

UNITED STATES OF AMERICA

NATIONAL TRANSPORTATION SAFETY BOARD

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In the matter of: *

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FORUM ON SAFETY, MOBILITY AND *

THE AGING DRIVER *

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NTSB Board Room and Conference Center
490 L'Enfant Plaza
Washington, D.C. 20024

Tuesday
November 9, 2010

The above-entitled matter came on for hearing,
Pursuant to Notice at 9:00 a.m.

BEFORE: DEBORAH A. P. HERSMAN, Chairman

APPEARANCES:

NTSB Technical Panel:

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Witness Panel 1:

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SANDRA ROSENBLOOM, Ph.D., University of Arizona
BONNIE DOBBS, Ph.D., University of Alberta
ANN DELLINGER, Ph.D., National Center for Injury
Prevention and Control, Centers for Disease Control
and Prevention (CDC)

Witness Panel 2:

STEWART WANG, M.D., Ph.D., University of Michigan
RICHARD KENT, Ph.D., University of Virginia
STEPHEN RIDELLA, National Highway Traffic Safety
Administration (NHTSA)
STEPHEN ROUHANA, Ph.D., Ford Motor Company

Witness Panel 3:

DICK SCHAFFER, Federal Highway Administration (FHWA)
JOSEPH COUGHLIN, Ph.D., Massachusetts Institute of
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THOMAS BROBERG, Volvo
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JACOB NELSON, AAA
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ELINOR GINZLER, AARP
JEFF MICHAEL, NHTSA

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P R O C E E D I N G S

(9:00 a.m.)

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3 CHAIRMAN HERSMAN: Good morning. My name is
4 Debbie Hersman and it is my privilege to serve as the Chairman of
5 the National Transportation Safety Board. I would also like to
6 recognize my colleagues who are here in the room with us this
7 morning, Member Mark Rosekind and Member Earl Weener. If you all
8 would please stand so people know who you are?

9 Very good. I know we'll have some breaks and I
10 encourage all of you to interact with the other Board members
11 during those breaks.

12 Welcome to the NTSB boardroom. We begin a two-day
13 public forum on Safety, Mobility, and Aging Drivers.

14 Many of you are familiar with the Safety Board for its
15 role in investigating transportation accidents and determining the
16 probable cause of those accidents. However, the Safety Board also
17 has the opportunity to bring leading experts together with the
18 goal of understanding safety risks and identifying solutions, even
19 when that activity is not tied to a specific accident. Today we
20 meet for that purpose. We're convening this public forum to
21 explore the safety issues related to the aging driver and to
22 discuss possible strategies to prevent and reduce accidents,
23 injuries, and fatalities within this growing population.

24 America is aging. Baby boomers are now well into their
25 middle years. People on average are living well into their 70s

1 compared with their 40s a century ago. And more and more seniors
2 are on the road than ever before. In fact, 30 million licensed
3 drivers in the United States are 65 or older, and the forecast is,
4 in 15 years, in 2025, this age group will comprise more than 20
5 percent of the entire U.S. driving population. That's one in
6 every five drivers on the road.

7 There's no precise way to define the term "aging
8 driver." Just as no two 17-year-old drivers have the same set of
9 driving skills, capabilities and experience, neither do 70-year-
10 olds to 80-year-olds or to 90-year-olds. Driver performance
11 varies widely in every age group and age alone is not a good
12 predictor of how well one will perform behind the wheel. Factors
13 like cognition, motor skills, medical condition and injury
14 tolerance are also predictive. So when we talk about the aging
15 driver, we mean age in relation to one's capabilities, not age as
16 in old or senior.

17 Older drivers tend to be conscientious and safety
18 oriented. They wear their seatbelts. They may choose to forego
19 driving when it's dark or when the weather is poor. They are less
20 likely to speed or drive intoxicated. And they drive fewer miles
21 than do other age groups. The good news is that drivers age 70
22 and older involved in fatal crashes has decreased in the past
23 decade by 20 percent, even though the number of licensed drivers
24 in this age group and the miles logged has increased. Despite
25 these encouraging numbers, we also know that when there is an

1 accident, it is the older driver who is more likely to be killed
2 or seriously injured. They simply don't fare as well as younger
3 drivers.

4 This forum is an exciting opportunity to better
5 understand highway safety trends and to discuss ways to minimize
6 the safety risks for a growing segment of drivers. Whether we are
7 the older driver deciding whether or not to set the keys aside, or
8 the older driver's family or community, we are all responsible for
9 making sure that no matter what your age or destination, everyone
10 arrives safely. While many of these issues we will discuss are
11 topics that have been explored by other organizations in recent
12 years, this is the first time that the NTSB is analyzing them in
13 this format.

14 We are very fortunate to have some of the leading
15 experts in highway safety, academia, the medical community, and
16 industry here with us today. I'd like to take a moment to
17 recognize some of the groups that will be participating in the
18 forum: AAA, the AAA Foundation for Traffic Safety, the Alliance
19 of Automobile Manufacturers, the Insurance Institute for Highway
20 Safety, the American Association of Motor Vehicle Administrators,
21 the American Occupational Therapy Association, the Governors
22 Highway Safety Association, the American Optometric Association,
23 the International Association of Chiefs of Police, the National
24 Institute on Aging, the Federal Highway Administration, the
25 National Highway Traffic Safety Administration, and AARP. Thank

1 you to all of the participants for sharing your time, your insight
2 and your expertise.

3 As for our roadmap for the next two days, this morning
4 we will begin with a discussion of safety metrics, accidents,
5 injuries and fatalities, and how we use those metrics to assess
6 the risks associated with aging and mobility. As part of this
7 discussion, we will also consider the travel characteristics and
8 the travel needs of an aging population. We will then break for
9 lunch.

10 And I'm pleased to announce that during the lunch break,
11 both today and tomorrow, we will be showing the documentary "Old
12 People Driving," by director Shaleece Haas. This documentary
13 chronicles the stories of Milton, age 96, and Herbert, age 99, as
14 they confront the end of their driving years. I encourage you all
15 to take the opportunity during the lunch period to view this
16 documentary.

17 This afternoon we dedicate a panel to occupant
18 protection for aging drivers and passengers. This is an important
19 issue because the core of our mission here at the NTSB is to
20 prevent death and injuries. We know that older drivers face an
21 increased likelihood of injury, hospitalization, and death as a
22 result of a crash. And because older drivers have decreased
23 injury tolerance, we will also examine how to better protect older
24 drivers in crashes, as well as the limitations of current occupant
25 protection systems and the potential benefit of new technologies.

1 We will then turn to highway and vehicle design and how
2 changes to those designs can affect the aging driver's
3 performance. Intelligent transportation technologies are also
4 emerging as safety enhancers, so we will discuss ITS advances as
5 well. The improvements to the vehicle environment discussed by
6 this panel benefit not just the aging driver but drivers in every
7 age group.

8 Tomorrow morning we'll resume by focusing on driver
9 performance, how we qualify driver capabilities such as self-
10 screening and driving assessments, and how we remediate
11 performance decrements once those decrements are identified. We
12 will then conclude the program with state programs and practices,
13 including state licensing schemes and the role of medical review
14 boards in state safety programs.

15 I know this is a lot of ground to cover in two days. It
16 is my hope that our dialogue will be honest and open. For some,
17 our discussion may be eye-opening, while for others it may be an
18 opportunity to dispel some of the many myths and misunderstandings
19 about the aging driver. But even more significantly, this forum
20 likely represents a collaborative launching point towards improved
21 highway safety for us all.

22 Now for a few housekeeping items. As a reminder, please
23 silence your cell phones and familiarize yourself with the
24 emergency exits that are available in the front of the room and
25 behind you where you came in. We welcome the public to view the

1 forum, both those in the audience as well as those viewing via
2 webcast on the NTSB's website. Copies of the agenda are available
3 in the lobby outside of the boardroom, and the agenda, along with
4 the biographical information of the participants and descriptions
5 of the parties, is also posted on the Safety Board's website.

6 So we've invited 20 panelists and over a dozen
7 organizations to take part in this forum. Notably, there are more
8 organizations participating as parties in this forum than is
9 generally typical at an accident hearing. This stems from our
10 desire to fully air the range of voices on this topic. For the
11 invited parties, I urge you to work through your spokesperson and
12 to rotate the responsibility of spokesperson as we move through
13 the panels. You will find question cards on your tables and you
14 can pass your questions to the spokesperson on those question
15 cards.

16 Because we have such a full agenda, we appreciate your
17 cooperation in helping us keep on schedule, and ask that panelists
18 respect time limits and keep discussions focused on the subject at
19 hand, rather than slip into topics covered by other panels. We
20 recognize that all stakeholders are not represented in person at
21 this forum. Because it was not possible to accommodate everyone
22 who wanted to participate, those individuals and organizations who
23 wish to submit written comments may do so until November 30th,
24 2010.

25 Finally, I'd like to take a moment to thank the NTSB

1 staff for their efforts in organizing and preparing for this
2 forum. Undertakings of this scope do not simply happen. They are
3 the end product of many months of long hours of meticulous
4 preparation and planning. Thank you to the staff for your hard
5 work and dedication. In particular, I'd like to recognize the
6 technical staff who really made this forum possible: Dr. Deb
7 Bruce, Dr. Rob Molloy, Dr. Jana Price, and Dennis Collins of the
8 Office of Highway Safety; Dr. Mitch Garber, Dr. Elisa Braver,
9 Dr. Ivan Cheung, and Dr. Kristin Poland from the Office of
10 Research and Engineering; and Stephanie Davis, Steve Blackistone,
11 and Danielle Roeber from the Office of Communications.

12 We also have some excellent administrative, technical,
13 and press support that's provided by Avis Clark, Vickie Wall,
14 Antion Downs, Rochelle Hall, Christine Fortin, Robert Turner, and
15 Bridget Serchak.

16 So with all of those housekeeping items taken care of,
17 we're actually ready to begin, and we'll begin with our first
18 panel and they are going to focus on safety data assessment of
19 transportation risk and aging. So we'll begin with a discussion
20 of safety metrics to help qualify what we know about the risk of
21 aging drivers. Because past forecasts have projected an increase
22 in accidents and injuries associated with aging drivers that has
23 not materialized, we would like to understand why.

24 This panel will examine the demographics of the U.S.
25 population, at-fault accident rates by age, the injury data for

1 drivers, passengers and pedestrians. The discussion will factor
2 in consideration of exposure measures such as the number of
3 licensed drivers, active drivers, and trips or trip miles traveled
4 by age group. We will also discuss how crashes differentially
5 affect aging travelers.

6 My colleagues here at the Safety Board, Dr. Deb Bruce
7 and Dr. Elisa Braver, have organized this panel. Dr. Bruce, would
8 you please introduce the panelists?

9 DR. BRUCE: Thank you, Chairman Hersman. First I'd like
10 to introduce the four panelists and then we'll return to your
11 opening comments.

12 Anne McCartt from the Insurance Institute for Highway
13 Safety is the senior vice president. Dr. McCartt recently
14 coauthored a study with Ivan Cheung on crash trends of older
15 drivers, released by IIHS in June of 2010. We've asked her to
16 talk about some of those findings today. She received her B.A.
17 from Duke University and her doctorate from Rockefeller College of
18 Public Affairs and Policy, State University of New York at Albany.

19 Our second panelist, Dr. Sandra Rosenbloom, is a
20 professor of planning natural renewable resources, gerontology,
21 and women's studies at the University of Arizona. She directed
22 the Roy P. Drachman Institute for Land and Regional Development
23 Studies, a research and public service unit of the university,
24 from 1990 through 2004. Dr. Rosenbloom has a master's in public
25 policy and a Ph.D. in political science from the University of

1 California at Los Angeles.

2 Dr. Bonnie Dobbs directs the medically at-risk driver
3 center and research programs within the division of care for the
4 elderly, both under the faculty of medicine and dentistry at the
5 University of Alberta. She is a professor in the faculty of
6 medicine and dentistry. Dr. Dobbs also participated in a Safety
7 Board forum on medical issues of noncommercial drivers in 2004.
8 Dr. Dobbs has a B.A. in psychology and a Ph.D. in gerontology,
9 with specializations in psychology, human ecology, and medicine,
10 from the University of Alberta.

11 Ann Dellinger. Dr. Ann Dellinger is an epidemiologist
12 and team leader for the motor vehicle injury prevention team at
13 the Centers for Disease Control and Prevention. The center she's
14 affiliated with is the National Center for Injury Prevention and
15 Control. Dr. Dellinger conducts research in motor vehicle safety,
16 focusing on older drivers, occupant protection and pedestrian
17 injury, global road safety, and injury risk behavior.
18 Dr. Dellinger received her B.S. in biology from the University of
19 San Diego, her master's degree from the Graduate School of Public
20 Health at San Diego University, and her doctorate in epidemiology
21 from the University of California at Los Angeles.

22 We've asked each of you to get us started this morning
23 with summary remarks in your area of expertise. We'd like to take
24 about 20 minutes to cover that, and I'll help us do that by sort
25 of stepping in and introducing the next topic as we go along.

1 Dr. McCartt, would you begin by talking to us about the
2 trends and limitations of safety data and within that context tell
3 us what we know about the safety of drivers 70, 80 and 90 years
4 old? Dr. McCartt, there's a green light. That's it, thank you.

5 DR. McCARTT: The crash rate per mile traveled begins to
6 increase at about age 70. This is true for fatal crashes and for
7 crashes of all severity. And as we've heard and we all know, the
8 population of people 70 and older is increasing and is supposed to
9 increase dramatically soon, so that by 2040 it will have doubled.

10 When we look at the percent of the population with
11 licenses, if we look at middle-aged drivers, we can see for about
12 the last decade that percent has been pretty stable. When we look
13 at older drivers, these are three: 70 to 79 -- 70 to 74, 75 to
14 79, 80 and older, you can see very dramatic increases in the
15 percentage of people holding onto their licenses, especially the
16 oldest drivers, 80 and older.

17 So when you put these things together, what we expected
18 to see when we look at crash deaths of older people was an
19 increase, but in fact we've seen just the opposite. So if we go
20 back to 1975 and we look at crash deaths of older people, after a
21 steady upward trend, what we found, they peaked in 1997 and then
22 they've been coming down and coming down very strongly.

23 Two points I want to make about fatal crashes of older
24 drivers. First, most older drivers involved in fatal crashes are
25 driving a passenger vehicle, as opposed to more and more younger

1 people driving a motorcycle, for example. And in a fatal crash
2 involving an older driver, the people who die are primarily either
3 the driver, the older driver or the older driver's passengers, who
4 also tend to be older.

5 So we want to take a closer look at these trends and we
6 did so by looking at the fatal crash rate first, first the fatal
7 crash rate per licensed driver, and we looked at this middle-aged
8 group as a comparison. You can see for this group, in the last
9 couple of years their fatal crash rate has come down. But when
10 you look at the older driver trends, you can see again, especially
11 for the oldest drivers, a very dramatic decline. So for drivers
12 80 and older, their fatal crash rate has come down by half.

13 We had two questions after this initial study. Two
14 things could explain this. One is that older drivers might be
15 getting into fewer crashes. And the second thing that might
16 explain it is maybe they're also doing better at surviving crashes
17 when they're in one.

18 So we turned to the best data that we could find to look
19 at nonfatal crashes. We weren't able to do that using a national
20 database. So we went to 13 states' crash databases and we did a
21 similar analysis where we look at a middle-aged, per-licensed-
22 driver crash rate. These are nonfatal injury crashes here for
23 these 13 states. We did see a decline. But again, when we look
24 at the older drivers, their decline was larger.

25 When we look at property damage-only crashes, these are

1 the middle-aged drivers, their crash rate actually went up a
2 little. When we look at older drivers, their rates were down. So
3 the answer to the first question is yes, the crash risk overall
4 for older drivers has come down.

5 To look at the second question of survivability, we
6 again looked at these 13 states and we measured survivability in
7 terms of the percent of older drivers who died in a crash and
8 compared them to middle-aged drivers. These are the middle-aged
9 drivers, a slight increase in the percent who died in a crash;
10 looking at older drivers, down. So the answer to the second
11 question is yes, their crash risk has gone down and when they're
12 in a crash, older drivers are less likely to die and in a stronger
13 way than compared to middle-aged drivers.

14 I think in the questions we'll talk more about this. We
15 don't have good explanations yet for this. These are some of the
16 hypotheses we have. It may be, and there's indication that this
17 is the case, that older drivers are healthier, in better physical
18 condition. Emergency medical services and medical treatment may
19 have improved, especially for older drivers.

20 We think there's probably some answers in their travel
21 patterns. Taking a preliminary look at the latest National
22 Household Travel Survey, older drivers are driving more in the
23 aggregate and also on average, and we know for drivers of any age,
24 drivers who don't drive a lot of miles have higher crash rates.
25 So we think either the quantity or the patterns of driving may

1 help explain some of this.

2 And then, finally, it may be we know that older drivers
3 tend to self-regulate, at least some of them. And so if they're
4 doing this, if there's an increase in this self-regulation, that
5 might point to some answers.

6 And then, finally, just a last point. Again, I think
7 we'll talk about this in the questions. There are some really
8 important limitations in trying to take a look at understanding
9 why older driver crashes are down. We don't have, as I said, a
10 good national sample of nonfatal crashes that would allow us to
11 look in detail at the crashes of older drivers. We don't have
12 perfect licensure data. And we know that they may be particularly
13 problematic for older drivers if a state has a pretty long renewal
14 period. It may be that the numbers may overestimate how many
15 older drivers are licensed.

16 And then, finally, as I indicated, we do have a National
17 Household Travel Survey. The sample is still being weighted, but
18 we only have these surveys every few years and they could be more
19 detailed than they are. And, you know, I certainly would like to
20 make the point that a really important exposure measure for any
21 age group, but maybe especially for older drivers, is their travel
22 patterns. Thank you.

23 DR. BRUCE: Thank you, Dr. McCartt.

24 Our next panelist, Dr. Rosenbloom, our question to you
25 is, what do we know about where people live and how that affects

1 their travel patterns?

2 DR. ROSENBLOOM: Increasingly, older people live in low-
3 density and suburban areas. About 75 percent of older people
4 either live in suburban or rural areas nationally. But they're
5 overrepresented, for example, in rural areas, where you could have
6 -- we're talking about 1 in 5 drivers might be over 65 nationally,
7 but it may well be 40, 50 percent in some rural areas. And folks
8 as old as 80 and 85, 90, can still be driving because that's their
9 only option. One of the issues is, if folks are living in low-
10 density areas, their alternatives to driving are less.

11 And in this, and as in so many things, there are
12 significant differences between women and men. Women are
13 substantially more likely, women over 65, to live alone, so that
14 they have no other driver in the house when they start to have
15 problems. They're significantly less likely to have financial
16 resources to allow them to purchase services or alternatives, have
17 goods delivered to them when they no longer feel safe in driving.
18 We know that older women generally cease driving much before older
19 men, because they don't feel comfortable. It's often not some
20 kind of sharp medical reason or because they've had a crash but
21 because they don't feel confident.

22 But at the same time we know that over the last three or
23 four decades older people have been driving longer, they have
24 longer trips, they make more trips, and the folks who have driven
25 their whole lives will not have made the kinds of -- will have

1 made the kinds of life decisions about where to live and so forth,
2 based on the convenience and access and flexibility of the private
3 car, and it's hard to see how we can substitute for that.

4 So there is a tremendous tension between mobility and
5 safety. I know that we're focusing largely on safety, but I think
6 that we have to deal with the fact that a lot of people will keep
7 driving maybe when they no longer want to or when they are no
8 longer safe because they simply have no other alternatives.

9 It's very common -- I speak on this a lot -- that
10 someone will get up in the audience and say, oh, well, my mother
11 won't have any problem when she stops driving; she will use one of
12 the community resources available to her. And later on in our
13 discussions, if we have time, I have some slides that show how
14 unlikely it is that there are enough community resources to deal
15 today with the vast number of older people who might want to cease
16 or just reduce driving. The resources aren't there. And if we
17 want to talk about safety, I think one of the things we have to
18 talk about is how to provide mobility for people that want to stop
19 driving or should stop driving.

20 In addition, I think that there are important issues
21 about self-regulation, but we have tremendous evidence that older
22 drivers, and particularly women, self-regulate. But I want to
23 make the point that long before you give up driving, self-
24 regulating can, in fact, seriously impact your quality of life and
25 your mobility. It's one thing to make three right turns instead

1 of making a left turn. That doesn't really have a lot of impact
2 on your life. It's quite another to avoid all congested areas, to
3 avoid driving in the morning peak, the noon peak or the evening
4 peak. It's quite another to avoid certain routes and so forth.
5 And we know that older drivers do that. They stay off of the
6 freeways and highways. They tend to be on smaller roads and so
7 forth. And these things actually do, in fact, impact people's
8 mobility and lifestyle and we have to be talking about that. And
9 that tension between wanting to keep people safe but also wanting
10 to keep them mobile is, I think, something we have to consider as
11 we consider safety issues.

12 I also think that land use is a major issue. I'm a city
13 planner and that's something that we look at a lot. But older
14 people are aging in low-density places, and that's continuing.
15 That's another reason why their trips are longer. One of the
16 things we do know about the travel patterns of older people, for
17 example, is that once they retire they tend to make longer
18 non-work trips than younger people. We think that because you
19 remove the constraint of having to shop or take care of activities
20 near your work location, once you're freed from those constraints,
21 older people seem to be more interested in going to different
22 places to shop and different locations for socializing. And I
23 think all of these patterns interact with safety issues in a
24 profound way.

25 So what I'd like to leave the panel with is that you

1 cannot address safety issues independent from how people live
2 their lives and where they're living, and we have to deal with
3 them both. Mobility and safety are two sides of the same coin and
4 often we are forcing older people to choose between them and
5 that's not acceptable. Thank you.

6 DR. BRUCE: Thank you. Next, we turn to
7 Dr. Bonnie Dobbs. We've asked you to help us understand aging
8 from the driver's point of view and, for that matter, from the
9 traveler's point of view. What are the special mobility
10 considerations for an aging population?

11 DR. DOBBS: Thank you, Deborah. I'd like to spend the
12 next five minutes describing a focused and integrated approach for
13 enhancing the safety and mobility of what I see as the most at-
14 risk segment of the older driver population and that's the
15 medically at-risk driver. The approach has relevance to the older
16 driver population in terms of enhancement, enhancements in safety
17 and mobility. The framework that I present has relevance to the
18 topics that I've been asked to address today, and that is, what
19 are the functional abilities necessary for driving, the impact of
20 medical conditions, considerations related to transportation for
21 seniors, and premature driving cessation.

22 The framework that is on the overhead is the focused and
23 integrated approach that I use as my approach to research, and the
24 three pillars are: How do we identify older people -- how do we
25 identify drivers in general who are at risk because of medical

1 conditions? Once we've identified them, how do we assess that
2 driver for determination of driving competency? And finally, for
3 those that we have determined are no longer safe to drive, how do
4 we support those individuals? I'm going to spend just a few brief
5 moments on each of the three pillars.

