigation on pedestrian safety, with emphasis on off-road crashes, based on the initial analysis of pedestrian crash types and other data sources that are made available.

Long Term:

- NHTSA will create more extensive educational material related to the types of crashes older pedestrians are involved in, as well as education on quieter cars and other concerns identified in the near- and short terms.

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