6 In terms of identification, we know that the changes
7 associated with normal aging are unlikely to affect a person's
8 ability to drive, but rather the role of illness plays a critical
9 role and that's particularly important for the older driver
10 population because of the age association of many illnesses, such
11 as dementia. Because of the prevalence of dementia, because of
12 the prevalence of medical conditions, it seems to me that we need
13 broad involvement, and that includes involvement of the medical
14 community, the law enforcement community, the individual, families
15 and friends, the community at large, and certainly licensing
16 authorities.

17 To assist each of these communities we need evidence-
18 based screening tools and we also need a coordinated system. So
19 we need the community, the medical community talking or working
20 collaboratively with the licensing community. We need
21 individuals' families coordinating or talking with the medical
22 community. So we need to develop a more coordinated system.

23 As I mentioned, a key component is it's one thing to
24 screen or identify someone who may be at risk, but because of the
25 importance of driving for mobility and independence, we want to

1 ensure that when a license is revoked, that the person really is
2 at risk, and for that reason we need evidence-based, standardized
3 protocols. And those protocols are important because what they do
4 is that they protect those who are safe to drive, in other words,
5 ensuring that we're not revoking driving privileges from those who
6 are still competent. But we're also protecting not only the
7 individual but other road users from those who are unsafe to
8 drive. It's politically unpopular to talk about revocation of
9 driving privileges, but my perspective is, if someone is no longer
10 safe to drive, let's remove their license, but let's support them.
11 And that allows me to talk about the third pillar, in terms of
12 support.

13 When I think about support for the medically at-risk
14 driver or for any driver, it's in terms of psychosocial and
15 mobility. We know that moving from the driver's seat to the
16 passenger's seat is one of the most difficult transitions that an
17 individual will make. There is the psychological component and we
18 know from our research that we have to assist the individual and
19 the family with that transition. We have developed evidence-based
20 driving cessation support groups to help people make that
21 transition and to help their families.

22 We also know that mobility is critical and often, if you
23 look at mobility in the community, we tend to think of mobility in
24 terms of public transportation, buses, LRTs, and taxis.
25 Unfortunately, for the medically impaired driver and often for the

1 frail older driver, those forms of transportation are simply
2 unacceptable. So our focus has been on developing more responsive
3 alternate models of transportation to keep people mobile and
4 independent.

5 DR. BRUCE: Thank you, Dr. Dobbs. Dr. Dellinger, one of
6 the findings from the IIHS report that Dr. McCartt spoke about
7 concerned the increased fatality risk for the very old driver.
8 What can you tell us about fragility and crash involvement?

9 DR. DELLINGER: Thank you. It's a pleasure to be here
10 today and be able to speak to you about this. I'm going to give
11 you my bottom-line message up front and then I'll explain. And I
12 think that the issue of crash involvement and fragility or frailty
13 is trying to answer the question of responsibility.

14 The main question around the issue of crash involvement
15 and frailty or fragility is that older drivers tend to have higher
16 crash rates when you take into consideration how much they drive.
17 So is this because they truly have more crashes or is this because
18 they're more likely to be hurt or killed in a crash? And then
19 they'll end up in our databases and either will appear that
20 they're more of a problem than they are or appear that they're a
21 problem and they're not. So that's the issue that we're trying to
22 get at.

23 The answer is critical because if you're causing, say,
24 more than your share of crashes, maybe the safety measure that we
25 need is to take you off the road. In short, you're responsible.

1 But if the answer is that you're just more likely to be hurt, the
2 safety answer might be to improve vehicle safety features or
3 roadway safety features. In short, you're physically frail,
4 you're not responsible.

5 So research has investigated many of the factors
6 affecting crash involvement and I'm going to mention just a few
7 that I've put up on this slide here. How much do you drive? So
8 the low-mileage bias that was mentioned by Dr. McCartt, drivers
9 who drive a lot tend to have fewer crashes and drivers who drive
10 fewer miles tend to have more crashes. So is this because they've
11 self-restricted to slower speed urban roads where they're more
12 likely to have potential conflicts and crashes, or is it because
13 of a reduced driving ability, so they're driving the minimum that
14 they need to get by? Crash involvement may not differentiate
15 between a causal action that you've done, you've caused a crash,
16 so you're responsible, and crashes that someone else caused but
17 you couldn't avoid it.

18 Factors affecting whether your physical frailty will
19 lead to injury or death in a crash include whether you were
20 buckled up, how safe your vehicle was, and what kind of medical
21 care you received. So that's a mix of factors that you have
22 control over and factors that you have no control over as a
23 driver.

24 Part of crash involvement is whether you're a risk to
25 yourself or others on the road or both. Researchers have

1 quantified this risk in addition to quantifying the proportion of
2 excess crash involvement that can be explained by fragility or
3 frailty. And I keep using fragility and frailty at the same time
4 and people typically use them interchangeably. It's just
5 interesting that the medical people tend to say frailty and the
6 traffic people tend to say fragility. But from the literature,
7 they normally are used interchangeably.

8 So in general, when you look at the literature, there is
9 some excess risk to other road users, typically to passengers of
10 older drivers who are themselves frail or in fragile health,
11 although the excess risk is small when you compare it to, say,
12 teen drivers or young adult drivers.

13 The contribution of frailty to excess crash involvement
14 is interesting to quantify and, in fact, the proportion has been
15 estimated at 60 to 95 percent of the excess crash involvement.
16 Several studies have estimated it at about half of the excess
17 crash involvement. It's hard at this point to put an exact number
18 on it, but it is a significant proportion of the excess crash
19 involvement among older drivers.

20 So when you take into consideration frailty and
21 fragility, a low-mileage bias, and maybe the types of roads that
22 older drivers are driving on, it makes a difference in your
23 consideration of how much of the excess crash involvement is the
24 responsibility of the drivers themselves or not. I think I'll
25 stop there. Thank you.

1 DR. BRUCE: Thank you. The way we've structured the
2 format for the panel this morning, we're going to now take an
3 opportunity between Dr. Braver and myself to ask you questions.
4 I've targeted these questions to individual panelists, but I want
5 to take this opportunity to encourage all of you to step in. I
6 mean, this is meant to be an interactive discussion at this point.

7 And by way of foreshadowing, we're going to do the
8 question and answers from the Technical Panel to the panelists
9 until about 10:20, which gives us about a half an hour. So for
10 you to sort of set your time. And thank you so much for the
11 timing on your opening remarks. We really appreciate your respect
12 of the clock.

13 After we do the question and answer from the front of
14 the table, we'll turn it over to the parties and you will have 50
15 minutes or so to ask questions. We will help rotate that through
16 the different tables. And again, just to reiterate, we've asked
17 that one person from the table be a spokesperson for that table
18 and that the questions that you want to ask you're writing on the
19 question cards, which helps sort of make the questions very
20 succinct when they come around.

21 So as we get started again, I'm going to turn to
22 Dr. McCartt. The earlier studies that warned us that we were
23 facing an older driver problem and your June 2010 report seems to
24 tell us that those drivers are not the problem that we
25 anticipated. What might've changed from the earlier studies to

1 today?

2 DR. McCARTT: Well, I think the challenge in this is we
3 can think of lots of things that have changed, but our study of
4 safer vehicles, for example, we know through research that we've
5 done and others have done, we're all driving much safer vehicles
6 than we used to. But the key in our study is that whatever
7 explains our findings has to be a factor that has affected older
8 drivers more so than middle-aged drivers.

9 If you think about vehicles, for example, one, it's a
10 challenge to look at that, but older drivers tend to drive older
11 vehicles. We know that more people are buckled up. But again, it
12 has to be the key to answering the questions that arise from our
13 study are these factors have to be something that have affected
14 older drivers much more strongly than middle-aged drivers.

15 So, you know, I talked about a couple of the
16 possibilities. Certainly improved health and basically, you know,
17 better physical conditioning of older drivers stands out. How we
18 do the studies to see whether that's part of the answer, we're not
19 sure how to do that. And again, I think travel patterns are
20 important. When we get the data from our latest travel survey,
21 again, the preliminary findings show that older drivers are
22 driving a lot more overall and on average.

23 But we need to look at beyond just the quantity of
24 driving. We need to know if -- it's been suggested, for example,
25 we know older drivers tend to have certain kinds of crashes.

1 Their crash risk at intersections is particularly high because
2 they tend to drive in more urban areas. Has this changed? Are
3 they driving on high-speed roads, which would have a lower crash
4 risk and are safer if you crash? These are the things that we
5 want to try to take a look at. But again, it's very challenging
6 to figure out how to do the studies to come up with the answers.
7 So basically we're not sure.

8 DR. BRUCE: Thank you. You alluded to this in your
9 opening comments, but I wanted to get a quick answer to a very
10 succinct question, which is, people worry about older drivers
11 posing a risk of injury to other road users. How do older drivers
12 compare with teenage drivers, those in their 20s and those ages in
13 middle ages from 30 to 60?

14 DR. McCARTT: Older drivers do less harm to other road
15 users compared especially to teens and people in their 20s.

16 DR. BRUCE: Thank you.

17 DR. McCARTT: You know, again, they are mostly a danger
18 to themselves and to their passengers, who also tend to be older.

19 DR. BRUCE: And then the last of my three questions to
20 you. Self-restriction, such as limitations for time of day of
21 travel or avoiding unknown routes, appear to be common in older
22 drivers. Does this get rid of the excess risk of older drivers
23 dying in crashes or the risk of them being involved in crashes?
24 In other words, does self-restriction solve the risks that they
25 might pose to themselves?

1 DR. McCARTT: Well, I don't think we have the answer to
2 that question. I think that it sort of leads to a series of other
3 questions. Do the right people self-restrict? You know, we're
4 doing a study now that's following older drivers over a five-year
5 period, asking them about their impairments, visual, physical
6 mobility, diseases, for example, and then their travel patterns,
7 in trying to -- you know, we have a couple of questions, but one
8 is, does it look like the right people are self-restricting?
9 Again, these are self-reported impairments. And then to see
10 whether as people report increased impairments over time, does
11 that translate into increased self-restricted driving? So I don't
12 think we know the answer to that question.

13 Another thing, though, I would point out, and there may
14 be other people talking about this later, is, there are state
15 programs, and we looked at one in Iowa, that attempt to identify
16 drivers of any age, but especially older drivers, who maybe should
17 be restricting their driving. Iowa then administers a road test
18 and can remove the license, renew the license without
19 restrictions, but for some drivers places restrictions. And we
20 interviewed drivers in these categories and we found that the
21 drivers who reported the greater impairments were the drivers that
22 Iowa was identifying for a road test and then getting
23 restrictions. And another thing that we found was that the older
24 drivers tended to comply with the restrictions, but they also in
25 general affirmed or strengthened the restrictions these older

1 drivers also were making.

2 So there is a lot of evidence, I think, that older
3 drivers do self-restrict. But whether it's the drivers who should
4 always be self-restricting, I think in the long run that would not
5 be -- that would not totally eliminate crash risks, the higher
6 crash risks.

7 DR. BRUCE: Thank you.

8 DR. BRAVER: So Dr. McCartt, you've been showing a very
9 dramatic decrease among drivers who are 80 and older and you've
10 said that these drivers are driving more than in the past. But
11 I'm also wondering whether this age group might contain a lot of
12 people who are holding on to their licenses because we use
13 licenses for all sorts of purposes, at the bank and in airports
14 and so forth, and whether you might have a large proportion of
15 people in their 80s nowadays who hold on to the license but in
16 fact are not active drivers. Is that one possible explanation for
17 that very, very dramatic decline?

18 DR. McCARTT: Well, I keep pointing to the National
19 Household Travel Survey. There may be other surveys that aren't
20 national that might answer some of that question, but that's one
21 of the questions I think we could answer when we have travel
22 patterns. Although I should point out that survey does not
23 specifically ask if someone is a licensed driver. They ask if
24 they drive. But that is a possibility. I would guess that that
25 wouldn't fully explain the large declines. But, you know, again,

1 without travel -- without a good survey with detailed travel data,
2 I don't think we can answer that.

3 DR. BRAVER: Well, as a follow-up question, do you
4 expect the National Household Travel Survey, when it becomes
5 available, the latest version of it, to provide adequate data on
6 the amount of driving and type of driving performed by older
7 drivers?

8 DR. McCARTT: Well, I'm a researcher, so probably I
9 would never say anything is adequate, but I think it would go a
10 long way. It would, for example, talk about the numbers of trips,
11 the length of trips, to some extent the types of roadway
12 circumstances for older drivers. So I think it would go a long
13 way. It has information on the vehicle being driven, for example.
14 But it's a sample -- it's a very large sample, but still whether
15 for the very oldest drivers there will be adequate data to look at
16 everything we want to look at by state, for example, in our study
17 -- I could mention in our study, in our models that included the
18 13 states, we controlled for state, but we did find some
19 differences among the 13 states.

20 And so one of the things we would really like to look at
21 more is, you know, whether by state, whether by urban/rural, we'd
22 like to look at the geographic component of what we're seeing in
23 crash trends. And a national sample, even a very big national
24 sample, quickly becomes problematic when you get down to a state
25 level or, you know, a city level, for example.

1 I wanted to point one more thing out because a couple of
2 people have asked about the question of gender in our study. We
3 did a couple of studies, but in the second study we didn't
4 specifically look at whether there were differences in men and
5 women in these trends that we saw. So we did take a look at that.
6 Ivan, my coauthor, took a look at that and we found that the
7 declines for women were somewhat stronger but not significantly
8 so. So whatever is explaining these differences, it's not -- the
9 answer doesn't seem to lie in differences among gender, the
10 genders.

11 DR. BRAVER: Thank you very much, that's very
12 interesting. I'm now going to turn this over to Deb Bruce, who's
13 going to ask some questions of Dr. Rosenbloom.

14 DR. BRUCE: Hi, Dr. Rosenbloom. I can't do this without
15 my glasses. What's that telling us?

16 Where people live dictate their travel patterns. And so
17 the first general question is, what do we know about where seniors
18 live? You alluded to it in your opening remarks and I'm curious
19 of what kinds of knowledge we have about the types of trips they
20 do take and where that trip information comes from.

21 DR. ROSENBLUM: Could I have slide number 2, Jana?
22 Thank you. Well, as I suggested, older people live in low-density
23 places. These numbers are from the census and one of the problems
24 with the census is determining what's suburban. You can live 30
25 miles from downtown Houston, downtown Tampa, downtown Phoenix and

1 be considered in the central city. So these numbers actually
2 underestimate the percentage of older people living at fairly low
3 densities. And that trend is strengthening.

4 I invite you to read this chart from left to right.
5 Because the younger cohorts are very suburban and they're moving
6 through and the cohorts behind them are even more suburban. And
7 so what we're seeing is, as people age in place, and they mostly
8 do age in place, the largest percentage of older people are going
9 to live in very low-density areas and somewhere around a little
10 less than a fourth are going to live in rural areas. So what this
11 means is the car is really the only feasible mobility option in
12 many of these areas.

13 And we have to be looking at -- and people talk about,
14 well, what if older people move back to the central city? But
15 that's not what they're doing. Let me see chart -- could you put
16 up 4, please? This is Brookings Institute data. The census does
17 not every year figure out a one-year move rate. These are people
18 who moved home and these are in thousands. This is not a
19 percentage. But -- wait a minute, that's not -- well, leave that
20 one up. Okay.

21 And what you can see is older people are substantially
22 less likely to move than younger people. They're substantially
23 less likely to move state, so they're not moving very far. We
24 think that a lot of the movement at older ages is into care
25 facilities. The idea that older folks move from Chicago or

1 Detroit to Tucson or Tampa or Houston, actually they're less
2 likely to do that than they were 20 years ago. It's just that
3 they're so many more older people. So those of us who live in the
4 Sun Belt states, we see a lot of older folks coming in, but
5 they're actually a smaller and smaller share of the total
6 population. Most people stay in the home where they were when
7 they were still in the labor force, and what we need to be talking
8 about then is mobility and accessibility and walkability in those
9 kinds of communities, because as older people encounter
10 difficulties with driving or just don't feel like driving, there
11 are very few options in those communities.

12 So what we're seeing is people staying in low-density
13 communities. In fact, for every person in 2006, 2007, which is my
14 slide number 4, but apparently not this anymore -- there it is.
15 Now remember, not many older people are moving, but for every
16 older person who moves from suburb to central city, which may not,
17 I need to remind you, mean moving to much higher densities, there
18 are two people moving the other direction.

19 So the stories about older folks moving to the downtown
20 of an area, and you see those in the papers sometimes, those are
21 what we call man bites dog stories. They're reported on because
22 they're unusual. In fact, older people that do move are going the
23 other way.

24 And let me show you something else. Could I see
25 number 8?

1 No, it's a map of Tucson. There we go, that's it. I'm
2 sorry, this is a really terrible picture and I'm not sure the
3 colors are going to show up. In sort of to the left is Tucson,
4 Arizona. The shaded areas are the city of Tucson or incorporated
5 cities. The little map that you can't see on top is north of
6 Tucson. The map to the side is south of Tucson. And those red
7 dots, which are hard to see, are active adult retirement
8 communities like Del Webb. There are also informal groupings of
9 folks who moved out sometimes in trailers. And if you can see the
10 red dots, you'll see that almost all of these are on the edge of
11 the metropolitan area and these are folks largely who moved in
12 from the Snow Belt to the Sun Belt. So they didn't come to the --
13 when they moved out of Detroit and Chicago and Cleveland and came
14 to places like Tucson -- and we did this in Phoenix and other
15 folks have done it in some other areas like Tampa -- where they
16 move is to the edge.

17 So most older people don't move. They're aging in place
18 in low-density areas. But those who do move, particularly out to
19 other states, are moving out in the boonies and they're moving to
20 communities -- many, many of these communities have no resources,
21 transportation resources whatsoever. There's no bus services out
22 there. These are people who move when they have a car and don't
23 have it in their mind that they're not going to have a car
24 sometime in the future.

25 DR. BRUCE: Thank you. And I have one last question and

1 I hope it's on a positive note. Can you give us some urban
2 planning examples that would be of benefit to seniors? I mean,
3 I'm thinking of in-fill for older people in aging neighborhoods.
4 And I know you've worked in other countries. Do you have any
5 experience with public policies or public transit systems that you
6 know of in other countries that would serve as examples for us?

7 DR. ROSENBLOOM: Well, yeah. I agree with my fellow
8 panelists that public transit is not generally the answer because
9 traditional public transit services are not meant for older
10 people, they're meant for commuters and so they don't serve the
11 destinations older people want to go to. They report frequently
12 that they don't like the vehicle starting before they get to their
13 seats and all of the other kinds of inconveniences that the rest
14 of us put up with when we use public transportation.

15 But there are some services that have been tried abroad,
16 particularly in Scandinavia, where they're called community buses
17 or service routes, where they're regular public transit but in
18 smaller vehicles. Older folks report liking smaller vehicles,
19 particularly being closer to the driver so if they had some
20 problem, the driver can see that they haven't made it to their
21 seat and so forth. And they're rooted to the origins and
22 destinations that seniors are more interested in.

23 They're public transportation, anybody can get on board
24 and pay the fare. But these things have been very successful in a
25 number of countries in Europe. They're more expensive than

1 traditional public transportation services, but they're not more
2 expensive than door-to-door services.

3 And I wonder if you could show me slide 20, please?
4 This is -- when it comes up, I just took some public transit
5 systems at random, and you may know that the Americans With
6 Disabilities Act requires public transit operators to provide at
7 least curb-to-curb services. Some of them provide door-to-door or
8 even door-through-door. I did not cherry pick these. The only
9 thing I was looking for in my somewhat random selection is to get
10 both Sun Belt and Rust Belt cities.

11 The first column is the annual number of trips that
12 these services -- that are provided by the transit operator in
13 that community in their ADA service. If you look, the next column
14 is what percentage of the total system ridership of all the
15 services each of those providers provide, what percentage are
16 these ADA trips, and you'll see it's very small. The highest is
17 Miami at 2.4 percent. Then, if you look in the next column,
18 you'll see what a one-way paratransit trip costs.

19 So if you take Mrs. Jones, just take her to the doctor
20 in Boston, that costs you \$33.21. If you take her to the doctor
21 and bring her home, it's \$66.42. And, in fact, the number for the
22 largest 50 systems in the country is about \$37 a one-way trip.
23 Which explains the fourth column, which is the percentage of total
24 system costs these ADA services require. And look at some of
25 those systems. Miami is spending almost one out of every four

1 transit dollars to provide these ADA services to a very small
2 percentage of its total ridership. What this means is that these
3 systems are not very likely to -- this is today. These systems
4 are not very likely to expand.

5 I wonder if I could see my slide 22, please? This is a
6 study that I did a couple of years ago for the Institute on
7 Medicine, which was mandated by Congress to look at the extent of
8 disabilities. Now these are not just older people, these are all
9 people who reported to the census that they had a serious
10 disability. And all I did was divide the number of trips by the
11 number of people who might be eligible for those services.

12 So in Chicago, for example, the average person of any
13 age with a serious self-reported disability got less than one-
14 fifth a trip a year. Now, in fact, what happens is the
15 overwhelming number of people who are eligible for these services
16 never use them at all and a small number use them frequently. But
17 then the last column calculates for each system, given their 2004
18 costs, which, you know, you just saw on the previous chart, were
19 somewhere between \$25 and \$45 a one-way trip, though those were
20 2008 data. And I just said, well, what if the transit operator
21 provided for every person with a serious disability of any age,
22 what if they just provided them with one round trip a year? And
23 so you're talking about in Atlanta, for example, \$290 million more
24 a year just to provide people with serious disabilities with one
25 trip a month.

1 So these options are not going to be -- these are not
2 realistic options for the very large number of older people who
3 are not going to be able to drive. So I do think that there are
4 public transit options that are more geared to older people, but I
5 think the answer really is to use the underutilized capacity in
6 cars, all those empty seats in cars. And I'm a very big advocate
7 of volunteer driver programs, which are much less expensive than
8 these kinds of things and are a way to provide services in the
9 low-density areas where public transit and these kinds of services
10 are not going to make sense. Thank you.

11 DR. BRUCE: Thank you very much. This is very
12 interesting. I really appreciate that. You've covered a lot of
13 the questions that we were going to ask.

14 I'm going to now move on to ask some questions of Bonnie
15 Dobbs. I know that you have an expertise with the whole area of
16 premature driving cessation, that is, you know, giving up driving
17 although the person still drives well. So I wanted to ask you a
18 couple of questions about it. What evidence is there that safe
19 drivers are misjudging their own skills?

20 DR. DOBBS: Thank you. The issue of a determination of
21 driving competency, particularly self-determination of driving
22 competency, is an interesting area. And when I think about the
23 senior population, it's often -- people often think of the senior
24 population as being a homogeneous population and, in fact, there's
25 more heterogeneity in the senior population than in any other age

1 group. So when I think about whether people can accurately assess
2 their ability to drive, I think about a framework, if you think
3 about a person's real competency and then their perceptions of
4 competency. And if you look at the framework that's up on the
5 overhead, you can see that there's four cells. And if we look at
6 the combination between real competency and perceptions of
7 competency in the first upper left cell, you can see that there
8 are a group of people that are competent to drive and they
9 perceive themselves as competent to drive. And the likely outcome
10 of that combination is that those individuals will continue to
11 drive and appropriately continue to drive.

12 The next cell in the upper right corner is when
13 individuals do not perceive themselves as being competent to
14 drive, or sorry -- thanks, Deb -- sorry, where the individual is
15 no longer competent to drive but they perceive themselves as
16 competent to drive. And in this case the individual likely will
17 continue to drive, but that will be an inappropriate continuation.

18 In the lower left cell is where the person is competent
19 to drive but they perceive themselves as incompetent to drive.
20 The likely outcome, predicted outcome, would be inappropriate
21 driving cessation.

22 And then in the fourth cell in the lower right corner is
23 where there is real -- where the person is no longer competent to
24 drive, they recognize that they're no longer competent to drive
25 and there's appropriate driving cessation.

1 So how does that have relevance to self-perceptions of
2 competency? If you look at the first upper left cell, that likely
3 represents the majority of healthy older drivers. They perceive
4 themselves as competent to drive; they continue to drive. The
5 upper right cell represents individuals with a dementia. So they
6 perceive themselves as competent to drive but they're no longer
7 competent and they continue driving. And interestingly, research
8 that we have done indicates that if you ask them to rate their
9 driving competency, they likely will -- most often they
10 overestimate their driving competency, such that they perceive
11 themselves even better to drive than an age-matched individual.
12 So using screening tools in this population, self-screening tools,
13 is not going to be helpful at all. They perceive themselves as
14 competent to drive and will continue to drive.

15 Interestingly, the lower left cell, where the person is
16 competent to drive but they perceive themselves as not competent,
17 that's likely representative of older females. We know when we
18 look at the data that older females often engage in premature
19 driving cessation. I think that this cell is interesting in that
20 we can likely do some interventions to have them continue -- to
21 give them training and increase their perceptions of competency
22 and keep them mobile.

23 And then the ones that appropriately restrict their
24 driving, those are the ones that we have to provide alternate
25 transportation for.

1 DR. BRUCE: Dr. Dobbs, I've read something that I just
2 want to almost lead you into a quote because I like it so much.
3 How much longer can we expect to live than we drive?

4 DR. DOBBS: Thanks, Deb. This is research done by
5 Foley, et al., and men outlive their driving careers by 6 years
6 and females outlive their driving careers by 10 years, based on
7 the research from Foley and colleagues.

8 DR. BRUCE: Thank you.

9 DR. DOBBS: So most of us should prepare for the day
10 where we will no longer drive.

11 DR. BRUCE: There is news in that.

12 Dr. Dellinger, you've been the cleanup panelist for two
13 rounds in a row. I'd like to turn to you and I thank you for your
14 opening remarks. They were right on.

15 A recent study from CDC shows that the annual average
16 cost of traffic accidents are about \$500 per licensed driver and
17 older drivers have an average annual cost of \$118 per driver.
18 That's such a difference. Why are the costs so much less for
19 licensed older drivers?

20 DR. DELLINGER: Right. If I can explain to the audience
21 a little bit about what we did in that study and then I think that
22 will -- it will make sense. I'm from the Injury Center at CDC, so
23 you'll understand when I tell you that when we do cost studies,
24 and in this one in particular, we added medical costs, medical
25 spending and productivity losses; what did you lose because you

1 couldn't work? We're less concerned, say, with property damage
2 costs, travel delays. That's not what we're about. We're more
3 about injury prevention. So it's a very conservative cost
4 estimate of motor vehicle crashes in the U.S. So to tell you that
5 first.

6 We estimated \$99 billion for a year. And to cover that
7 cost, because it's a great way to get people's attention, that
8 would mean \$500 every licensed driver would have to pay to cover
9 the medical and lost productivity costs of all driver crashes.
10 And it would be fatalities, hospitalizations and you visited an
11 emergency department. We captured all of those costs plus lost
12 productivity.

13 This human capital approach, one thing that it does
14 because of the lost productivity, the work part of it, it
15 undervalues children, women and the elderly. Why? Because we
16 either don't make any money as children or as women. I'm sorry to
17 say, we make less money than a lot of the men. So the men's costs
18 will be higher. The \$118 per capita for older male drivers was an
19 average, and for older women it was \$67.

20 So the differences here are largely due to our
21 methodology, which takes the medical spending plus the
22 productivity losses, and the productivity losses are a bit skewed,
23 I guess, is the way to put that. Does that make sense?

24 DR. BRUCE: Yes.

25 DR. DELLINGER: And also, as an aside, deaths usually

1 don't cost as much as hospitalizations. So if you die you're
2 accumulating less --

3 UNIDENTIFIED SPEAKER: Debt.

4 DR. DELLINGER: Yes, less cost than someone who has an
5 extended hospital stay, for example, which you might do if you're
6 older and you have underlying medical conditions and then you get
7 injured in a crash.

8 DR. BRUCE: Well, thank you very much.

9 We're running a little bit low on time here. We wanted
10 to allow the parties time to ask questions, too. So I would like
11 to ask the entire panel to make some brief remarks about their
12 recommendations for future research, bearing in mind that we want
13 to leave time for the parties to ask questions.

14 So let's see, since you've been -- keep coming last, why
15 don't you start out first, Dr. Dellinger?

16 DR. DELLINGER: Okay. And one question that might have
17 come up, that I think we discussed, were what risks to other road
18 users and what kind of research in that category do we need and
19 what kind of exposure measures? And I guess my point there is
20 there have been several studies on risk to other road users by
21 older drivers, teenage drivers, and I'm not actually sure we need
22 to do that again. The results are fairly consistent. So my
23 answer to that is we probably don't need another study that shows
24 the risk of older drivers to other road users. I think we have
25 that covered.

1 DR. BRUCE: Thank you.

2 Dr. Dobbs.

3 DR. DOBBS: Thank you. I guess when I think about the
4 older driver population and an area of research that is sorely
5 needed is in terms of providing alternate transportation. We know
6 right now that there are challenges in providing transportation to
7 seniors and that's only going to escalate over the next two to
8 three decades. When I look at the research that has been done on
9 alternate transportation for seniors -- and that's transportation
10 that's outside of the traditional public systems, so buses, taxis,
11 LRTs, paratransit -- we know that there are a number of
12 organizations in the communities that are providing transportation
13 for seniors, but there are more gaps in that transportation
14 provision than there are strengths. And research that we've done
15 in Alberta indicates that in order to build a responsive model
16 that will meet the demands today and in the next two to three
17 decades, we need leadership at both the local, the state, at the
18 federal level. We have a need for more intersectorial
19 collaboration for alternate transportation for seniors. There's a
20 need for the identification of new funding streams to start
21 building the alternate transportation models that are needed, and
22 we need implementation of innovative, sustainable models.

23 It's interesting when you look at alternate
24 transportation for seniors. Most of the organizations are working
25 tirelessly. They do a lot of work in terms of fundraising so that

1 they can provide the transportation to seniors at a cost that is
2 acceptable. However, that approach often ends up being a barrier
3 in that they spend most of their time fundraising so that they can
4 afford to provide the transportation. So I think that when I look
5 at transportation for seniors right now, there's a lack of
6 capacity building and there's a lack of sustainability, and
7 research is needed and implementation in order to address those
8 needs.

9 DR. BRUCE: Thank you.

10 Your thoughts, Dr. McCartt, on directions for future
11 research.

12 DR. McCARTT: I would mention three. The first is
13 following on our studies, as I said, to try to dig down deeper and
14 look at geographic differences, for example, to try to understand
15 better why we're seeing this very positive change.

16 The second would be -- and I know you have a panel on
17 this -- has to do with vehicles. You know, I think when you look
18 at highway safety, one of the real amazing things is how much
19 better we are doing at protecting people in crashes. And of
20 course, older drivers have benefited from that, as have other
21 ages. But I think all we can do to look at how -- to look at the
22 particular issues of older drivers in terms of crashworthiness.

23 And then a different thing about vehicles are all these
24 new crash-avoidance technologies which people are looking at as
25 being very promising to preventing crashes from happening at all.

1 And there's a lot of discussion, but it's hard to do research on
2 this, about how older drivers may either find them confusing or
3 how will they benefit compared to younger drivers. So I think
4 that's a promising area.

5 And then, finally, I think we still need to continue to
6 look at restrictions by states, because when there are bad crashes
7 involving an older driver, you know, it's always the first thing
8 to try to figure out a way to impose restrictions on older
9 drivers. And I think there's still a lot we don't know about the
10 effects of visual requirements or other special restrictions that
11 are placed on older drivers which in the end affect their
12 mobility. So that would be the third area I would suggest.

13 DR. BRUCE: Thank you very much.

14 Dr. Rosenbloom, your, you know, brief thoughts on
15 directions for future research.

16 DR. ROSENBLROOM: I'm very interested in the whole issue
17 of premature driving cessation. I do a lot of work on that here
18 and abroad. And the whole issue of women who -- it tends to be
19 women who give up driving earlier than they need to and they have
20 fewer resources to fall back on. And increasingly women are
21 entering their senior years living alone and with no family
22 members. So I'm very interested in that.

23 I'm very interested in the whole issue of whether men
24 and women receive safety messages differently. There seems to be
25 some evidence about that, and that may be related to how we can

1 keep older women driving safer longer, as we're trying to get
2 older men who are unsafe to stop driving.

3 I think we need to look at the whole range of -- women,
4 for example, are much more likely to accept rides from -- to ask
5 for and accept rides from other family members and friends and
6 people in the neighborhood. So I'm interested in seeing what
7 kinds of alternatives might be more appropriate for -- it may be
8 that the systems that we look at will be very gender-based because
9 women will be willing to look at options that men aren't and I
10 think we need to be looking at that.

11 And I want to disagree a little bit with Dr. Dobbs. I'm
12 not sure that we need a lot of research about why things are so
13 expensive; they are. I think what we ought to be looking at is
14 how we can develop a package of options, which could include
15 people moving to facilities that serve them better. I don't
16 necessarily mean nursing homes or assisted living, but whether we
17 can find a way for people to live in their own neighborhoods, for
18 example, but not in the same 2500-square-foot house that they
19 lived in when they were in the workforce.

20 DR. BRUCE: Well, thank you very much. This has been a
21 very interesting set of presentations and questions. Since this
22 is going to continue, I'm now going to turn this over to
23 Chairman Hersman to work with the parties.

24 CHAIRMAN HERSMAN: Wow, this is great. And you've
25 certainly helped me understand my parents a lot better by

1 explaining who decides what to give up when.

2 How are the panels doing? Would you all like a short
3 break?

4 Okay, we'll move to the parties and we're going to just
5 go in a round robin and allow each of the tables to do questions.
6 We'll begin with NHTSA.

7 MR. MADDUX: Good morning and thank you for the
8 presentations. All very interesting. It looks like we have a
9 couple questions here. A question for you, Dr. McCartt. You
10 mentioned that you thought that our national databases were not
11 sufficient for answering these questions. Are there other
12 databases in other countries or insurance databases or others that
13 would be useful or we should look to for comparisons?

14 DR. McCARTT: Well, I have to say I'm not really
15 familiar so much with databases in other countries. As you know,
16 we have a sister agency, the Highway Loss Data Institute, and we
17 get claims data for something like 85 percent of the insurers, and
18 we do studies looking at older driver trends using those data.

19 The difficulty, the limitations to the HLDI data are
20 that it's a huge database, a huge sample size, but not a lot is
21 known about the circumstances of the crashes. So without doing a
22 special study, there are some issues that can't be studied very
23 well. But it is a database that we use.

24 MR. MADDUX: Okay. Do we continue with our table?

25 CHAIRMAN HERSMAN: Sure.

1 MR. MADDOX: Okay, thanks. This is a question from
2 Jonathan King from the National Institute on Aging. Pardon me, my
3 throat's a little sore. What would be the best estimate of the
4 cost of premature driving cessation in older drivers, given just
5 the cost of paratransit and cost of providing goods and services
6 to older adults in their homes? Should I repeat that?

7 DR. ROSENBLOOM: Well, if that was directed to me, I
8 have no idea what the dollar costs are. But I think that if
9 someone prematurely stops driving, they probably don't qualify for
10 most of those community-based services. You have to be fairly,
11 significantly disabled to qualify for ADA service. And I think
12 it's hard to quantify the social isolation and the lack of
13 interaction, and I think there's a lot of evidence that those kind
14 of symptoms lead to earlier -- to morbidity. And I think it's
15 tragic, but I don't know that anybody can put a dollar figure on
16 it.

17 MR. MADDOX: Thanks.

18 This must be from you, Beth. How do the demographic
19 changes related to people staying in the labor force longer affect
20 older driver issues? And it's not addressed to anyone, so if
21 anyone wants to take that one, staying in the workforce longer.

22 DR. ROSENBLOOM: Well, actually, it's women who are
23 staying in the labor force longer. And so I don't know.
24 Presumably they'll keep their driver's licenses if they have to
25 keep working and don't have any alternatives. But I think that's

1 an interesting question, but one I don't know that anyone has done
2 any research on.

3 MR. MADDUX: And then we've got one last question.
4 Someone -- and I don't remember which panelist it was -- mentioned
5 that seatbelt usage rates for older drivers is perhaps different.
6 How does it compare to the average-age driver, if you will? And
7 then, secondly, does seatbelt usage use rate change for drivers
8 who are under restrictions, restricted drivers?

9 DR. McCARTT: I may have mentioned that, but if I did,
10 that's not what I meant to say. I don't think that the belt use
11 for older drivers is problematic compared to younger drivers. And
12 I don't know about belt use and how restricted drivers -- how that
13 relates to restricted drivers.

14 I wanted to follow up one thing about our insurance
15 database. I should've mentioned this. When we did our study, we
16 did -- in our discussion to our paper we do talk about when you
17 look at trends in the insurer claims database, they aren't seeing
18 the lower -- they're not seeing the decline in claims rates for
19 older drivers compared to younger drivers. There are some
20 differences. Their data relate to newer vehicles and these are
21 crashes reported to insurers, not police-reported crashes. So
22 those are two different reporting systems.

23 But it is different and, again, we tried to figure out
24 why that might be and we're not sure why. But I should mention
25 that it does present not as positive findings, you might say, for

1 older drivers relative to younger drivers. And these are crashes
2 of all severities and the data are dominated by very low severity,
3 not injury crashes.

4 DR. DOBBS: Could I address the issue of restricted
5 driving? The issue of restricted licensing is interesting, in
6 that I think that most often it's predicated on the recognition
7 that mobility is so central to our mobility and independence, and
8 restrictions in driving are appropriate, I would argue, for some
9 segments of the older driver population. For example, individuals
10 with visual impairments, restricting their driving to daytime-only
11 makes sense. But often those restrictions are generalized or
12 extended to individuals with cognitive impairment, and in those
13 instances it's inappropriate. And my analogy would be that we
14 wouldn't think about letting an alcohol-impaired driver drive
15 within a five-kilometer radius of home. We wouldn't let an
16 alcohol-impaired driver -- we wouldn't restrict an alcohol-
17 impaired driver to driving between 10:00 and 2:00 in the
18 afternoon. And that's essentially what we're doing with an
19 individual with a cognitive impairment who's no longer safe to
20 drive. The difference between the alcohol-impaired driver and the
21 cognitively impaired driver is the alcohol-impaired driver may
22 sober up and the cognitively impaired driver won't.

23 I think that the reason that the restricted licensing
24 looks so attractive is because of the woeful inadequacy of
25 alternate transportation to allow these people to stay mobile. I

1 would prefer that we put our efforts towards developing responsive
2 models of transportation to keep these people mobile, as opposed
3 to using something like a restricted license and just keeping our
4 fingers crossed that they're not going to crash.

5 MR. MADDOX: That's all ours.

6 CHAIRMAN HERSMAN: Thank you. And we'll move to the
7 back table. Do you all have an appointed spokesperson? Please go
8 ahead.

9 MS. LYNOTT: Good morning and thank you. At our table,
10 our first question has to do again with the premature cessation of
11 driving, and are there other sources of premature cessation and
12 ideas of how we should address these? So things like doctor's
13 orders to stop driving that may not be really substantiated.

14 DR. DOBBS: In terms of the role of illnesses and the
15 role of the medical community, to my knowledge, there are no data
16 that indicate what the prevalence of, in terms of doctors advising
17 departments of motor vehicles about driving cessation when it's
18 inappropriate. However, I suspect that that does occur.

19 What that suggests is that we need to provide the
20 medical community with better tools to help them identify people
21 who may be at risk and then we have to do a better job of
22 implementing the protocols that allow the person to be referred to
23 or assessed at motor vehicles or through an evidence-based driving
24 assessment to ensure that when physicians do identify people as at
25 risk, that they are assessed using evidence-based protocols and

1 that we're revoking privileges of those people who are unsafe but
2 leaving those people who are still safe and still competent on the
3 road.

4 DR. ROSENBLOOM: I'd like to say that, looking at it
5 from the other side, I do a lot of focus groups here and abroad
6 and one of the things women say the reason they give up driving is
7 that their husbands tell them they're bad drivers. And there's a
8 lot of evidence about that. And actually NHTSA has a study that
9 showed something similar, too. So there's a lot of research about
10 that.

11 So the other side of the question is, can we find ways
12 to -- that people can test themselves to assure themselves that
13 they are good drivers? And there's a small AARP study where they
14 asked people who went through -- is it called mature driver now?
15 I can't remember what the AARP program is called now, where the
16 men who went through rated themselves before the program as good
17 drivers and after the program as good drivers. The women rated
18 themselves worse before and better after. And what seems to be
19 occurring is that women are getting -- are seeing, okay, this is
20 what good driving is and I'm doing it, so I feel better now. And
21 I think that we need to be looking at, in terms of premature
22 driving, if we can get some evidence-based things that tell safe
23 drivers, oh, I am a safe driver and here's some proof I can say to
24 my husband or just to myself to feel good about driving.

25 MS. LYNOTT: Okay, thank you.

1 Our next question is for Anne McCartt. And is it true
2 that despite decreasing numbers of fatal crashes among persons age
3 70 and older, the share of all traffic fatalities that are of this
4 age group is increasing? And we pulled this latter stat from a
5 recent white paper that was written for TRB's Towards Zero Deaths
6 conference that was held this past summer, I believe.

7 DR. McCARTT: I'm not sure I follow your question.
8 You're saying that even though older driver fatal crashes are
9 going down at a faster rate than middle-aged drivers, they're an
10 increasing percentage of all the deaths?

11 MS. LYNOTT: Correct.

12 DR. McCARTT: I don't know if that's the case or not,
13 because I know that we've seen very strong declines in teen
14 crashes. I don't know if that's correct or not. It doesn't sound
15 logical to me, but maybe when you look -- I mean, again, our study
16 looked at passenger vehicle drivers, which wouldn't actually
17 support your hypothesis because motorcyclist deaths have gone up
18 among younger drivers. We didn't look at that. So I don't know
19 if that's the case or not. It would be easy to check. I can
20 check while you're asking people other questions. But I don't
21 know.

22 MS. LYNOTT: Thank you. And a following question has to
23 do with barriers and the use of cars, volunteer driver programs,
24 you know, any type of program that's outside the traditional
25 options, whether these be insurability, training, education, cost

1 of gas, et cetera. So Dr. Dobbs and Dr. Rosenbloom, if you might
2 address some of the barriers.

3 DR. DOBBS: The barriers that we've identified in
4 alternate transportation service provision -- and just for
5 clarification, alternate transportation service provision is
6 transportation outside of traditional modes, such as public
7 transit, paratransit. Alternate transportation service provision
8 often is provided at the community level by community
9 organizations, seniors organizations, church groups.

10 Typically, the model is such that alternate
11 transportation service providers for seniors rely primarily on
12 volunteer drivers. Some organizations use a blend of paid drivers
13 and volunteer drivers. When you look at the service provision
14 across those two, the paid driver/volunteer driver model is a more
15 responsive model because it allows the service provider to provide
16 transportation not only on weekdays, but weeknights or weekdays
17 and weekends, daytime and evening.

18 And we know that when we look at senior transportation
19 that often their what's called life-enhancing [sic] transportation
20 needs are met -- so they get to the doctor's; they get to the
21 grocery store -- but they're life-enhancing transportation needs
22 are not met, so the ability to go social events, the ability to
23 attend religious events. So using a blend of paid drivers and
24 volunteer drivers is more responsive; it's more costly.

25 We also know that funding streams, there often are not

1 dedicated funding streams, so alternate transportation service
2 providers, as I mentioned earlier, spend a great deal of their
3 time and their resources fundraising to provide what they perceive
4 as being affordable transportation for seniors.

5 Interestingly, that perception, that assumption, that
6 transportation should be provided at no cost or little cost is a
7 barrier, in that all of us pay for transportation until we're 65
8 years of age. For some reason there's this assumption that as
9 soon as we turn 65 we should have our transportation subsidized.
10 When you talk to seniors themselves, most of them say, I quite
11 expect and I'm quite willing to pay and pay more than what my
12 service provider is charging me. I recognize that there are
13 segments of the older driver population that don't have the
14 resources for transportation and we do need to subsidize that
15 segment, but for the most part, I think that there's more capacity
16 from the seniors themselves to assist with building better models
17 of transportation.

18 MS. LYNOTT: Thank you.

19 DR. ROSENBLUM: Yeah, I think it's a given there's not
20 enough money, because there's a huge demand and there's not enough
21 service. But some of the other issues are not as pressing. It
22 turns out insurance is not that big a problem. People talk about
23 it a lot and some of the volunteer systems do provide additional
24 insurance coverage. You can be covered under the national agency
25 or the agency service and that sometimes, I think, makes drivers,

1 volunteer drivers feel better. But there's not a lot of evidence
2 that these people are running around getting into terrible
3 crashes. So it's less of an issue than you might think.

4 One of the problems that I see is that when any of these
5 services get to any size, they run quickly into diseconomies of
6 scale. And I remember early in my career the Red Cross was
7 running a service in El Paso, Texas, and I went down there
8 assuming -- I think I had a contract from the Texas Department of
9 Transportation. I went down there assuming they would have the
10 cheapest costs of any big city in Texas and, in fact, they were
11 somewhere in the middle and I couldn't understand that; they had
12 volunteer drivers.

13 Well, they had to have a lot of people sitting around
14 called coordinators or social service providers for the drivers
15 who didn't show up. When you have a large system of drivers and a
16 lot of them are themselves seniors, then they don't feel well or
17 it's raining or -- and so you have to have all of these paid
18 backup drivers.

19 So I think one of the problems is -- I don't want to do
20 too much about this thousand points of light business, but I do
21 think that a lot of little services might -- thousands and
22 thousands and thousands of little services might actually be a
23 better way to do it. Once you start to aggregate them up, then
24 the drivers' wages go up, then you have to have dispatchers, then
25 you have to have backup drivers, then you start to be a business.

1 And I have looked at the -- and the Beverly Foundation
2 has as well. We've looked at some of the costs of some of the
3 well-known volunteer systems and they're running \$20 to \$25 a one-
4 way trip with volunteer drivers in their own cars. So I think the
5 problem -- there's an issue there of how big you can get before
6 you start to be very expensive.

7 DR. DOBBS: The one area where there are opportunities
8 is certainly the use of technology, in terms of allowing the local
9 service organizations to start using technology to do the
10 scheduling of rides, and there's cost efficiency in that.

11 MS. LYNOTT: Thank you.

12 If our group has time for one more question? Okay.

13 Sandy, you mentioned that land use is major issue and,
14 as a city planner, could you talk more specifically about what
15 some of the potential land-use solutions might be?

16 DR. ROSENBLUM: Well, I think it's very heartening that
17 the Federal Transit Administration has taken on, along with their
18 promotion of transit-oriented development, an understanding that
19 you have to have affordable housing at the same time.

20 One of the problems is that land value goes up a lot
21 around light rail and very good transit service and you gentrify.
22 And there's some neighborhoods in San Francisco where they put in
23 service simply to hit populations of elderly people and force them
24 out because the rents went up and the prices went up. So I think
25 we have to be looking at a coordinated way to make sure that in

1 denser areas with more transportation choices, with more land-use
2 choices, that you can walk to grocery stores and all of those
3 sorts of things, that they remain affordable.

4 Now there are plenty of older people with a lot of
5 money, but there are plenty who don't have it and I think we have
6 to be watching to make sure that as we provide more desirable
7 neighborhoods, the people that we're looking at can actually live
8 there, afford to live there.

9 DR. McCARTT: I wanted to just follow up. I don't have
10 the information to answer the question. It's a really good
11 question and I should know the answer.

12 And it is possible, when you look at the deaths, if you
13 -- our study looked at older drivers. But if you look at deaths
14 and you include children and pedestrians, I don't know how the
15 total package has changed, but it gives me an opportunity to
16 reiterate the importance of exposure measures. The reason our
17 study was interesting or important, maybe, is that this is not
18 what we expected, because we have more older people, more drivers,
19 and the best indication we have is that older drivers are driving
20 more. So deaths are always the ultimate measure that you're
21 always trying to reduce, but especially when you're comparing age
22 groups or different types of drivers, it's critical that you have
23 an exposure measure.

24 So I just wanted to clarify. I think our study was not
25 focusing on deaths. It was focusing on deaths per licensed

1 drivers. And if you look at population or VMT, vehicle miles
2 traveled, you tend to see the same patterns.

3 CHAIRMAN HERSMAN: Thank you. And we'll proceed to the
4 next table. It looks like the Alliance of Automobile
5 Manufacturers is going to be designated to ask questions for the
6 table.

7 MR. SCHMIDT: Yes, and excellent presentations so far
8 and excellent questions by the other panels. This is for the
9 whole group and it's kind of a two-part question. Data is lacking
10 on the effectiveness and validity of many screening methods,
11 assessment programs, and associated licensing policies. What, if
12 any, of the above should have national priority for data
13 collection? And also the second part: How should priority areas
14 be defined for large-scale national epidemiological studies to
15 address those issues?

16 CHAIRMAN HERSMAN: Could you repeat the first part --

17 MR. SCHMIDT: I realize I was probably rattling.

18 CHAIRMAN HERSMAN: Could you repeat the first part of
19 your question, please?

20 MR. SCHMIDT: Okay. Sorry to be so -- it's a long
21 question and I tried to rush through it. Data is lacking on the
22 effectiveness and validity of many screening methods, assessments,
23 and licensing policies. What, if any, of the above should have a
24 national priority for data collection itself, the actual
25 collection of data for those?

1 DR. McCARTT: Well, I think there are a couple of
2 efforts underway. I know California and Maryland have both been
3 very progressive in looking at the development of screening tests
4 that could be -- that could produce reductions in crashes. And I
5 know California isn't just focusing on older drivers. They've
6 done a series of studies comparing, you know, drivers of all ages
7 and different screening instruments.

8 So I think the priority with a lot of countermeasures in
9 older driver safety is relating them to crashes. So I think the
10 priority would be whether through random assignment or through
11 other very strong research methodologies to try to get to that
12 goal, which is to identify specific screening instruments that
13 would not only change driving behavior or self-reported behaviors
14 or test-track behaviors, but actual crash reductions. And that
15 won't be easy, believe me.

16 DR. DOBBS: I can talk about what's happening in Canada.
17 We have just developed a new screening tool for the identification
18 of cognitively impaired drivers, and in one of our jurisdictions
19 in Canada, the Province of British Columbia, the new screening
20 tool, which is called the SIMARD-MD, has now become the screening
21 tool for cognitively impaired drivers and it's a requirement by
22 their department of motor vehicles, as is an evidence-based
23 driving evaluation. And in Alberta, the screening tool is
24 increasingly being used by the medical community. Looking at our
25 website, the screening tool is also being used a lot or being

1 picked up a lot by the medical community, the occupational therapy
2 community in the United States.

3 I think it would be -- it is really important for us to
4 start looking at the effectiveness, the efficacy of these tools,
5 when they're introduced. And I would love to see research done.
6 We're doing research in Canada, but it would be nice to see some
7 research done at the state level in the United States as well.

8 The screening tool, the SIMARD-MD, focuses on
9 cognitively impaired drivers, but we need the same type of
10 development and then an implementation and results of that
11 implementation for motor conditions and sensory conditions, visual
12 conditions. So to me that would be a priority, particularly when
13 you look at the demographics that are coming out, as we know, as I
14 said earlier, that it's most often illness, not age, that impairs
15 a person's ability to drive. So if we can start targeting the at-
16 risk population, then there should be reductions in collisions as
17 a result of identifying the appropriate drivers who are at risk.

18 MR. SCHMIDT: The next question is for Dr. Rosenbloom.
19 Is there evidence of changes in the patterns of driving of older
20 drivers that may help explain their greater crash reductions
21 compared with younger drivers?

22 DR. ROSENBLOOM: No, I think that's what's ironic about
23 it. They're driving more. They're driving to different places.
24 They appear to be driving in situations they didn't before. Peak-
25 period traffic is spread out so much that you can't avoid it, so

1 they're driving more in congested times, just because they can't
2 avoid it. So I think it's sort of interesting and I think that's
3 the issue that's been raised. They're driving more, they're doing
4 all of these things more, why aren't they getting into more
5 crashes? And I don't think we have good data on that.

6 DR. McCARTT: I think also we don't know the
7 relationship. Why are they driving more? Maybe they're
8 healthier, you know. So I think all of these things are bound up
9 together in terms of looking at sort of the root cause. You know,
10 it's hard to ferret that out.

11 DR. DELLINGER: Well, I was just asked to pipe in. We
12 can't really explain fully the huge drops that we've seen in the
13 last couple of years, overall. So for the first time in decades,
14 we have only 34,000 deaths a year in 2009. I mean almost 34,000
15 deaths. On the one hand, it's amazing that it's gone down that
16 far. On the other hand, I'm not willing to say that 34,000 deaths
17 is anywhere near good news. Part of the good news maybe is that
18 older driver safety seems to have improved more than anybody else
19 and we've had the shocking safety gains over the last couple of
20 years. But we can't fully explain it.

21 People talk about the economy and differences in
22 discretionary driving and that might affect older folks and teens
23 more than it affects people, say, that are working every day. But
24 a lot of it's guessing. I mean, even when you put together the
25 economy and safer vehicles and then, on the other side, driving

1 more, we can't explain it. It's interesting. We can't explain
2 it.

3 DR. McCARTT: I think also that, you know, I seem to be
4 the bearer of bad tidings about data, but the National Household
5 Travel Survey, the last one was conducted during the gas crisis
6 and during the downturn in the economy and that will make it --
7 now the last one was also during a recession, but not as bad a
8 recession. So if we didn't have to have national travel -- if it
9 weren't only every, you know, seven or eight years that we do a
10 survey, you know, we would be able to understand a lot of these
11 things.

12 But I think it's going to be just a fact of life, that
13 the latest travel data we have were collected during a very
14 unusual period. Thankfully -- hopefully unusual. But that will
15 make it challenging -- especially when you're trying to look at
16 how one age group differs from another, that will make it very
17 challenging to draw conclusions on how things have changed since
18 2001, 2002.

19 MR. SCHMIDT: Okay. Another one for the whole panel.
20 We know sandwich boomers are struggling with how to cope with
21 aging parents and their driving skills and safety. But is there
22 research that looks at the influence adult children have on their
23 parents' driving decisions and/or cessation?

24 DR. McCARTT: I think that question goes back to the
25 accuracy of self-assessment or the accuracy of assessments. We

1 know that self-assessment of driving competency is pretty
2 inaccurate in at-risk populations. We know that most older people
3 overestimate their driving competency; everybody's better than
4 average.

5 Research that we've looked at in terms of family
6 members, caregivers, making assessments of driving competency, and
7 these assessments are compared to actual on-road driving
8 assessments where the individual was determined to be safer and
9 safe to drive based on a road test, is that family members are not
10 very accurate, either. Caregivers, spousal caregivers tend to be
11 less accurate than sons and daughters who live nearby, and I think
12 that there's some good reasons for that.

13 If you have an older couple, if it's the gentleman whose
14 driving competency is being questioned -- she doesn't drive, the
15 wife doesn't drive -- she is going to be less reluctant to admit
16 or to disclose that his driving has declined to an unsafe level,
17 because if his driving privileges are revoked, they're both
18 immobilized. That may change with the baby boomers because there
19 are more females licensed to drive in my cohort than in my
20 mother's cohort.

21 Having said that, so the next group would be sons or
22 daughters and if they're living close to their parents, they may
23 be a little bit more accurate. Certainly asking sons and
24 daughters that live a distance away, they have no greater insights
25 than you or I. My take on the situation is that if you have

1 someone, a family member or a neighbor, that you are concerned
2 about their driving, the most evidence-based assessment is to have
3 them have a road test.

4 MR. SCHMIDT: Okay.

5 DR. ROSENBLOOM: There actually is a lot of -- leaving
6 aside whether the kids are right or not, which is not trivial, but
7 there is a lot of evidence about parents and kids, and what a lot
8 of it shows is that older parents don't want to listen to their
9 children or their family members. They just don't. Where, as I
10 said earlier, that women are more likely to listen to criticism
11 than men are.

12 But I found some funny things. I did a major study for
13 the British government where I interviewed a lot of adult children
14 of older drivers in Britain and comparative in the United States,
15 and while they both expressed -- both sets of kids expressed
16 concerns either about their parents' current driving or what would
17 happen in the future, that I found that Americans were much more
18 worried about what it would mean for them if their parents stopped
19 driving. And I liken it to why parents let teenagers, who are,
20 you know, much more dangerous, why would you let your teenagers
21 drive all the time? And it's because it makes your life easier.
22 Once those kids get a license and you don't have to cart them
23 around, your life gets easier.

24 And what I'm seeing among adult children of older
25 drivers in the United States is yes, they're worried, but they're

1 equally worried about what is it going to mean to me when my
2 mother stops driving? And it's not just the driving. It's will
3 she come live with us? Will we have to move her to a care
4 facility?

5 And I saw a sort of -- you know, it's hard to interpret
6 what people say sometimes, but I see a sort of willful ignoring of
7 some bad signs about their adult -- their parents, because they
8 see this crushing wave of responsibility hitting them, which I
9 think gives us a window for policy. Because if we can be talking
10 to baby boomers who are now experiencing problems with their
11 parents and they can see the burdens that they're going to carry
12 because there are not enough transportation and mobility options,
13 that maybe we can get the baby boomers -- not for themselves, you
14 never sell people on what it's going to do for you, because they
15 never want to see themselves as in that position. But if we can
16 say, okay, here's all the burdens you're going to carry for your
17 parents; don't you think you might want to fund some more public
18 transit and some more alternative services so those burdens don't
19 hit you?

20 DR. DOBBS: Dr. Rosenbloom's point is a good one. It's
21 interesting, the longer I've worked in this area, the longer I'm
22 starting to realize that for -- particularly for illnesses, the
23 driving is the canary in the coal mine and particularly for
24 cognitive impairment. So if mom or dad have word-finding problems
25 or if they have memory problems, the families can usually explain

1 it away. But when driving becomes affected, then they can no
2 longer explain it away and that's when action starts to occur. So
3 driving can become the early or not-so-early indicator of
4 cognitive decline. And we know that in the primary care setting,
5 two-thirds of all dementias are missed and 90 percent of mild
6 cognitive impairment. So the driving issue really does need to be
7 on the radar screen.

8 The other point that I think is really important is
9 that, often when driving privileges are revoked because of
10 illness, the blame is put on the driving, that mom or dad -- there
11 now has to be all of these lifestyle changes because they could no
12 longer drive. Well, in fact, it's because there's an illness and
13 the lifestyle changes are going to occur. The loss of driving
14 privileges means that the family has to step in or somebody has to
15 step in and make the arrangements. But those arrangements were
16 going to have to be made anyway. It just becomes the red flag for
17 it.

18 CHAIRMAN HERSMAN: Thank you, thank you all for your
19 honesty in answering the questions. It's very refreshing.

20 We'll move to the last table. GHSA will ask the
21 questions for the last table.

22 MS. HARSHA: There we go. The first question is for
23 Anne McCartt, and it has to do with subgroups within the aging
24 population.

25 CHAIRMAN HERSMAN: Barbara, if you could just pull the

1 microphone close? There you go.

2 MS. HARSHA: Okay. Do you see -- thank you. Are there
3 differences within the aging population? In other words, are
4 there differences in crash risks between those drivers who are,
5 say, 65 to 75 and those who are maybe older than 75? Did you find
6 that in your research?

7 DR. McCARTT: Yes. In our study we had three older
8 groups. We had 70 to 74, 75 to 79, and then 80 and older. And
9 consistently what you saw was that the beneficial or the
10 improvements we were seeing were the strongest for the very oldest
11 drivers. And I believe in our initial study we did take a look at
12 65 to 69 and I believe we found that they weren't that different,
13 actually, in our study. They may be in other ways, but in our
14 study, using our method, they weren't that different from the
15 middle-age group we were looking at.

16 MS. HARSHA: I want to have you make some projections,
17 if you can. Do you expect the decrease in crash risk in older
18 drivers to continue in the future?

19 DR. McCARTT: Do I expect our study, the improvements
20 that we saw, to continue?

21 DR. ROSENBLOOM: You would have to know what causes
22 them, wouldn't you?

23 DR. McCARTT: I would say yes, but -- I'm intrigued by
24 the question and I couldn't answer very well, because there are
25 lots -- whenever you're looking at a group and you're looking at

1 other groups, there are other great things going on and we were
2 partly looking at not just are they doing better but are they
3 doing better than other groups? And children, for example, I
4 mean, the gains that we've made for children in crashes is just
5 phenomenal.

6 But yes. And I don't have a scientific reason for that,
7 but I think that what really stood out for me in our study was
8 just the consistency of what we were seeing. So it was almost
9 every year there was a decline in deaths. You know, we looked at
10 all of these different severities of crashes in these states and
11 it was very consistent. And I didn't talk about it today, but we
12 looked not only at whether older drivers were less likely to die,
13 we looked at whether they were less likely to die or be seriously
14 injured.

15 So I think that what was compelling to me was the
16 strength and the consistency of what we were seeing. And while we
17 can't explain it, what that says to me is it's part of something
18 that's, you know, maybe long-lasting. The big question, which one
19 of the other panelists mentioned, is what just happened in the
20 last couple of years. And I agree, we don't really understand it
21 and -- but putting that aside, yes, I think whatever is happening
22 will continue to happen, but I could be wrong.

23 MS. HARSHA: We have to think about older drivers, not
24 just the current older driver population but people who will
25 become older drivers in the future, people -- our cohort and

1 people our age. And so when you think about future older driver
2 populations, do you think that -- can you project whether they
3 will continue to have a reduced crash risk? Or are there any
4 differences that you think might occur between people who are
5 older now and people who will be older in the future?

6 DR. McCARTT: Is this for me?

7 MS. HARSHA: Yes.

8 DR. McCARTT: Well, it's hard to be objective about
9 this, because I'm going to be older pretty soon. I'm already
10 older, but I'm going to be 70 and older. But yes. Again, this is
11 purely speculative on my part, but -- you know, there's an
12 expression which I never get right, but the new 70 is 60, or
13 whatever. I just think older -- I think people who are older are
14 really different than they were certainly 20 years ago, maybe even
15 10 years ago. And, you know, I think it has to do with health,
16 but also just lifestyle.

17 But again, I have to -- you know, I'm looking at myself
18 here and my colleagues and I think, yes, we're going to be -- if I
19 look at my -- my parents were different than their grandparents
20 and I think I'll be different from my parents. I think I'll -- my
21 travel patterns will be different, my health will be better. Now,
22 I'm not representative of the population as a whole and there are,
23 you know, lots of people who won't be healthier than their
24 parents. But yeah, I think what old age is, is not what old age
25 used to be.

1 MS. HARSHA: Sandy, that same question is for you. Do
2 you think that there will be a difference in terms of lifestyle
3 and demographics and geography?

4 DR. ROSENBLOOM: Well, one of the things that Anne said
5 that surprised me is that while women increased safety faster,
6 there were no statistically significant differences. One of the
7 things -- if she hadn't said that, what I would've guessed is that
8 more women are hitting their 65th birthday with a lot of
9 experience under their belt. They're coming into their senior
10 years as better drivers with higher exposure over that -- you
11 know, the 3,000 low mileage bias. And that's what I would've
12 guessed, that women are coming in with now 30 and 40 years of
13 driving in some hectic situations, with screaming kids in the car
14 and all of that.

15 So even if she can't see it statistically, I still
16 suspect that that's some of it, that women are just more
17 experienced drivers now. And also I think that people do have a
18 healthier attitude toward these things. Safety is a hard sell,
19 but I think it's slowly -- you see it coming into people's
20 behavior.

21 DR. DOBBS: I don't know what the data look like in the
22 United States, but Paul Bose from Transport Canada, he and I
23 looked at data last year in terms of the baby boomers, and we
24 looked at the female and male crash rates, and historically, in
25 terms of the older driver population, that male crash rates are

1 higher than female crash rates. And what we found in our
2 Transport Canada data is that the baby boomer females are looking
3 more like the male baby boomers, both in terms of amount driven,
4 but also in terms of crashes. So based on those projections, we
5 can expect our cohort, the baby boomer cohort, the females, to
6 look more like the males.

7 The second consideration is that while there is a
8 segment of the baby boomer population that is going to be
9 healthier than their parents, there also are going to be segments
10 of the baby boomer population that are in poorer health. If you
11 look right now -- and I'm sure that the statistics in the United
12 States are similar to Canada -- diabetes is at the epidemic
13 proportions. Cardiovascular disease is at epidemic proportions.
14 Right now in the United States one in seven Americans has a
15 dementia. So, 3.4 million Americans 71 and older have a dementia
16 and that's projected to increase sevenfold with the aging of the
17 baby boomer population. So there may be segments of the baby
18 boomer population that will be safer to drive as we move through
19 our senior years, but there's increasingly going to be segments of
20 the population that will be at risk.

21 CHAIRMAN HERSMAN: Do you have any more questions?

22 MS. HARSHA: No, we don't.

23 CHAIRMAN HERSMAN: Okay, thank you all very much.

24 Mr. Magladry.

25 MR. MAGLADRY: Excuse me. Just one quick question.

1 Would any of you care to comment on the current or future role of
2 doing things like shopping for my drugs online or by telephone, or
3 my groceries in that way, things that can actually meet your daily
4 needs without causing a driver to get out on the roadway?

5 DR. ROSENBLOOM: I just saw a study that said that
6 online shopping encourages in-store shopping, that it was not a
7 substitute, it was a complement for that, that you troll online
8 and look at various things and then you then go out to a store and
9 look at them, too. So it's a really interesting question that a
10 lot of people are addressing, the extent to which online shopping
11 and those sorts of things will substitute for travel, or almost
12 all improvements in communications technology and travel
13 technology have led to more trips. Now, because we can easily
14 call somebody in Europe, we're more likely to go see them. So it
15 may well be that all of these online kinds of things don't, in
16 fact, substitute. But I don't think we fully know that.

17 DR. McCARTT: The one area that I think is interesting
18 is the social networking that's occurring, and particularly when
19 you look at life-enhancing needs for social interaction.
20 Increasingly, people can have those needs met through the
21 Internet. So I don't know of any research that's being done in
22 that area, but I think it's an interesting area, that people may
23 be able to meet more of their social needs without having to get
24 in the car.

25 CHAIRMAN HERSMAN: Thanks, that's a great question. I

1 think that goes back to what Ms. McCartt said about, that we're
2 not going to be the same seniors that our parents were, and I
3 think things are changing.

4 I have a question for all of you. Is there any agreed-
5 upon age at which we would say someone is an older driver? And so
6 I guess this also goes back to is 70 the new 60 or is 80 the new
7 70? What is an older driver and do we have a definition? Maybe,
8 Dr. Dellinger, I'll go to you.

9 DR. DELLINGER: The short answer is no. I think we've
10 used 65 and 70 as the most common ages to talk about older
11 drivers. I think 65 because that's when, traditionally, Social
12 Security started. I don't think there's any biologic or
13 physiological reason that we decided to use 65 and above. We can
14 use 70 and above. I think that those U-shaped curves for crash
15 involvement, you can make a case for 70 and above. You can
16 probably also make a case for 75 and above. But there's no right
17 answer to that.

18 CHAIRMAN HERSMAN: And I have a number of questions, and
19 so if you all want to jump in. Drs. Rosenbloom and Dobbs, I was
20 very interested and kind of in a little bit of an intersection of
21 some of the issues that you all raised. I was intrigued by your
22 chart that showed how people self-select and who self-selects and
23 that women tend to stop driving before they really should or
24 could, but also by the statistic that you used, that women outlive
25 their driving ability by 10 years and men by 6.

1 How does all of this kind of work together to
2 demonstrate how people are making the right choices in self-
3 regulating or not? How do you reconcile all of that different
4 information, as people are living longer and women outlive men,
5 but they also self-select earlier? What does that mean for us as
6 a society?

7 DR. DOBBS: I'll take a go at it and then Dr. Rosenbloom
8 can take a go at it. In terms of self-selection -- well, first,
9 in terms of men outliving their driving careers 6 years, women, 10
10 years, that's due in part because women live longer. Again, it's
11 going to be interesting to see whether that trend holds for the
12 baby boomer population.

13 The other is whether the trend, in terms of premature
14 driving cessation, will hold for the baby boomer population. My
15 sense is that it likely will not. I agree that we are not going
16 to look like our mothers in that our driving habits are clearly
17 very different than our mothers' driving habits were when they
18 were our age. And so I think that we're basically going into the
19 unknown. I guess if I was going to project at all or predict at
20 all, I suspect that there will be a certain segment of the female
21 population that will look like the current population in that they
22 may stop too soon, but overall, I think that the female boomers
23 are going to look more like male boomers and that we won't be
24 prematurely stopping our driving.

25 DR. ROSENBLUM: I think there's two conflicting things

1 going on here. I do agree that probably the baby boomer women are
2 going to look more like baby boomer men. On the other hand, women
3 are so much more likely, when they're drivers, to sit in the
4 passenger seat. And I think they're going to show a slide in a
5 minute. If you look at older women drivers, they're hardly ever
6 driving -- if they're in the car with another driver, usually a
7 male driver, they're not driving.

8 Okay. So this is already women over 65. So you can
9 see, as they get older -- these are women drivers now, not just
10 women, these are women drivers, and how often they're actually
11 driving the vehicle that they're in and it's never more than 43
12 percent. And it gets less and less and less. So even though we
13 know -- even though women are coming into the senior years as
14 drivers with all of this experience, they're still sitting in the
15 passenger seat, which puts them at risk for that low-mileage bias.

16 And I looked -- and I didn't bring it with me. I looked
17 all the way back, all the way through, back to 17-year-olds. If a
18 woman is in a car with a man, she's not driving most of the time.
19 So I see two conflicting things. I see women with all of this
20 driving experience that look more like men, and then I see all
21 these women who are sitting in the passenger seat. And some well-
22 known Swedish researchers, Liisa Hakamies-Blomqvist, has looked at
23 it and says, well, if women drive as much as men, they have the
24 same driving patterns, et cetera, and her solution is that women
25 should insist on driving when they're in the car with a male

1 driver. And it's very clear that men often have a very different
2 psychological investment in driving. And so I can just see all of
3 these fights across America: No, let me drive today so five years
4 from now, when you're too decrepit to drive, I'll be able to. And
5 I don't see that happening.

6 So I see this dangerous situation, even among the very
7 youngest women, they're still driving only 8 miles for every 10
8 miles driven by men and these older women are driving three --
9 women drivers are driving three and four miles for every mile
10 driven by a comparable guy. And so until this balance changes,
11 I'm still worried that baby boomer women actually won't still look
12 like baby boomer men.

13 DR. DOBBS: Your question is a good one because it
14 speaks to the need for research priorities, and perhaps what we
15 need to do is we need to start looking more at the 55 to 64-year-
16 old age group, because that's what we're going to be dealing with
17 in large part over the next 20 to 30 years.

18 CHAIRMAN HERSMAN: Well, I have to say this is all a
19 little bit frightening because I feel like you're holding up a
20 mirror on my life, and so I'm kind of questioning some of the
21 decisions that I make in my family. I always just tell myself
22 that my husband's a really bad passenger and so I'd just rather
23 him drive.

24 But, you know, regardless, I think one of the questions
25 that I was a little bit troubled with is how do you undo 40 years

1 of conditioning for women who might have been told, you're not a
2 good driver? And so if they're prematurely stopping driving,
3 they're not confident or they're not comfortable, and how
4 appropriate is it for us to say, no, you should drive, when, in
5 fact, that individual doesn't have confidence or comfort behind
6 the wheel? And is that an appropriate thing for society to be
7 doing?

8 DR. DOBBS: I think you're right on. If people do not
9 feel like they're confident to drive and they don't wish to drive
10 when they can meet their mobility needs in other ways, who are we
11 to push them to be behind the wheel? It has to be an individual
12 choice. We can as a society empower them, give them driver
13 training, attempt to increase their confidence, but if they don't
14 feel confident to drive, then I don't think that we have the right
15 to say, you have to be behind the wheel.

16 DR. ROSENBLOOM: Yeah, I have this vision of police
17 coming to your house and asking how many miles you've driven, and
18 if it's not enough, they give you a ticket.

19 What we see in the data and we can't quite -- there's a
20 little uptick in the number of women driving between 80 and 85 and
21 we think -- and you see it in lots of datasets, in the British and
22 Australian datasets I work with, too, and I think what's happening
23 is that's the age when their male -- their husbands die or become
24 incapacitated and they start driving.

25 No, of course, we shouldn't force anyone. But I think

1 if people are competent drivers and we're not offering them
2 meaningful alternatives, then I think we do have to provide ways
3 for women to judge whether they are, in fact, safe and to
4 encourage them to keep driving if they are, because we're not
5 giving them anything else. Until we give them something else -- I
6 mean, I think that's the question for society at large. There are
7 environmental issues, of course. But until we have mobility
8 options for people, then I think we have to help women see if
9 they're competent to drive and if there are fears.

10 It's a vicious cycle. You don't drive, so you don't
11 drive, so you don't drive, and then pretty soon you're below 3,000
12 miles a year and you're running into the same issues that, when
13 you go out, you're more likely to have a crash. So I think we
14 have to offer women a way to assess whether they're competent
15 drivers, and in most cases, I suspect that will mean they see that
16 they're more competent than they thought they were and they'll
17 drive more.

18 CHAIRMAN HERSMAN: Mobility sounds like it's a big piece
19 of wellness. And so I wonder if you all envision or if you're
20 familiar with any scenarios in other countries where the state or
21 healthcare or medical services might pay for driver assessments or
22 evaluations to keep people driving?

23 DR. DOBBS: In Canada, in all provinces, with the
24 exception of one, having a driver assessment is user pay. The
25 Province of British Columbia now is paying for a driver assessment

1 for medical reasons. And that's precedent-setting and it will be
2 interesting to see if it results in policy change across the other
3 provinces and territories.

4 My argument would be that when a physician, because it's
5 often the physician that's charged with determination of driving
6 competency and reporting in to motor vehicles, if they're having
7 -- if they're being charged with that responsibility, they're
8 having to make that assessment. They refer out for CAT scans.
9 They refer out for blood tests. Those are paid for by the
10 healthcare system. If they're referring for a driving assessment
11 for medical conditions, then it should be paid by the healthcare
12 system.

13 CHAIRMAN HERSMAN: Great.

14 A couple of data questions. Are any of you all familiar
15 with any statistics -- we're talking about passenger vehicles.
16 Are any of you all familiar with any statistics about older
17 commercial drivers? The Safety Board investigates accidents
18 primarily involving commercial vehicles and we do see that there
19 are many cohorts. Whether it's truck drivers or school bus
20 drivers, these are things that many people may elect to do in
21 their retirement. And so they certainly have a high-mileage
22 component, but they also have maybe some other challenges. Can
23 you all speak to that?

24 DR. ROSENBLOOM: There was just a study released by one
25 of the cooperative research programs of the Transportation

1 Research Board on older commercial drivers, and I recommend it to
2 you because in one -- there is not a lot of research about older
3 commercial drivers, so they reviewed -- it's a very good review of
4 all the research on older drivers, period.

5 And then what they concluded was that older commercial
6 drivers are doing the same thing that all older drivers are:
7 they're self-regulating, they're staying out of dangerous
8 situations, and their greater experience makes up for any physical
9 deficiencies. They are not having higher crash rates as
10 commercial drivers. So I recommend that report to you.

11 CHAIRMAN HERSMAN: And that report has been submitted to
12 our docket. And so I thank you for summarizing it for the
13 audience.

14 One other question I have about data, and I don't know
15 if Ms. McCartt or others -- you all have looked at this, but how
16 does the composition of the population potentially affect the
17 data? When I say this, I drive in an urban, you know, highly
18 congested area. My parents live in a very rural area. The way
19 that people drive is very different. And I've also experienced
20 going to Florida during the wintertime and I see that there's very
21 different driving patterns on the road. And so what is
22 potentially more of a risk, is it more of a risk as we have a
23 higher number of drivers on the road that may be older drivers
24 that may have some performance issues, or is it more of risk
25 having a mix of population of drivers that, you know, you've got

1 some very young, fast drivers and you've got older drivers who may
2 be self-selecting or going slower because that's maybe how they
3 feel comfortable? Do we have any understanding that as we get to
4 2025 and one in every five drivers on the road is going to be an
5 older driver, will that change the statistical information that
6 we're looking at?

7 DR. McCARTT: That's a tough question. If you look at
8 what I think is the best exposure measure of vehicle miles
9 traveled, the latest data we have, 2001-2002, it does show that
10 when you get to a -- old enough, that the crash rate, whether it's
11 the overall crash rate or the fatal crash rate, goes up. I think
12 the issue of the severity of the crash gets complicated because,
13 as we've heard, when you're looking at fatal crashes and probably
14 serious injury crashes, what's going on is not so much that the
15 older drivers are riskier, but that they're more likely to be
16 injured or killed, as are their passengers.

17 So I'm not sure what the answer to your question is.
18 And again, if part of what's changing about older drivers is that
19 they're beginning to drive more than they used to on safer
20 highways, you know, that's a factor that, you know, has to be
21 considered, too, so --

22 DR. DELLINGER: I'll just pipe in. So today I think
23 we've heard a lot of good news about older drivers and their risk
24 on the road and their risk to others, for example. And I think
25 we're having this conversation because we thought, a few years

1 ago, that this burgeoning baby boom population, when 1 in 5
2 drivers is going to be over 65 in a couple of decades, was going
3 to be this horrible thing. So I think the question is complicated
4 because even now we don't see that.

5 So what we were hoping would not happen, doesn't look
6 like it's going to happen. So now we have to change our whole
7 viewpoint about what it means to have one in five or one in four
8 drivers on the road that are older, when they're not even looking
9 now like we thought they were going to look. So I guess that's a
10 long way of saying we don't know. We don't know, but I think
11 we're confident enough to say it's not as -- it won't be as bad as
12 we thought it might. We don't know why it's not going to be as
13 bad as we thought it might be, but it's not going to be as bad.

14 CHAIRMAN HERSMAN: Well, and maybe it might even be
15 better for all of us than that. My last question, I think, Dr.
16 Dobbs, we're going to have some panels who talk about some of the
17 medical issues with respect to screening and things like that
18 later. But I wanted to get a sense from you -- and I'm not
19 talking about older drivers, I'm talking about all drivers. Is
20 there are a particular medical condition that you think that we
21 really ought to be paying attention to?

22 DR. DOBBS: That's easy to answer. Yes, dementia.
23 Dementia clearly is the medical condition that needs to be on the
24 radar screen. And it's interesting that -- I think that when you
25 mention the word dementia, people often think about Alzheimer's

1 disease, and certainly it's the most common form of dementia. But
2 there are many illnesses other than Alzheimer's disease that can
3 result in a cognitive impairment with or without dementia.

4 So in terms of the medical conditions, that's the
5 condition that, from my perspective, we have to be most concerned
6 about. When you look at the traffic data, individuals with
7 dementia have crash rates that are two to eight times higher than
8 individuals without dementia. We know that they are very much a
9 high-risk group.

10 CHAIRMAN HERSMAN: And what do you recommend as the best
11 way to address any driver that has dementia?

12 DR. DOBBS: For individuals with a progressive dementia,
13 the question is not will their driving become unsafe, the question
14 is when will their driving become unsafe? For that reason, we
15 absolutely need the medical community to be engaged. For the
16 medical community, we need to give them evidence-based screening
17 tools. We now have that screening tool that they can use to
18 identify when their patient may be at risk. In addition to the
19 screening tool, we need to embed, particularly in primary care
20 practices or family medicine practices, because they're the
21 physicians that are going to be seeing the people with dementia,
22 we need to embed the evidence-based protocol.

23 We need to have the medical communities working with the
24 driver fitness communities, the DMVs, in order to streamline the
25 reporting system. And then we need to have, for example,

1 reimbursement for physicians for engaging in the medically at-risk
2 driver issue. We need reimbursement for driving assessments so
3 that the cost of a driving assessment doesn't fall on the user.
4 So we need to work really hard, I think, over the next two, three,
5 four years to get a scientifically-based, integrated system in
6 place to address the issue.

7 CHAIRMAN HERSMAN: Fantastic.

8 DR. DOBBS: And then we need to get the alternate
9 transportation systems in place.

10 CHAIRMAN HERSMAN: Sure, sure. A fantastic, succinct
11 answer. Thank you very much. And thank you to everyone on the
12 panel. You all have done a great job of setting the table for us.
13 It's almost lunchtime. But we know that what you've built is the
14 foundation for the next few panels. It will really help us in our
15 discussions and conversations. So thank you for your
16 participation.

17 Before we break, I want to remind everyone that at noon
18 it's show time and we've actually gotten special dispensation to
19 be able to eat and drink in the board room while you watch the
20 movie. I know our staff are all about to fall on the floor. So
21 bring your lunch back. And this actually was originally a movie
22 theater, and so please come back to watch Shaleece Haas's work.
23 And you won't want to miss this. It's a really poignant portrayal
24 of Milton and Herbert and the decisions that all of us are going
25 to face one day.

1 So we are adjourned. The movie starts at 12:00 and
2 we'll reconvene at 12:30.

3 (Whereupon, at 11:30 a.m., a lunch recess was taken.)
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A F T E R N O O N S E S S I O N

(12:40 p.m.)

1
2
3 CHAIRMAN HERSMAN: Welcome back. And I really
4 appreciate Ms. Haas allowing us to show the film. I thought it
5 was a great personal story about the decision that all of us are
6 going to face, and it was very well done.

7 So this panel, the second panel for today, is going to
8 discuss occupant protection for aging drivers and passengers. The
9 panel is going to explore the details of decreased injury
10 tolerance with age and the complications associated with recovery,
11 given crash injuries. The panel will also focus on the current
12 limitations in occupant protection systems for protecting older
13 adults, and new technology that can be incorporated into the
14 vehicle design to improve the outcome for older adults in a crash.

15 Dr. Kris Poland and Dr. Mitch Garber have prepared
16 questions for this panel. Dr. Poland, will you please introduce
17 the panelists?

18 DR. POLAND: Thank you, Chairman Hersman. If it's all
19 right with you, I plan to introduce each panelist before their
20 opening remarks.

21 So to begin, Dr. Stewart Wang is director of the
22 University of Michigan program for injury research and education,
23 as well as the director of research for acute care surgery.
24 Dr. Wang, would you please begin your introduction to this
25 occupant protection panel?

1 DR. WANG: Thank you for that introduction. I'd just
2 like to comment that this morning I very much enjoyed the panel
3 discussion. Certainly on the frontlines of taking care of elderly
4 patients, it seems to me that the elderly problem continues to be
5 quite substantial. Most of my unit these days is full of
6 geriatric trauma patients.

7 I'd like to begin by speaking a little bit more
8 specifically regarding the issue of fragility, frailty and aging,
9 as I'll be touching on those subjects. Elderly individuals are
10 more fragile in that they sustain more severe injuries. Given a
11 specific mechanical load, they break more easily. This is
12 different from the fact that the elderly individuals are also more
13 frail in that they experience a worse outcome given a certain
14 injury. They do poorly. What's important is that there is very
15 substantial variability between individuals, and I'll touch on
16 that.

17 Now let's touch first on the issue of fragility. We all
18 know that older folks tend to break more easily, but it's very
19 important to touch on the fact that they don't break more easily
20 in every single specific location. So if you look at the NASS
21 data -- now this summarizes crashes over a period of 10 years that
22 we looked at, and these are just for belted drivers and frontal
23 crashes at 30 miles per hour. And across the bottom there you see
24 the age, and on the Y axis you see the predicted risk of an AIS-3+
25 injury. And where you see that all the lines generally go up, the

1 one place where you see it going up the greatest and the quickest
2 is in the thorax. And if you look specifically at thoracic
3 injuries, what you see is that rib fractures are very, very
4 frequently observed in the most elderly population.

5 And I'd like to relay a common story that we see all the
6 time in the surgical ICU. There's been a motor vehicle crash, a
7 patient comes in with chest injuries, and in the elderly, these
8 almost always involve rib fractures. And because of these rib
9 fractures, it causes a lot of pain. These elderly patients
10 typically have decreased pulmonary reserve. They end up on the
11 ventilator for support. Once they're on the ventilator, you have
12 difficulty clearing secretions and we know that the longer they're
13 on the ventilator, the more likely they are to get pneumonia.

14 We also know that elderly patients have very limited
15 physiologic reserve in all areas and tend to get a lot more
16 complications, and what typically happens is, after a period of
17 time in the ICU, where their different organ systems are being
18 stressed, they experience organ failure and not infrequently,
19 death.

20 So this is a slide to just summarize some of the things
21 that we find. If you look on the upper left there you see the rib
22 cage and the very nice looking ribs on a younger person, and on
23 the bottom left there you see that they're quite muscular, with
24 very prominent abdominal muscles in particular. And if you look
25 on the upper right you see an older chest with these ribs that

1 look rather moth-eaten. You can almost see through them in
2 locations. You see that there's a difference in the geometry.
3 And if you look on the bottom right, what you see there is almost
4 a transparency of the abdominal muscles. Okay. And that's
5 because it's become infiltrated with fat. And this is based on
6 the CT setting here. It looks transparent.

7 So the muscles have become replaced with a lot of fatty
8 tissue. And this happens the same in the intercostal muscle,
9 which is that strip. We've been looking this on CT scan. This is
10 very important because the muscles and the hard tissues together
11 are what is able to resist injury.

12 Now this issue of muscles is something we've been
13 looking at quite closely and we found that it very significantly
14 affects both fragility, as I mentioned, and also frailty. We know
15 it affects fragility, because the more muscle they have, the less
16 likely they are to get severe fractures, but it affects frailty as
17 well. And we what we found is that body condition in the specific
18 core muscle mass predicts survival after surgery.

19 Now if you think about it, as a surgeon, we inflict
20 trauma on patients all the time. We just hope that they can
21 recover from it. But there is some sort of benefit from it.
22 Okay. And for many, many years we've been trying to find the best
23 predictors of frailty and what we find is that body factors,
24 particularly muscles, are much better predictors than models
25 incorporating age or comorbidities.

1 Okay. And what we've been doing, for instance, is
2 looking at psoas muscle, which is a core muscle, and if you look
3 at it -- and this is on the upper right there -- is a chart
4 showing mortality on the left. You can see it gets up between 60
5 and 70 percent. Okay. And across the bottom are terciles of
6 psoas muscle, core muscle area. And what you see is that people
7 that have the smallest amount of core muscle experience the
8 highest level of mortality. And this by far the best predictor.
9 It's better than a -- it's the best predictor we've ever found to
10 predict mortality in the ICU for respiratory failure.

11 So you go, that's nice. Well, this is for abdominal
12 aortic surgery repairs, and you see the same thing. It's the
13 smallest group that has the highest mortality rate and the highest
14 group has the best mortality rate after an elective abdominal
15 aortic repair. And you think that's -- we go on. This is for
16 liver transplant, okay, and it's the same exact thing. We found
17 the same thing after pancreatic transplants, after major abdominal
18 organ surgeries, after many things.

19 So let me give you a scenario. You're hiking with two
20 friends, A and B, in the Grand Canyon, you're bitten by a snake
21 and you need to get anti-venom in two hours or you're not going to
22 do well. So who do you send back up to get it? And if all you
23 have is age, that seems to be a pretty simple solution, right?
24 Let me give you a little bit more information. By weight -- and
25 I'm not really stacking the deck here. You have a friend who's a

1 bit overweight and the other guy's normal. The younger guy is a
2 couch potato. He plays video games all the time. Whereas the
3 older guy actually likes to exercise quite frequently, does a lot
4 hiking, walking, biking. Okay, habits? The younger guy's a
5 smoker and drinker. The older guy is a nonsmoker. Okay. And in
6 terms of medical condition, they're both diabetics, but the
7 younger guy happens to be very noncompliant and the older one
8 happens to be a diabetic who's controlled just on diet alone.

9 Now, who would you send? Okay. For me, we can argue
10 about this, but I would send B. But I think all of you, despite
11 the large disparity in age, you kind of gave a little thought
12 after you got the additional information. And I would say that
13 what we found is that their bodies would be very different on CT
14 scans. It's not the fact that they have a comorbidity but how
15 they deal with the comorbidity.

16 So from a trauma surgeon's perspective, and all I'm
17 interested in is in saving lives and I don't -- you know, they
18 come to me after having sustained their injury, and what we have
19 found is that what really matters is the body condition and not
20 the age. Okay. And what we have learned to do is to focus on the
21 individual patient.

22 Medical treatment over the last several decades has
23 gotten better, but I think a lot of that is because it has become
24 more personalized. We know that the population is comprised of a
25 diverse group of individuals, and effective treatment and

1 prevention requires that differences between individuals be taken
2 into account. Treat the patient and not the disease is what they
3 teach us in medical school.

4 And that brings us to the issue of crash injury and
5 potentially dummies. In the past, I think the population of
6 America was like this. And this is not to scale. But I would say
7 that in the last several decades the population has certainly
8 gotten to be more -- there are segments of the population that are
9 more fragile or frail because people are living longer, life is
10 safer.

11 There's also a substantial amount more variability.
12 Just think about the issue of obesity. The size of the patient
13 population, the individuals, has changed substantially. And while
14 crash dummies are very nice and they represent a standardized
15 segment of the population, my personal opinion is that this is
16 going to become a problem as the population becomes even more
17 fragile and frail and there becomes -- and there is even more
18 patient variability.

19 So in summary, age is a very poor descriptor of
20 condition, as are preexisting medical conditions or comorbidities.
21 Body characteristics are much better indicators of fragility as
22 well as frailty. Patient variability is a fact of life and must
23 be addressed. It can't be ignored, it can't be averaged, it can't
24 be designed, and it can't be regulated away. And in medicine,
25 we've improved results by personalizing or tuning the handling and

1 treatment of vulnerable populations such as the elderly.

2 My assessment is that current crash injury databases
3 collect no specific or objective data regarding occupant
4 characteristics. Even the best provide, if possible, age, height,
5 weight, and just a number of comorbidities, none of which are
6 sufficient. We need a more detailed and in-depth understanding of
7 this complex problem in order to improve treatment and prevention.
8 And I think that the federal agencies and National Institutes of
9 Health, including the CDC, that have the necessary scientific and
10 technical expertise in live human disease research should take a
11 greater leadership role to address this growing public health
12 problem. Thank you very much.

13 DR. POLAND: Excellent. Thank you, Dr. Wang. I'd like
14 to proceed with our second panelist. Our second panelist is
15 Dr. Richard Kent. Dr. Kent is a professor of mechanical and
16 aerospace engineering at the University of Virginia, with
17 additional appointments in biomedical engineering and in emergency
18 medicine. He is also head of automobile safety research at the
19 University of Virginia, Center for Applied Biomechanics.

20 Dr. Kent, could you please proceed with your opening
21 remarks?

22 DR. KENT: Yes, thank you, Dr. Poland. Sort of
23 following up on what Stew started with, I'm going to talk a little
24 bit about some of the characteristics of our body that change as
25 we age. And certainly they are related to individual variability

1 as well. But there are some things that generally trend with
2 aging that have pretty important consequences for crash
3 protection. And I'm going to start reiterating one of the points
4 that Dr. Wang made, because I think it's a critical one, and that
5 is this change in the distribution of injury pattern.

6 This happens to be the pattern of injury by body region
7 for drivers that are killed in frontal crashes. This is not the
8 risk of injury; this is the proportion of injury, given that an
9 injury happens. And we see this general trend, periodically, of
10 head injuries decreasing as age increases, whereas thoracic
11 injuries make up a larger proportion as age increases. And this
12 trend persists. It's not just fatal injuries to drivers in
13 frontals. This persists by crash mode. And, in fact, it persists
14 in all sorts of trauma, including things like even falls or
15 motorcycle crashes. So this seems to be an intrinsic aspect of
16 aging.

17 And the other thing that's important is over 75 percent
18 of those injuries are rib fractures. And if you look at the
19 injuries that older folks die of in the hospital, they will
20 frequently die of injuries that are no more severe than the rib
21 fractures. So it's not, you know, massive cardiac lacerations or
22 things like that that are killing folks. It is rib fractures and
23 sequelae that develop from them.

24 I think the other thing that's important to recognize
25 here is that this injury distribution reflects really three

1 somewhat independent aspects of aging. And Dr. Wang touched on a
2 couple of those: the fragility issue, which is the risk of
3 sustaining an injury given an exposure; the frailty, which I think
4 of as sort of a conditional probability, the probability of not
5 doing well given that an injury happens, and that could be
6 expressed in terms of something like dying; and then the third
7 thing is the environment, which, as we heard a bit this morning
8 and we'll hear more about today, changes also with aging. And the
9 biomechanics really, I think, can help us understand the fragility
10 part and why it is that it is easier to injure a person as they
11 age, again, given the individual factors as well.

12 But I want to talk about this issue of length scales.
13 This is the way engineers tend to think about things. If we start
14 at the very smallest length scale, we can look at things like
15 material property changes in the human body. And we're all very
16 well aware of things like osteoporosis, that are correlated
17 strongly with age. So the porosity in the bone decreases with
18 aging. Also, the percent of the bone that is the inorganic
19 compound, so the mineral, goes down with aging. Those are
20 separate and distinct characteristics. Both change with age and
21 both tend to reduce what we call the fracture toughness of bone.

22 And, in fact, there are other factors. It seems like
23 every time we learn something new about aging, it turns out to be
24 something that reduces fracture tolerance or toughness in bone.
25 So even things like collagen cross-linking, a filling of lacunae

1 as you get older, all of those things tend to decrease the
2 fracture toughness of bone. And we've yet to find many things
3 that happen with aging that increase it.

4 And then there are also -- if we keep moving up on this
5 sort of idea of length scales, if we go to the cross-section of a
6 rib, for example -- so we've gone up now. We're not looking at a
7 material; we're looking at a structure. And what I'm showing on
8 the lower right-hand corner of this slide here are micro CT images
9 of the cross-sections of ribs. And on the left you see the rib
10 bone from a younger individual and on the right from an older
11 individual.

12 And what you see is this cortical shell, the heavy,
13 dense, really load-bearing part of the bone, which is the outer
14 shell there that shows up very dense in these images, has
15 decreased in thickness from young to old. And this is a
16 significant trend. It's been observed in lots of populations.
17 I'm showing you a scatter plot here where you can see the
18 individual variability that Dr. Wang was talking about, but also a
19 general trend to decrease in cortical thickness.

20 And what happens there essentially is, the way your bone
21 grows is bone is deposited on the outer surface of the bone and
22 it's resorbed on the inner surface of the bone, and as that occurs
23 during development, the bone grows. But what happens when you
24 reach adulthood and on into senescence is the apposition stops on
25 the outer surface, but the resorbtion on the inner surface

1 continues. And so what happens is the bone essentially eats
2 itself away from the inside and so you end up with bones that have
3 similar outside geometry, but the cortical shell thins with aging.

4 And then we can go up to larger-scale changes. Dr. Wang
5 showed a nice example of a change in ribcage morphology and I'm
6 going to show you one that's even more dramatic, if you can run
7 those videos. These are CT scans on -- well, they were. Maybe
8 they don't run. Maybe we can go to the next slide, which is just
9 an image capture from that, from those videos.

10 But what you see on the left is a CT scan of a ribcage
11 from a 17-year-old, and the ribcage on the right is from a 64-
12 year-old. And in addition to sort of the porous appearance that
13 Dr. Wang mentioned, you can see a pretty dramatic change in the
14 shape of those ribcages and we have found that the ribs tend to
15 get more horizontal or perpendicular to the spine as one ages.
16 And you can see this probably anecdotally. It manifests itself in
17 sort of a barrel-chested appearance as we get older.

18 And if you look at the way, for example, a seatbelt
19 might load something like those two structures, in the case of the
20 left, that seatbelt load is going to induce deformations like
21 rotations at the spine, which is the kind of rotation that ribs do
22 very well. That's what we do when we breathe. And so that's a
23 kind of loading that the ribcage can tolerate. On the right, you
24 can imagine sort of deforming that chest like a barrel, where
25 instead of putting the stress through the joints at the spine,

1 you're putting the stress through the ribs themselves. And so
2 structurally, the structure is at a disadvantage for anterior
3 loading.

4 And so just to conclude, then, the biomechanics of aging
5 are a challenging problem, but I think they're key to the idea of
6 passive safety for older drivers. We did a study where we
7 estimated that the aging of America over the last decade generated
8 about half as many serious injuries as increased seatbelt use
9 prevented. Okay, so this is a pretty big deal. And again, I
10 think understanding the biomechanics is a key part of the solution
11 and incorporating it into things like federal standards and safety
12 countermeasures is important. Thank you.

13 DR. POLAND: Thank you, Dr. Kent.

14 Our third panelist is Mr. Stephen Ridella. Mr. Ridella
15 is chief of the Human Injury Research Division at the National
16 Highway Traffic Safety Administration. Prior to coming to NHTSA
17 in 2002, he worked at General Motors Research Labs, EASi
18 Engineering, and at TRW Automotive, addressing biomechanics
19 analysis and restraint system design and performance.

20 Mr. Ridella, could you please continue with your opening
21 statement?

22 MR. RIDELLA: My pleasure, Dr. Poland. Thank you very
23 much for inviting us. I'd like to talk about NHTSA's older
24 occupant research. An approach that we have identified for
25 research has two goals, which would be to eliminate crashes due to

1 aging and to reduce transportation-related fatalities and injuries
2 due to aging. A fourfold process could entail understanding the
3 problem by data, older occupant safety, older occupant protection,
4 and pedestrian safety. I'll only touch on the data and the
5 vehicle approach, specifically the biomechanics research, that
6 we're currently working on at NHTSA.

7 In terms of data, there's an extensive body of existing
8 research, as identified through NASS studies and others, with
9 respect to injury incidents by age. But the Crash Injury Research
10 and Engineering Network that is part of NHTSA's data collection
11 and analysis can inform us more of injury causations and
12 mechanisms. And I'll touch on a little bit about how we'll use
13 that data in the future.

14 But I think what's necessary is specific injury analyses
15 for older occupants with respect to both gender and body mass,
16 preexisting medical conditions and comorbidities, as Dr. Wang
17 mentioned, and also to dive in-depth more to causation and
18 mechanisms with respect to crash direction and crash severity.

19 Regardless, the analysis does show that age affects
20 severe injury outcome for almost every body region in every crash
21 mode. An example follows. There's some work that was done by the
22 University of Michigan to look at a combined NASS and CIREN
23 analysis. CIREN has the ability to add more serious injury cases
24 to an analysis, while NASS gives us the power of national
25 representation.

1 And we look at the risk of chest and head injuries in a
2 specific population, when you control for whether it's gender,
3 belt use, the driver of a normal BMI, in the passenger car in a
4 side impact, typical of currently regulated conditions, the
5 thoracic and head injuries dominate as age goes up. In fact, it's
6 almost a fivefold increase in risk for a serious injury of the
7 thorax and at least a twofold increase in risk of head injury,
8 serious head injury, in the older population, everything else
9 being equal.

10 When you look at just NASS data and look at rib
11 fractures as a function of both age and crash severity, it does go
12 up in all age groups as a result of increased crash severity. But
13 even at the low crash severities -- sorry. I went backwards.
14 There we go. And even at the lower crash severities, the
15 increased risk for older folks, it goes up to at least 15 percent.
16 This indicates at low crash severity, the increased risk, we
17 should perhaps do something more in this area with respect to both
18 crash types as well as dummy development, because our dummies
19 currently only look at crash speeds in the moderate to high
20 severity range.

21 So emphasis on older occupant research that we do at
22 NHTSA is data. As I mentioned earlier, the Crash Injury Research
23 and Engineering Network, looking at injury causation and
24 mechanisms, we have over 300 cases of older occupant injuries with
25 in-depth analysis and we'll be publishing extensively off of this

1 work in the future.

2 With respect to injury biomechanics, we're focusing on
3 thoracic injury research and head and brain injury research. As I
4 mentioned in the previous slides, those are the two areas where we
5 see the most potential for older occupant protection. We're
6 evaluating crash dummy response. We're evaluating the current
7 dummies that we have for older occupant biofidelity. We're
8 determining the suitability of those dummies to predict older
9 occupant injury as a result of the analysis that we do with CIREN
10 and NASS data. And we'll determine if we need to revise injury
11 criteria based on age.

12 One thing that's apparent, the use of computer models
13 must increase, and computer models of the older occupants, human
14 occupants, is, we think, a frontier that needs to be explored to
15 evaluate restraint systems and vehicle designs of the future.
16 With respect to that, we're doing work where we're characterizing
17 age and gender changes in ribcage ages across all ages. From the
18 youngest to the oldest, we're collecting CT scans to develop
19 parametric ribcage models using inputs such as age, gender, and
20 the size of the occupants, and then changing the shape, the mesh
21 size, the density of the bone, as Dr. Kent mentioned, the density
22 of the bone and other mechanical properties to create a model that
23 can then be used in a variety of restraint and vehicle conditions.

24 This video, which thankfully works on my computer, or at
25 least my presentation, indicates what Dr. Kent was trying to say.

1 As you get older, the morphology changes, the bone density
2 changes, and the protection and the restraint interaction will
3 change as the occupant ages.

4 Similarly, for head injury research, we're
5 characterizing age and gender changes to the head and brain.
6 We're taking CT scans of a variety of occupants, from the youngest
7 to the oldest, and developing a parametric head computer model.
8 Inputs such as age and gender and other information that we get
9 from the CT scans will go into a brain model, where we'll change
10 the shape, size, and mesh density, thickness of the bone, the
11 thickness and changes that we see in the morphology of the brain,
12 and input that into what we have published recently, a SIMon brain
13 injury model, to help us predict brain injury in older occupants
14 as well as younger occupants and see what the differences might be
15 as a result of input.

16 So in summary, we have identified an approach for older
17 occupant injury research. We want to understand injuries and the
18 causation as a critical path to future development of projects
19 aimed at the most frequent injuries, as I said, brain and chest
20 injuries. This will again help us to determine what dummies we
21 need to use, models, test procedures that address reducing the
22 incidence and severity of injuries for older occupants. Thank
23 you.

24 DR. POLAND: Thank you for that overview of NHTSA's
25 biomechanics research. Our final panelist is Dr. Stephen Rouhana.

1 Dr. Rouhana is Ford's senior technical leader for safety and
2 passive safety research and advanced engineering. He has also
3 helped Ford lead the development of inflatable seatbelts and
4 pediatric crash dummies.

5 Dr. Rouhana, your opening remarks, please.

6 DR. ROUHANA: Thank you, Dr. Poland. Thanks for
7 inviting me. I'm going to talk about taking what we've just heard
8 from the other three panelists and putting that into systems in
9 vehicles that can actually make a difference, we hope.

10 Excuse me. If I can start with a look at a summary of
11 what goes on with aging, we have three takeaways from this slide.
12 Young kids think they know how to drive but don't have the
13 experience and they drive too fast. This is the fatality rate, by
14 the way, per hundred billion vehicle miles versus age. And older
15 occupants, as you see, 85 plus, they don't get into as many
16 crashes but they are overrepresented in terms of the fatalities.
17 And then the third thing to take away from this, this is the only
18 piece of scientific evidence I know of that shows there's a
19 benefit to middle age.

20 In the 1970s, Renault, the automotive company in France,
21 put load-limiting seatbelts into an experimental fleet, which they
22 then allowed people to drive and every time there was a crash,
23 they studied the injuries and the crash kinematics. And when I
24 was at General Motors in my former employment, we did a study that
25 looked at the survival, the forces that people were experiencing

1 and the injuries that they experienced, and we came up with a
2 relative tolerance graph, shown here. So in the age category of
3 16 to 35, that's the best you can do in terms of your tolerance to
4 belt-loading. By the time you're in the age category of 36 to 65,
5 you have half the ability to withstand belt-loading on your chest.
6 And by the time you're over 65, you have one-quarter of the
7 ability to withstand belt-loading.

8 This is some work that was done at my current employment
9 at Ford Motor Company, by Tony Laituri and others in my lab. They
10 looked at NASS data and they did a whole series of models using
11 mathematical models under similar crash conditions to what's found
12 in the field. And this graph shows AIS-3+, which is a serious
13 thoracic or chest injury risk, as a function of Hybrid III 50th
14 percentile male chest deflection. So the Hybrid III is the crash
15 test dummy that's used in frontal impact.

16 And the takeaway from this graph is that, if you're 20
17 years old and you have -- and you're in a crash in which a Hybrid
18 III dummy would get 60 millimeters of chest deflection, if you
19 were a 70-year-old in that same crash, if you're -- I'm sorry. If
20 you're a 20-year-old, you would have a 25-percent risk of injury
21 when you get 60 millimeters of chest deflection, and when you're a
22 70-year-old, you would have about a 90-percent risk of chest
23 injury in the same crash with the same chest deflection.

24 So we wondered, is there a way to reduce the chest
25 injury risk for older occupants? And we answered that with, maybe

1 with an inflatable belt. And I should say that this was in the
2 context of a research project to try and enhance not just safety
3 for aging people but safety for people in the rear seats of our
4 vehicles.

5 And so what is an inflatable belt? It's a tubular
6 airbag sandwiched between two pieces of shoulder belt webbing. In
7 the event of a crash the airbag inflates across the chest within
8 10 to 20 milliseconds. And this is what the system looks like.
9 You can see there's a shoulder belt retractor and then there's
10 standard webbing that goes to a D ring, which is the little loop
11 that holds the belt to the B pillar of the vehicle. And then the
12 shoulder portion of the belt actually has an airbag placed inside
13 that inflates to about six to eight inches in diameter. Then, on
14 the left side, there's a lap belt retractor and a standard lap
15 belt. The lap belt does not inflate.

16 This is a little close-up of the inflator and the latch
17 plate and the buckle. So the inflator is actually attached to the
18 buckle. It's a stored gas canister with inert gas, helium and
19 argon, that upon a crash receives an electrical signal from our
20 crash module, restraint control module. The electrical signal
21 fractures the diaphragm in that canister and allows the gas to
22 flow through the buckle and it also flows through the latch plate
23 to inflate the shoulder belt.

24 This is a video of the inflation as it occurs. So you
25 see the gas in the canister. A crash occurs and the diaphragm

1 bursts, the gas flows through the buckle, through the latch plate,
2 into the shoulder belt and inflates the shoulder belt within 10 to
3 20 milliseconds.

4 Now I'm going to need to come out of my PowerPoint
5 presentation and play this in Windows Media Player here. This is
6 a crash test that we've done with a small female dummy on the
7 right side and a six-year-old child dummy on the left side,
8 showing the inflation in slow motion. And one of the things you
9 can see is that we capture the chin and that reduces the forward
10 excursion of the head. We also expand the area of the belt on the
11 chest by five to seven times, which reduces the pressure on the
12 chest to one-fifth or one-seventh of what it would be normally,
13 and that reduces the likelihood of injury.

14 Can I go back to the presentation? Yeah.

15 So some of the benefits we expect from inflatable belts
16 are, because we're inflating the shoulder portion, it increases in
17 size, it also -- as it increases in diameter, it pulls the ends of
18 the belt closer together, which takes slack out of the system, and
19 we have a load limiter associated with it to help reduce the chest
20 loads. Then the increased size of the bag helps reduce occupant
21 head excursion. By reducing the head excursion, we reduce that
22 pulling on the neck so we limit the occupant neck loads, and by
23 the increase in the size of the bag we distribute the pressure
24 over more of the chest, resulting in less risk of chest injury.

25 This is from a frontal crash test using the Federal

1 Motor Vehicle Safety Standard 208 pulse. And these are just some
2 of the results. We've normalized everything to the standard belt,
3 which is in red. The inflatable belt is in blue. So you can see
4 that the head injury criterion, or HIC, has been reduced by about
5 60 percent. The chest acceleration and, more importantly, the
6 chest deflection, which we believe is the right measure for chest
7 injury, has been reduced by about 40 percent with the inflatable
8 belt.

9 And I'm happy to say that this system is going into
10 production in the 2011 model year Ford Explorer, which should be
11 out in the first quarter of next year. It's optional currently in
12 the second row outboard seats. But we feel it will have great
13 ability to protect older occupants by reducing their likelihood of
14 chest injury, which, as you saw from my colleagues, is one of the
15 major problems for older adults in car crashes. Thank you very
16 much.

17 DR. POLAND: Thank you, Dr. Rouhana.

18 Gentlemen, thank you so much for a comprehensive
19 overview of a clearly challenging problem.

20 Chairman Hersman, I'm going to try and restrict my
21 questions to a period of time to give the parties time, but I feel
22 like I could talk about this all day. So I apologize if I go
23 overtime.

24 I think it's interesting that you have separated out
25 fragility and frailty. This morning, when we were hearing the

1 discussion, it seemed like those two words were interchangeable.
2 And I guess what I'm gathering from what you've said to me so far
3 is that fragility is the chance for me to get an injury, given I'm
4 in a certain type of a crash, and that frailty is the outcome;
5 once I have that injury, if I have a rib fracture, how likely am I
6 to recover from that injury and what kind of decrement am I going
7 to have. Is that correct?

8 DR. KENT: Yes, I would say that was actually very well
9 stated. And in fact, we have done some work looking at the
10 relative importance of these two things as one ages. I don't know
11 if we can pull this slide up here that I'm showing. But we looked
12 at, again, sort of mathematically describing this phenomenon where
13 this thing we're calling fragility would be expressed as a risk of
14 injury, given an exposure, and the frailty metric would be a
15 conditional probability of death, given an injury.

16 And what I'm showing you here is the rate at which these
17 two things change with age. So here I'm showing the relative
18 probability of any injury, of an injury, given exposure -- that's
19 this fragility metric in this dashed line -- and this frailty
20 metric, which is the probability of death, given an injury. And
21 I've normalized everything to one at age 20.

22 And what we see is that this fragility issue, this risk
23 of getting an injury in the first place, goes up by about a factor
24 of 8 over the age -- from 20 to 80; whereas the frailty thing, you
25 know, the risk of dying once you get an injury, only goes up by

1 about a factor of 2. And so in terms of what's more important for
2 aging or what changes more with aging, we found it to be this
3 fragility issue. So the fact that they get hurt in the first
4 place is the big -- maybe where the low-hanging fruit is.

5 DR. POLAND: Okay. So you're basically saying that we
6 need to prevent the injury from happening in the first place.
7 It's not that we need to improve the medical treatment in a
8 certain way so that the outcomes are better, but it's prevent the
9 injury in the first place.

10 DR. KENT: Well, I mean, they're both important, but I
11 would say that maybe that's more important, yeah.

12 DR. POLAND: Okay. You've talked a lot about different
13 types of injuries and I'm going to maybe have a couple questions
14 hidden in here. And you've talked about chest injuries. So I
15 guess my first question to you is, when I'm looking at trying to
16 prevent injuries to the older adult, what part of the body am I
17 most interested in? Is it the chest or is it the head? Because
18 typically I hear, for children, I want to protect the head. But
19 is it different for older adults? Is it not the head that's the
20 most important part of the body to protect anymore?

21 MR. RIDELLA: Well, I think we clearly heard the chest
22 was probably the major one. The injuries that we see, and in
23 fact, every case that we've seen in CIREN with any older occupant,
24 has a chest injury. And getting to the point that Rich made a
25 little while ago about frailty, we see that for a given age or for

1 a given injury, like chest injury, their outcome, not just in
2 terms of death but quality of life, is even down, much more
3 reduced for the older occupant than the younger occupant. So I
4 would say that the chest is definitely the top and head not far
5 behind.

6 DR. POLAND: Okay. So just to be clear, when we talk
7 about chest injuries and then we go into rib fractures, if I
8 sustained a rib fracture, is that an injury that I may die from or
9 is it only like -- I think Dr. Wang talked about this earlier. Is
10 it only because of the additional complications with breathing
11 difficulties, because it's difficult to get a deep breath because
12 my chest hurts because I fractured my ribs, and then it leads to
13 some complications? Or is a rib fracture just a really, really
14 severe injury and people die from this?

15 DR. WANG: The patient's condition has a very
16 substantial influence on the outcome after rib fracture. So we
17 see football players all the time at the University of Michigan
18 with some bruised ribs or some rib fractures, or some younger
19 people that fall off their bike, and what we typically do is, you
20 know, give them some Motrin and ask them to take, you know, a nice
21 hot soak, that they'll be sore for a couple of months but that
22 it'll get better. And they're in a bit of pain, but certainly
23 they can manage it with some pain medication.

24 Now, what typically happens with an older person is they
25 have very limited cardiopulmonary reserve. So you need to be able

1 to breathe, you need to be able to move your chest wall to expand
2 it out, you need to be able to pull down on your diaphragm in
3 order to pull the air in, and you only have enough oxygen in your
4 system, you know, to live for a couple minutes. So this is
5 something that you have to be doing all the time. And what we
6 find is that the older folks tend to have a limited reserve.
7 Okay. And so when they get a couple rib fractures, pretty soon
8 they're not moving their air very well, they begin to desaturate,
9 then that whole vicious cycle that I showed then occurs. So it's
10 much, much more impactful in an older person than it would be in a
11 young person.

12 DR. POLAND: Okay, so you're telling me that I need to
13 protect the chest and that older adults typically have rib
14 fractures that can have a very poor outcome for older adults. And
15 you've also told me that as people age, they don't tolerate belt-
16 loading as well as they do when they're younger. So Dr. Rouhana
17 talked about this a little bit, something that can be done to try
18 to decrease the belt-loading, the inflatable restraints are
19 certainly an interesting option.

20 Are there additional options for us to look at to be
21 able to make the belt system, to make older adults more tolerant
22 of this belt-loading? Because we want everybody to wear
23 seatbelts, but we certainly don't want the seatbelts that they're
24 wearing to cause injury in and of themselves.

25 DR. ROUHANA: I think the data shows that you're almost

1 always better off with the seatbelt on, even if you're an older
2 occupant. There are many technologies that are currently
3 available or are being researched on to address this frailty of
4 the chest -- or sorry, fragility of the chest. For example, in
5 many vehicles today there are load-limiting shoulder belts, so as
6 you move forward in a crash, you'll apply a load to the seatbelt
7 and the load will build up to a certain value and then the belt
8 will start to, in a controlled fashion, pay out and that reduces
9 the force or keeps the force at a constant level, hopefully below
10 the level that's required to break your ribs. But as both
11 Dr. Kent and -- actually, all three of my colleagues have shown
12 the rib cage really deteriorates with age and so that load gets
13 lower and lower as you get older and older.

14 So force limiters can only go so far, so low, in terms
15 of the force before you start allowing the occupant to have too
16 much excursion forward, in which case they may start going through
17 the air bags or hitting things in the compartment that you don't
18 want them to hit and then head injury could be the problem. So
19 load limiters are one mechanism or tool in the arsenal.

20 We've also been doing research on what are known as
21 four-point belts, which are double shoulder belts. We got that
22 from racing. We've done a lot of studies, GM has done a lot of
23 studies, looking at race drivers. And you see these crashes all
24 the time; they're 200 miles-an-hour around an oval, the car
25 crashes, parts fly everywhere, and people get up and walk away.

1 And so we've been trying to find out what is it in that
2 environment that we can pull into the passenger car environment,
3 and one of the main things that we have considered is the double
4 shoulder belts. So a four-point belt is two shoulder belts
5 connected at the lap. We have done a lot of research on that and
6 we are hopefully continuing that research until we can come up
7 with a solution we can put in a vehicle.

8 MR. RIDELLA: One thing we've been looking at, the
9 agency, is advanced restraint systems, but a follow-on to that has
10 to be adaptable restraint systems, and Dr. Wang touched on it, in
11 terms of the individual -- in other words, the restraint system
12 would adapt to the individual, whether it's their body condition,
13 the crash condition, and perhaps even gender. So the next
14 generation of restraint systems might indeed take that tact of
15 going beyond just what Steve's mentioning, but beyond it to
16 adaptability for the individual.

17 DR. KENT: I think there's also, there's an intermediate
18 phase between the two systems we're talking about where this full
19 adaptability is sometime in the future but not now. But the load
20 limiting, there are systems now that are extremely clever with
21 regard to load limiting. And so one system that we've looked at
22 in my laboratory is a load limiter that adapts the load limit
23 based on the speed of the crash, and so you only get as much belt
24 force as you need.

25 And so in a low-severity crash, the belt load limit will

1 actually be quite low. And that's good for everybody, but it's
2 disproportionately good for older people because they tend to get
3 hurt in lower-severity crashes. And so if you can really offload
4 the chest if it's not needed, then that should have a
5 disproportional benefit for older folks and that's, I think, a
6 much more kind of proximate technology than the full adaptability
7 that Steve Ridella was talking about.

8 DR. POLAND: So I guess it's kind of a pie-in-the-sky
9 question. You know, you've kind of talked about how age isn't
10 necessarily the predictor, but it's the condition of the body. Is
11 there some way -- again, kind of pie-in-the-sky type of thought
12 process, that you can measure the condition of my core muscles,
13 like Dr. Wang was talking about, some measure that can give some
14 prediction of my outcome and then have my car know what I am, so
15 that when I'm driving my car or when my husband is driving the car
16 or when my mom drives my car, that these intelligent systems can
17 appropriately deploy to maximize the benefit for the driver or the
18 passenger?

19 DR. WANG: There are a number of different techniques
20 which I think are becoming available. For instance, we've
21 processed so far about 10,000 CT scans, full-body CT scans, on
22 surgical patients and trauma patients, so we're getting a much
23 better idea now of being able to predict sort of condition based
24 on measurement of specific points.

25 So it may be fairly simple in the future, just to show

1 up at a dealership or anyplace -- you know, people get bone
2 densitometry readings quite frequently. There are now ultrasound
3 machines which are very fast, painless, and obviously without
4 exposure to radiation, which can measure core muscles very
5 quickly, and with a few parameters measured on the outside, I
6 think it's fairly feasible to come up with an objective measure of
7 a subject's condition, of a patient's condition. And I think that
8 could be used to adjust some of the settings, as Dr. Kent talked
9 about and Dr. Rouhana talked about.

10 DR. KENT: I think we do need to acknowledge, though,
11 that the biomechanics is probably a few decades behind in terms of
12 knowing what you actually do with that information. So I think
13 there is technology that could tell you all sorts of things about
14 the person. The question is, then, what do you do? And, you
15 know, questions of individual variability and tolerance and where
16 you put loads on an individual are certainly yet to be answered.

17 DR. POLAND: I guess that kind of leads me to my next
18 question, which is -- and I'm going to address it to Dr. Rouhana
19 to start with, but I think Dr. Kent and the others will probably
20 want to join in, as well. But we've seen a lot of advancements in
21 child safety and I think some of that is because of the amount of
22 testing that's involved and the encouragement for these safety
23 systems to become really excellent to be able to provide
24 protection for children.

25 Are there tests? The Insurance Institute has a best

1 pick. NCAP has a star rating system. Is there something that
2 manufacturers can design to encourage them to adapt their vehicle
3 to better address older adults? And along what Dr. Kent was just
4 saying, do we even have the technology to biomechanically assess
5 this? If you make a change, do we know what that injury value
6 needs to be? Do we know how much chest deflection is okay for an
7 older adult to be able to even have some sort of a rating system?

8 DR. ROUHANA: Okay, there are several parts to that
9 question. I'll try and remember them all. The first is, is there
10 some sort of a standard protocol that we use to assess our
11 vehicles for elderly occupants? And the answer to that is,
12 really, no. NCAP, FMVS-208, the IHS testing, doesn't really
13 address older occupants, per se. That said, we are doing
14 research. We just published some research last week, in fact, on
15 our Ford finite element human body model, that we have determined
16 what its age is and we've made a younger version and an older
17 version so that we can go ahead and look at different restraint
18 systems with the two versions and see how they affect the aging
19 population.

20 The other part of this equation, which we're not talking
21 about, really, as biomechanics, is ergonomics. We do a lot in our
22 research to try and make our vehicles friendlier for older people
23 to drive, bigger numbers and things like that on the speedometer,
24 and we look at ingress and egress issues. But that's probably a
25 different subject for a different day. Did I answer all the

1 questions?

2 DR. POLAND: Yes. And I'm actually also being hurried
3 on a little bit here to keep us on schedule, so I'd like to turn
4 it over to my colleague, Dr. Mitch Garber, to see if he has some
5 follow-up questions based on our discussion so far.

6 DR. GARBER: And like Dr. Poland and perhaps unlike many
7 others in the room, I could talk about this sort of stuff all day,
8 as well. But in order to keep this moving along, I think I've
9 just got one point of clarification that I wanted to go over and
10 then maybe I'll come back at the end after the parties and perhaps
11 the Board has discussed this.

12 You talk about fragility and frailty and you gave us
13 some very specific definitions of those terms. I think we all
14 sort of have in our mind the 80-year-old great grandmother when
15 you talk about that, that's who we have, that's the picture that
16 we look at and think of. And in fact, we're seeing an epidemic of
17 obesity in this country and particularly in the aging population,
18 we're seeing them become obese. I don't think we tend to think of
19 those people as fragile or frail, but I would like for you to
20 address how those terms may apply to that population, as well,
21 because, again, it's hard to think of a 280-pound great
22 grandfather as being fragile or frail when, in fact, they may be
23 at increased risk. And perhaps you could discuss that just a
24 little bit.

25 DR. KENT: Okay. There's a lot in that, in the answer

1 to that question. But so in looking at this issue, what I have
2 found is that the literature is absolutely replete with studies
3 showing that obesity is an independent risk factor of death
4 following a car crash, but the literature is sorely lacking
5 studies of which of the factors is it, is it fragility or frailty?
6 And if you go into -- you know, it's a difficult question to study
7 because the question of, you know, what's the risk of getting an
8 injury in the first place is really the hard one to answer because
9 we have really good fatality data, but once you start looking at
10 injury, the question gets much more murky. And so pretty much all
11 of the literature is sort of contaminated with this combining of
12 serious injury and death, and so what that incorporates is both
13 the fragility and the frailty.

14 You know, from some of the limited biomechanical studies
15 we've done in our lab, we see obesity makes the bones a lot
16 stronger. If I test a rib cage from an obese cadaver, those ribs
17 will be stronger than a comparable rib cage from a thin person
18 and, you know, it's the way bone remodels; it's been carrying a
19 load around and so the bones do tend to get bigger. But then
20 there are all sorts of issues about kinematics and how people move
21 in crashes that may disadvantage an obese person in terms of
22 restraint performance. And so it's a complex question and I think
23 getting at the answer to your question is difficult and we don't
24 have it now.

25 DR. WANG: If I could address that a bit? In the

1 obesity epidemic we've certainly been seeing, and what we've
2 noticed, is that it is highly correlated with an increase in
3 severity and also the number of lower extremity factors. And
4 where it begins to play in from our perspective is that I think in
5 the obese population -- well, in the elderly population, obesity
6 plays a much greater role in terms of frailty and that's because
7 in the heavier-set population -- and what we typically have is
8 that they're a little bit more fragile and they get more lower
9 extremity injuries, but what tends to happen is that the obese
10 folks have a much more difficult time getting back to weight-
11 bearing and ambulation, okay. And what that typically means is a
12 very prolonged hospital stay during which their complication rate
13 goes up markedly.

14 On top of that, when you have a very heavysset person who
15 has a difficult time weight bearing -- and the elderly just
16 generally tend to have a harder time recovering strength, so that
17 means a very substantial impact on their long-term sort of quality
18 of life. Okay. So I would say that certainly in the elderly,
19 obesity is having a very substantial impact more on frailty even
20 more so than fragility, even though we clearly see a fragility
21 effect.

22 DR. ROUHANA: And I think Richard's right. It shows up
23 in every analysis. We did something with rollover recently where
24 the most severe cervical spine injuries, when you look at the
25 population, they were the oldest group of people and they were

1 also the fattest people and so it just shows up over and over
2 again in these analyses.

3 DR. POLAND: Chairman Hersman, I'd like to turn it over
4 to the parties, please.

5 CHAIRMAN HERSMAN: Well, thanks a lot, guys. It's not
6 New Year's, but I think you've encouraged all of us to have a
7 resolution to get a little bit more exercise and build up our core
8 strength, so Pilates and yoga are in my future.

9 I have been asked to make sure that each of the parties'
10 spokespersons for the table, if they could please identify
11 themselves by name and their organization for the people who are
12 watching, who are not here with us. So we'll go to the first
13 table, FHWA.

14 MS. ALICANDRI: I'm Beth Alicandri. I'm with the
15 Federal Highway Administration's Office of Safety. And we have
16 one question from our table. No? Do you have one? Just one.

17 Funding for crash biomechanics has decreased steadily
18 over the decades with only a handful of government agencies and a
19 couple of larger car companies doing the work. I should've let
20 John read this question. How could we best maximize the
21 effectiveness of our research efforts to lead to earlier
22 deployment of technological improvements?

23 MR. RIDELLA: Okay, I'll take a stab at that. The
24 answer is correct, there's been a larger emphasis in the last
25 several years on crash avoidance than active safety technology.

1 But when you go to conferences worldwide, and recently I have, the
2 number of people of doing research or collaborating on injury
3 biomechanics is still quite high and there's still -- all of us in
4 the community think there's a lot left to do.

5 What we're finding and what we're really trying to do is
6 more international collaboration. We've recently started some
7 collaboration in rear impact dummies and side impact dummies with
8 governments and research agencies across the world. We've been
9 meeting quite regularly for the last year. There are consortium
10 in Europe that are joining together companies, academia,
11 governments, to look at biomechanics research and we're starting
12 to join those things, as well, to leverage the dollars and the
13 expertise that's around the world in this area. So that's one
14 area that we can best maximize our resources.

15 DR. ROUHANA: I guess I'd like to weigh in on this one,
16 too. We continue to do research at Ford, but there used to be
17 much more public money for research in this problem, and injury
18 from automotive crashes is the number one cause of death between
19 the age of 1 and 34, and it's not getting the attention, I think,
20 that it needs in terms of the public dollars that are out there
21 for research compared to some of the better-known causes that are
22 out there that are getting funded. So I think there is a lot of
23 room for improvement there.

24 DR. KENT: Maybe I can just, from the perspective of the
25 guy chasing the money, as a university research lab, I certainly

1 have noticed that phenomenon. And a couple of comments. One is
2 that in recent years in particular, there's been sort of an
3 increased level of funding coming out the DOD and other sort of
4 military focus groups and it's because, you know, crash injuries
5 are a big deal in wars and this kind of thing. And so there has
6 been a little bit of an increase there in terms of the ability to
7 look at some of these questions.

8 Another thing that has recently been discussed, at
9 least, is the VA. You know, veterans have disproportionate crash
10 involvement and the VA also has tons and tons of money and this
11 might be a good way to spend it, frankly, is try to keep these
12 guys out of the hospital. And so there have been some of these
13 more military focused areas where we've been trying to proceed
14 down these paths that have maybe dried up.

15 I also just heard that Ford had record profits this
16 quarter, so I don't know.

17 (Laughter.)

18 DR. ROUHANA: We'll see if that translates into a
19 research budget.

20 MR. MADDOX: Can I do a follow-up, Kris?

21 DR. POLAND: Please.

22 MR. MADDOX: The other part of that question was how do
23 we maximize the effectiveness of the money that we already have?

24 DR. ROUHANA: I think Steve has hit on it, by seeking
25 out collaborations where we maximize the number of people and the

1 number of labs that are participating and each person brings their
2 own perspective and can really contribute to the project.

3 MR. RIDELLA: One thing we did recently is have a focus
4 thoracic injury research symposium out in Arizona, and you find
5 that people are doing similar research around the world. Well,
6 then the best thing to do is to say let's not be redundant and try
7 to focus people in different areas so we can maximize the results.

8 MS. ALICANDRI: It turns out we do have another question
9 at our table for Drs. Wang and Kent. This is from Jon King,
10 National Institute on Aging: How truly modifiable are the
11 fragility risk factors for older adults? That's the first
12 question. And the second one is: Are older women at greater risk
13 due to greater reductions in bone mineral density, osteoporosis,
14 et cetera, et cetera?

15 DR. WANG: I'll try to address the first question is how
16 modifiable are they? We are in the process of studying that right
17 now. We certainly think that -- for instance, we've been seeing
18 these very substantial effects of core muscle on operative
19 outcome. We believe a substantial number of those things can be
20 addressed, whether it's by intervention, placing -- a lot of
21 surgeries, for instance, are -- it can be delayed so that people
22 can get conditioning. Now, obviously in a trauma situation that's
23 not possible and these patients are coming in. And there, I think
24 I'll say that, you know, you can't really -- you can perhaps
25 modify the entire population, in general, is one thing.

1 I believe, however, in working with a lot of automotive
2 engineers in southeast Michigan and elsewhere, I believe that
3 there are a substantial number of technologies which are, I think,
4 on the near horizon, which, if they're adapted for a more elderly,
5 more frail, occupant, I think can provide substantial benefit.
6 So I think, in that way, as I think that a smarter, more tuned,
7 vehicle system can prevent a number of injuries because you don't
8 have time -- the patients are going to come in because of the
9 trauma and you can't say, well, you're going to get into a crash
10 in two months, you're going to go out and do exercise.

11 However, the frailty issue can be addressed over the
12 long term. I think there are interventions, whether it's
13 nutrition or exercise, specific regimens where that can be
14 addressed.

15 MS. ALICANDRI: And the second part of the question was
16 are older women at greater risk due to greater reductions in
17 bone --

18 DR. WANG: We do see that. We certainly see that trend.
19 What we see is actually a very -- equally large contribution from
20 muscle mass and conditioning. We, as I mentioned, have processed
21 over 10,000 total body CT scans and we see very substantial
22 differences.

23 The other thing that's interesting is that men and women
24 are quite different and they get -- surprise, it's a news flash.
25 But they get completely different patterns of injury, okay. So

1 men and women get very -- you know, there are certain types of
2 crashes where, you know, men will get, for instance, in a frontal
3 crash -- let's get away from the chest a little bit. In a frontal
4 crash, men will tend to, you know, will tend to get posterior
5 acetabular fractures, whereas women rarely -- it's an odds ratio
6 of about 9 to 1. And whereas if you flip it around to a side
7 impact crash, it's about 9 to 1 females. And what's interesting,
8 it's actually a younger female, okay, that are more likely to get
9 some of these other factors. So while osteoporosis in general
10 goes down, there are much more substantial gender differences
11 which we are only now beginning to get an inkling of.

12 DR. KENT: Maybe one quick comment on that. I actually
13 have some data here that illustrates -- I think the answer to your
14 question on the gender question is it should, but it often doesn't
15 manifest itself in very clear ways.

16 What I'm showing you up here is relative risk, again,
17 plots as a function of age. And this came out of combining,
18 again, a whole bunch of exposures, you know, motorcycle crashes,
19 falls, and there were attempts made here to control for exposure.
20 So the idea here is that this is the risk of injury given a
21 comparable exposure as a function of age. And on the left is men
22 and on the right is females and all of it's expressed relative to
23 men at age 20.

24 And it's a lot, but the point is that women have about a
25 20 percent greater risk of dying at a given exposure and it's

1 almost constant across the entire age spectrum. And in fact, it
2 almost maintains into preadolescence that that ratio stays
3 reasonably constant and I cannot tell you why. Certainly things
4 like osteopenia and osteoporosis do manifest themselves at younger
5 ages in women, although they do show up in both genders. And the
6 other thing that tends to make that a difficult question to answer
7 is there's this whole size issue whereas men are bigger. And so
8 is this just simply a size manifestation or is there actually some
9 genderness issue in here? And I would say getting to a
10 quantitative answer to that is probably in the future. I don't
11 think we have a good one now.

12 CHAIRMAN HERSMAN: Hum, I don't like those numbers too
13 much.

14 Thank you for your questions. Any more questions at the
15 first table?

16 (No response.)

17 CHAIRMAN HERSMAN: We'll go to the second table and if
18 you could also identify yourself with your name and your
19 organization.

20 MS. BELL: Sure. Nancy Bell from AARP. And the first
21 question for the whole panel: Would an older crash dummy aid in
22 the development of more effective occupant protection for older
23 drivers and passengers? What is involved in aging a crash test
24 dummy? Does an older dummy change the injury criteria in injury
25 criteria performance levels for frontal and side impact test

1 procedures? And what effect, if any, would this have on current
2 vehicle design?

3 DR. ROUHANA: A lot of questions. It's good questions,
4 too. I'm not sure I would want to go to an old crash test dummy.
5 I know there is some thought about that. I think the best way to
6 handle this might be by modeling. As I mentioned, we just made an
7 old version of our human body model and can use that to simulate
8 various restraints.

9 An older dummy would look like a dummy with perhaps
10 different response force deflection properties of the chest. It
11 may have different rib angles, as both Dr. Wang and
12 Dr. Kent have shown, that the rib angles change as a function of
13 age. The injury criteria, most likely, would remain the same. I
14 think chest deflection is the criterion of interest for old people
15 as well as young people. Did that cover it all or --

16 MS. BELL: Would there be any resulting effect on
17 vehicle design?

18 DR. ROUHANA: That's a really tough question to answer.
19 One of the things that hasn't come out is it sounds simple that we
20 can have systems that automatically adjust for an occupant's age,
21 but it's not quite that simple because age is only one of the
22 variables in crashes. The amount of room you have in the vehicle
23 limits how far you can allow the occupant to move. So if you have
24 a load-limiting shoulder belt, for example, and you make the load
25 limit really low for an older person, as I said earlier, you're

1 going to end up with a lot of excursion. All crashes are
2 different, of course. You have angles to crashes. Crash pulses
3 are different. So there's a lot of factors that have to be
4 factored in to this adjustable restraint system that make it a
5 little bit more challenging. That's not to say we couldn't do it,
6 but it's going to take significant amount of effort, I think, to
7 do an adjustable system in that regard that encompasses everyone.

8 Bio-variability is enormous. We have to accommodate
9 from the smallest occupants to the largest occupants and from age
10 8, in most states, onward to the oldest person who's in a vehicle
11 has to be accommodated, so -- and there are all sorts of different
12 shapes and sizes. It's a complex problem.

13 MR. RIDELLA: One of the things we're kind of immune to
14 or say, blind to, is the effectiveness of these restraint systems
15 because of the way the dummy's designed or what it measures.
16 Current crash dummies only measure chest deflection in one
17 dimension at one spot. But we have a project of an advanced crash
18 dummy that looks at ribs that are angled properly, like a human's,
19 and measures at four different locations on the chest. This slide
20 shows some advanced technology where we're actually putting LEDs
21 on each of the ribs of the dummies and we can measure deflection
22 at any point along the rib in three dimensions.

23 Question is we don't know what that actually means. We
24 know that the chest deflects when a belt is loading. In fact, all
25 of us had pictures of these -- amazing pictures of both post-

1 mortem human subjects and dummies and the amount of deflection you
2 can see. So we have to figure out what that means relative to an
3 injury predictive that the current dummy just does in one
4 dimension, but now in three dimensions at multiple spots. I think
5 it will make us evaluate restraint systems in a different way by
6 having more advanced capability in a dummy and more advanced
7 criteria, but we still have to work on what that criteria means.

8 DR. ROUHANA: That will be something that will be
9 applicable to all ages, not just the elderly.

10 MR. RIDELLA: Correct. Sure.

11 DR. ROUHANA: Yeah.

12 MS. BELL: Talking about occupant protection as a
13 system, could you talk about the airbag, how that comes into play
14 with the older occupant or driver and working with the restraint
15 system?

16 DR. ROUHANA: Before we had airbags, we just had belts
17 and we broke a lot of chests. The risk from belts alone is,
18 especially for elderly occupants, is quite high. With the advent
19 of airbags, we now had the ability to change the amount of load
20 going through the belt. We could reduce the amount of force by
21 having the airbag come out and take some of the forces of the
22 restraint. And so the risk of injury for a combined restraint is
23 somewhat in between what it would be for an airbag alone, which
24 distributes the load completely and has the lowest risk for chest
25 injury. So airbags do work in conjunction with the seatbelt to

1 reduce the risk. More importantly, I think they reduce the risk
2 of head and neck injury, but they are positive forces in chest
3 injury protection.

4 MS. BELL: I think one of the things that's been
5 discussed on this panel and the panel prior to this is that death
6 from rib fractures often occur subsequent to the accident, up
7 to 30 days, possibly longer than 30 days after the accident. Do
8 you feel that these deaths that ultimately occur from the rib
9 fractures are accurately reflected in the fatality data or to what
10 extent do you think they're reflected?

11 DR. KENT: If I could just pull up my slides here. Give
12 me one second. So this is sort of getting to this maybe an even
13 bigger issue. So here I'm showing you some -- maybe if we can get
14 this slide up. Here I'm showing you just some proportions. If
15 you pull out fatal data in the U.S. and look at, say -- I'm
16 calling it a young group; it's actually kind of a middle-age
17 group, age 30 to 45. If you try to compare the oldest group to
18 teenagers, it really gets crazy, but here I'm just comparing to
19 age 30 to 45 and then a group that's age 75 and older. And you
20 see a lot of different things that go to this sort of crash
21 exposure issue, but one of them is this delayed death question.

22 And so it's about 30 percent of people over 75 who die
23 in a car crash die a day or more after that crash, whereas it's
24 only about 10 percent in the middle-age group and it's very low in
25 teens. And that's somewhat counter-intuitive. You might think

1 these young, robust people hang on and try to live and -- but no,
2 what they do is they kill themselves quickly in this crash -- it's
3 so severe, massive head injuries and this kind of thing; whereas
4 the older folks don't have those kind of crashes.

5 And I have a couple of examples of some case studies we
6 did where -- I just pulled out some random cases here because they
7 illustrate the point. This is a FARS case of a 39-year-old
8 female; so again, not a teenager. But this is a single-vehicle
9 crash with a drunk driver at night, goes head first or roof first
10 into a tree and there's a massive intrusion in the roof and this
11 person dies immediately of massive head injuries. And that's an
12 archetype, really, of a fatal crash. It's not the kind we study,
13 but the typical fatal crash is that they tend to be pretty crazy
14 events.

15 And then we pulled out some of the older cases, if you
16 go to the next slide. Here's a 75-year-old male, was in a minor
17 crash, died 16 days later of complications from a preexisting
18 bowel condition. Okay, that's in FARS. Here's one, an 89-year-
19 old drove slowly through a fence across a yard, hit a house,
20 backed up, hit the house, backed up, drove into the house a third
21 time and then died six days later of a cause that's not known, was
22 not -- but it's in FARS.

23 We found several cases in FARS with heart attack listed
24 by the medical examiner explicitly as the cause of death. And so
25 these cases do show up in FARS. And we see all sorts of cases of

1 sort of moderate severity, belted occupants who die.

2 And one of the things that I think is very illustrative,
3 if you go to the next slide, this is the driver gender
4 distribution by age in FARS, and if you look over at the right
5 there, you see in the age 65 plus, you see 45 percent male, 40
6 percent female. Fifteen percent are coded as either unknown or
7 pregnant females. So probably not many of them are pregnant
8 females, so what that means is 15 percent don't even have the
9 gender coded. And this reflects the fact that investigations of
10 elderly driver fatalities are not done very thoroughly because
11 it's not apparent they're going to die.

12 And so when a young person dies, you know it and it gets
13 a lot of investigation. They survey the scene. They take a lot
14 of photos. When an older person dies, there are no pictures,
15 generally. There's no investigation. And in fact, I found cases
16 where the police report had been denoted no injury or minor
17 injury, which had later been whited-out and fatal had been
18 checked. And so it's not apparent that these guys are going to
19 die in these crashes. And so it's a very good question, what is
20 an elderly fatality and when should it be included as sort of
21 being caused by the crash? It becomes gray.

22 MS. BELL: And as a follow-up question, I guess, what
23 you just said, do you think that calls into question the lowering
24 fatality rates that were discussed during the first panel today?

25 DR. KENT: I hadn't really thought about how that might

1 be affecting that kind of data. I don't know. I don't know how
2 pervasive this kind of thing is or how much it affects the
3 database in terms of overall trends. I haven't looked at that.

4 MS. BELL: Then, I think, as our final question, are
5 there after-market design options to address the needs of older
6 drivers and passengers who are likely under-protected by the
7 current designs on the market?

8 MR. RIDELLA: I've seen things like protectors for --
9 or, say, comfort devices for belts. Typically, I don't like those
10 because they may interfere with the belt's performance, but in
11 general, most of those products, we don't know what their
12 effectiveness is. We just don't test them and we don't think
13 actually they're that effective, so -- the belt ones are the ones
14 that we see the most, just for comfort reasons and for, you know,
15 ease of use to put them on and off.

16 DR. ROUHANA: Some of the after-market belt devices that
17 aim to get the belt off the shoulder actually change the routing
18 of the shoulder belt and cause an increased risk of submarining,
19 sliding under the belt. So I don't like to see those systems at
20 all. We do a lot of evaluations with our belt systems to try and
21 get them to get good kinematic performance and dynamic performance
22 and when you start altering the geometry of the system, you can
23 run into a lot of problems.

24 MS. BELL: Thank you.

25 CHAIRMAN HERSMAN: Thank you. IIHS for the third panel,

1 for the third table.

2 MS. BRAITMAN: Good afternoon. I'm Keli Braitman from
3 IIHS. Thank you for your presentations. They're all very
4 interesting.

5 We have a few questions. Since motor vehicle safety
6 standards such as FMVSS-208 drive restraint system design, do you
7 think any changes to that standard would help vehicle
8 manufacturers further optimize belted performance for the older
9 population?

10 MR. RIDELLA: I like to say I'm just a research guy, so
11 I'll let Steve answer it.

12 DR. ROUHANA: Well, currently Federal Motor Vehicle
13 Safety Standard 208 requires us to test unbelted and that can
14 drive restraint system design, in particular, the airbag design,
15 to be very aggressive or more aggressive, perhaps, than it needs
16 to be because we have to protect 50 percentile male, 168-pound
17 occupant, in a 30-mile-an-hour Delta V, which is a lot of energy
18 to manage. So that could cause compromises in what we do with the
19 belt system because it has to work with the airbag. So I guess
20 the answer -- the short answer is yes, I think that there are
21 aspects of the regulations that could have an effect on
22 performance for all occupants, actually, not just elderly
23 occupants.

24 MS. BRAITMAN: Thank you. This next question is similar
25 to a question that the other table asked, but it's a little bit

1 different. Are modeling procedures from injury measures on
2 dummies sufficient for predicting patterns of crash injuries for
3 older population and, if not, what else should be done?

4 MR. RIDELLA: I think modeling will take us a long way.
5 We just need to understand better the material properties of the
6 older folk. Stew certainly showed some interesting data relative
7 to muscle versus fat. Some of those material properties aren't
8 well known for, let's say, fat or the distribution of fat or bone
9 changes, so a lot more work has to be done. I'm sure Dr. Kent
10 would be happy to know that because he could do more work like
11 that, but it is necessary.

12 We are investigating those things, looking at rib
13 properties and looking at brain properties. It's going to take a
14 while, but we just can't do it by scaling or by, you know, what we
15 think is right. There's a lot of literature out there, but it
16 takes detail analysis of individual tissues to really come up with
17 these solutions.

18 DR. ROUHANA: I guess one of the things I'd like to say
19 about modeling, though, is the dummy is a model. It's a model of
20 the human, also. It's a physical model and it's named
21 appropriately because we make a lot of approximations in
22 developing those models. The mathematical models that we have
23 developed, not just Ford but the whole industry, there are many
24 different models being developed around the industry. Steve
25 mentioned SIMON, which is a model of the brain and skull.

1 These models are much more detailed -- excuse me.
2 They're much more detailed than the crash dummy can be. The crash
3 dummy is a tool. It's meant to be repeatable and reproducible, so
4 that when we run a test in our lab and NHTSA runs a test in one of
5 their contract labs, we get the same answer, hopefully. And
6 because of that, to make it a laboratory tool, many, many
7 compromises have been made. It's a good representation of the
8 human and we've done a lot with the dummies. As many people this
9 morning have noted that, you know, the number of fatalities have
10 come down.

11 I think a lot of that is due to the economy in the last
12 three years. In fact, Michael Sivak from the University of
13 Michigan had a study on that. But -- got off track, sorry.

14 The fact of the matter is that the computer models, I
15 think, can give us much more detailed answers. The caveat is
16 that, as Steve said, there are many properties we don't know and
17 the computer models are only as good as the properties that we put
18 into them, so there's compromises everywhere, I guess.

19 DR. WANG: If I could also address that question? I
20 think there is a very substantial and, in fact, glaring deficiency
21 right now. I think the modeling is going to be very helpful, I
22 think adding additional properties. But as Dr. Rouhana mentioned,
23 what you end up with is much more detailed, hopefully with models,
24 sort of detailed injury locations, okay, and specific injuries.
25 And what we've done is, in looking at our very large substantial,

1 very large set of crash cases, we see differences in the location
2 and the specific sites of injuries and how they're related to each
3 other.

4 Now, very different than a young person versus an old
5 person. Young person, those ribs tend to collapse, you get
6 internal injuries, pulmonary contusions, whereas in an older
7 person, the ribs break in a different spot, which leads to lung
8 lacerations and liver injuries and whatnot. So I think what's
9 necessary is a three-dimensional injury mapping.

10 All the current injury databases now are basically lines
11 with a specific injury and a score. They don't give you the
12 three-dimensional location. And what you need to see is the exact
13 location in 3D space as well as how they relate to each other and
14 to the location of the force loading on the exterior surface of
15 the body. And all that now is very easily obtainable by
16 processing of CT scans, and I believe that's absolutely necessary
17 to support modeling. You have to have a target for any sort of
18 test that you have. You have to have a valid target. So I think
19 that's a very substantial and glaring deficiency right now.

20 MS. BRAITMAN: Thank you.

21 And one last question from our table. There is a lot of
22 information on polypharmacy effects on cognition. Do you have any
23 thoughts on polypharmacy effects on bone density, fragility and/or
24 frailty?

25 DR. WANG: As a trauma surgeon, I don't believe I'm the

1 best, the most qualified, person to say that. We certainly see
2 polypharmacy. A substantial portion of the American population
3 seems to be on multiple drugs at this time. What the interaction
4 of those effects are on osteoporosis, in particular, I cannot say.

5 MS. BRAITMAN: Thank you.

6 CHAIRMAN HERSMAN: Okay. Thank you very much for those
7 questions. And we'll proceed to the final table and I think
8 AAMVA's going to lead this time.

9 MR. MANUEL: My name is Tom Manuel and we're from AAMVA,
10 and we just have one question; you kind of touched upon it
11 earlier. But are there gender differences in terms of the older
12 driver and crash biometrics and what are the policy implications
13 of this difference? And one of the things that I was thinking
14 about was we talked about in the last session that females tend to
15 be the passengers when there's a male present in all age groups.
16 I mean, are there any implications for protecting those passengers
17 specific to gender, perhaps, or what are the implications, policy
18 implications?

19 MR. RIDELLA: Well, I'll start with that. We certainly
20 see very substantial gender differences and we know that these --
21 we attribute many of the differences in injury patterns to the
22 anatomic differences that we see between the genders. My personal
23 feeling, again speaking from the outside and not being one that
24 designs the dummies or the -- designs the dummies or the test
25 devices, is I don't believe that there is sufficient gender

1 specificity in the tests. I think when you -- we certainly --
2 when you lump all the injury risks together, you kind of lose a
3 lot of that understanding and so my personal opinion is that there
4 is not sufficient gender specificity in the test devices.

5 DR. ROUHANA: That aside, we still do use small female
6 dummies in our both regulatory and consumer level tests and side
7 impact dummies that, I mentioned earlier, we're developing and
8 helping to evaluate worldwide have both the mid-size male and the
9 small female based on more recent biomechanical data of, let's
10 say, fragility of females relative to males.

11 DR. KENT: Let me make one quick comment. The front
12 passenger position -- I don't have this kind of data, but one
13 thing we've been looking at lately, which has become kind of a hot
14 research issue is the rear seat, which sort of goes to your point
15 about non-drivers. We do know some things about the rear seat
16 that do have policy implications, I think, and this, what I'm
17 showing you here is the effectiveness -- this is the fatality
18 effectiveness of the rear seat as compared to the front seat, and
19 so a positive number means that the rear seat is safer compared
20 with the front seat for the same kind of an exposure. And if
21 there's been a historical truth in automobile safety, it's been
22 that the rear seat is safer; it's an intrinsically safer
23 environment than the front seat. And it's only in recent years
24 that this has started to become untrue and it's become untrue for
25 older drivers.

1 And so what you see there is up through about age 50,
2 the front seat has positive -- or the rear seat has positive
3 effectiveness and then when you get into the older age groups, the
4 rear seat becomes negatively effective. So in other words, the
5 front seat is actually safer than the rear seat for the oldest
6 occupants. And there are some working hypotheses on why that is.
7 One of them, if you go to the next slide, is this, illustrated
8 here, where this is the percent of various kinds of technology
9 that are in the driver's seat and we see things like pretensioners
10 and load-limiters.

11 This data is a little bit dated now. If you were to go
12 up through the current time, you would see, essentially, all of
13 them, 100 percent, that these technologies have come into the
14 driver seat. And that's been largely motivated by consumer
15 information and federal compliance tests, which involve dummies in
16 the driver seat. But there are no such tests involving dummies in
17 the rear seat, and so the rear seat sort of -- you know, it's
18 still a safe environment, but intrinsically, the front seat has
19 caught up because we've been working so hard on it, I think, and
20 so that's starting to show itself and so there may be some
21 advances to be made there by incorporating some of this technology
22 from the driver's seat into that -- into the rear seat. And there
23 may be policy issues that could drive some of that.

24 DR. ROUHANA: I'd like to weigh in on that one, too.

25 What this graph doesn't show is the driver for the fact

1 that there are pretensioners and load-limiters in the front seat.
2 Of course, there's always, there's -- and I didn't mean that by
3 the car driver, I meant that by the major factor, I guess I
4 should've said that. There's always a driver in the vehicle and
5 one-third of the time there's a passenger and one-tenth of the
6 time somebody in the rear seat.

7 Nevertheless, vehicles, themselves, have become, have
8 been forced to become, for all of our sakes, more fuel-efficient,
9 which makes them typically lighter. Also, a lot of the design
10 trends in recent years have been to shorten the front end. And
11 both of these trends, making them lighter and more stylish, tends
12 to drive the crash pulse up. And the crash pulse is the reason
13 that we have pretensioners and load-limiters in our vehicles. The
14 crash pulse is the acceleration that you experience because the
15 structure of the vehicle is much different now than it used to be.

16 And that, if you were to plot the structure, if you were
17 to plot NCAP stiffnesses as a function of time, which would be a
18 good thing to do, my guess is you would see that the NCAP
19 stiffnesses also follow the same trend. And so these technologies
20 are needed and it's time for them to come to the rear seat, which
21 is why we put our inflatable belts in the rear seat.

22 CHAIRMAN HERSMAN: Dr. Bruce.

23 DR. BRUCE: I just have a very short question. It's
24 actually going back to Dr. Kent. When you talked about your
25 delayed death slide -- and you don't need to bring it up because

1 the question's actually for Dr. Wang. When you see your sequence
2 of injury failure that's going on, how long does that typically
3 take?

4 DR. WANG: That can take in the order of weeks to
5 months. What happens is that -- and I think this goes back to one
6 of the issues that Dr. Kent brought up is that the young people,
7 we tend to get a very early read on them and -- they have enough
8 reserve that they begin to get into convalescence. What happens
9 with the older folks is they tend up on a lot of intensive care
10 support for quite a period of time. In these days with advances
11 in critical care, which have been very substantial over the last
12 two decades, we're able to keep folks going for weeks and then
13 afterwards, they typically then kind of dwindle and then they --
14 so it can be months before that pops out.

15 DR. BRUCE: So it would be fair for me to say that the
16 delayed death number is an under-reporting?

17 DR. WANG: Yes. I think -- and I'm not familiar with
18 Dr. McCartt's, you know, database, but I would say that there
19 would be -- we'd be quite concerned about that. And then, I
20 think, if you add on top of that not just death, but the very
21 poor, long-term outcome, okay, you would have to follow that out
22 much longer because there will be a much larger portion of the
23 elderly population that fail to return to full function, whereas
24 in the elderly [sic], they tend to, you know, bounce back and have
25 that recovery function much, much more substantial.

1 DR. BRUCE: Right. And just for the record, you were
2 using FARS data, so that would've been a 30-day window.

3 DR. WANG: Thank you. Yes.

4 CHAIRMAN HERSMAN: Thank you. And Dr. Price, I'm going
5 to keep you busy trying to pull up a couple of slides. Dr. Kent
6 had a slide that showed head injury and thoracic injuries, and one
7 arrow was going one direction and the other was going the other
8 direction, and what I'm trying to understand is why does head
9 injury, if I read this chart correctly, why does head injury
10 decrease with age? Is it because of the operation of the vehicle,
11 speed, or belt use? What's going on here?

12 DR. KENT: I should've made that point more clearly.
13 The risk of injury to any body region goes up with aging. So this
14 is not numbers or risk; this is proportion. So when an injury
15 does happen, it's more frequently in the thorax in an older
16 person. So they actually have a higher risk of injury in the
17 head, as well.

18 CHAIRMAN HERSMAN: Okay.

19 DR. KENT: It's just --

20 CHAIRMAN HERSMAN: Thank you.

21 DR. KENT: Yeah, it increases faster in the chest.

22 CHAIRMAN HERSMAN: Yeah, okay. Thanks. That's exactly
23 what I needed. I was having trouble understanding that. And I
24 think when you kind of talked about the exemplar accident where
25 you have the 39-year-old female driving into the tree, I'm like

1 oh, well, it's because they're having these catastrophic, high-
2 speed or drunk driving accidents, but we're not seeing that in the
3 older driver. But they have as many head injuries, just the
4 proportion is not as high?

5 DR. KENT: I don't know about numbers, but the risk is
6 higher in older folks, but their exposure is less; they aren't
7 driving as much. So the total number of head injuries, there's
8 probably more head injuries in the young, but the risk is higher
9 in the old. And the proportion is higher in the young, so
10 proportionately, younger people will have head injuries more
11 frequently.

12 DR. ROUHANA: I think it's also true that older people
13 do not get into the severe-type crashes that younger people do.

14 CHAIRMAN HERSMAN: The speed and things.

15 DR. ROUHANA: Speed, right.

16 CHAIRMAN HERSMAN: Okay.

17 DR. KENT: Yeah, it's the environment issue which is
18 also important.

19 CHAIRMAN HERSMAN: Great. And you had another slide and
20 it was the one that had the category of unknown and pregnant
21 female. And I don't know if there's a gender bias because last
22 time we had, for women on the -- now we have the for men. But I'm
23 just confused as to why unknown and pregnant women are in the same
24 category.

25 DR. KENT: I think my post-doc put them that way. I'm

1 not sure why.

2 CHAIRMAN HERSMAN: Okay.

3 DR. KENT: But there are some that are coded as pregnant
4 -- I think I was trying to make the point that that's pretty
5 clueless in either case. If you're coded as unknown or 65 plus as
6 pregnant female, in both cases you probably missed, and so that's
7 why I kind of combined them to show that, you know, over 10
8 percent of the database is coded clearly --

9 CHAIRMAN HERSMAN: Improperly.

10 DR. KENT: -- incorrectly.

11 CHAIRMAN HERSMAN: Yeah, good.

12 DR. KENT: Yeah.

13 CHAIRMAN HERSMAN: Okay. And, Mr. Ridella, I think, you
14 know, we've kind of talked a lot about the dummy types. I'd be
15 curious as to what type of dummy -- I know you're talking about
16 modeling and you think modeling is a great solution, but there's a
17 reason why we have dummies. And so we've talked about obesity.
18 We've talked about fragility or frailty. What do you think is the
19 single most critical area that we're missing in our family of
20 dummies? What would we benefit most if we're going to go through
21 the effort of putting together a new dummy? What is it that we
22 don't do well in our modeling now?

23 MR. RIDELLA: I think we do well everywhere, and we
24 touched on it and I think Dr. Rouhana did too, the word that comes
25 to mind is biofidelity, and that means how lifelike is the dummy,

1 how well does it mimic not just the injury but also the
2 kinematics. In other words, when we look at CIREN crashes we try
3 to deduce where was the occupant initially, where did it go, and
4 then we try to recreate that in a lab. The dummy doesn't always
5 want to go where the human went and so part of that is a process
6 of we don't want to break the dummy because if we make it too
7 lifelike it'll break over and over again. It gets kind of
8 expensive and guys like Steve get complaints because they don't
9 want to keep replacing dummy parts.

10 But if we can think of technology and make dummies
11 smarter, more biofidelic, more lifelike to respond to the crash
12 direction, the crash forces, and then to have the instrumentation
13 that can predict the injury. That's why we're moving into
14 rotational brain injury criteria, multi-point chest sensing,
15 acetabular load cells so we understand what's happening at the
16 pelvis, more complex lower extremities and more lifelike lower
17 extremities, which we recently completed a project on. Those are
18 all great things to move forward with. What comes with them is
19 complexity of dummies get more issues of calibration,
20 repeatability, durability, and reproducibility from dummy to dummy
21 that we have to tackle. And we will do that, but it's a process
22 we have to go through. Hope that answered your question.

23 CHAIRMAN HERSMAN: It sounds like all dummies need to
24 have better biofidelity, but is there one kind of prototype human
25 that's not well represented in the dummies? I think that's what

1 I'm trying to understand. You know, when we talk about dummies
2 performing like human beings, what's the dummy that's the
3 heaviest, and when we look at obesity, are we able to capture
4 that?

5 MR. RIDELLA: Dr. Kent would like to weigh in on that.
6 Go ahead.

7 DR. KENT: To weigh in, so to speak. Well, a couple of
8 comments. I guess to the very last question you asked, we have
9 done some work looking at a fat jacket for one of the dummies.
10 You know, the rib cages of obese people are actually quite like
11 the rib cages of anyone else and so if you can get down to the
12 bony structures, they're about the same. And so it is -- I mean,
13 there's visceral fat, for sure, but the thing that affects, say,
14 crash kinematics the most is the subcutaneous fat and we can
15 represent that and we've started looking at that. But again, it
16 gets into issues of repeatability and robustness and all of that.

17 And so the point I was going to make is that, you know,
18 we had this question about resources. To my mind, you know, the
19 resources required to develop a new dummy, to get worldwide
20 acceptance of it, and to get people to start using it, that
21 actually has never happened in my lifetime. You know, we got one
22 right around the time I was born, but -- and we've been working on
23 them ever since. And it's very hard and it takes a ton of work
24 and I just don't see that as the best use of resources would be to
25 build yet another dummy.

1 We can work on ways of making them better and also, I
2 think, ways of interpreting what they tell us. Things like SIMON,
3 you know, SIMON uses a dummy input to drive a model and give us
4 more information about what a human would experience in that
5 exposure, and those kinds of things seem to me to be a better use
6 of resources, is interpreting the dummies we have rather than
7 trying to build another one.

8 CHAIRMAN HERSMAN: Okay. I was interested in the back
9 seats and I'm really glad that the last table asked the question
10 and you were able to put up some slides on that information. If
11 you could pull up that slide that Dr. Kent used that had the back
12 seat information? And I think, Dr. Rouhana, you tried to kind of
13 shade a little bit of information in there about one-third of the
14 time there will be a passenger and one-tenth of the time, back
15 seat. Help us to understand the data a little bit more with
16 respect to the benefits that -- let's just say a front seat
17 passenger, not talking about a driver, just a front seat passenger
18 -- the benefits that a front seat passenger gets out of having the
19 combined airbag and seatbelt versus a back seat passenger not
20 having an airbag. And so maybe you can talk us through your data
21 here again. Whoever feels like they have something to add here.

22 DR. KENT: So this effectiveness issue, to sort of start
23 trying to understand this a little bit, we've done a couple of
24 things in my lab. One is we've started looking at the
25 distribution by body region; where are these injuries happening?

1 And it's the chest, surprise. And in fact, it's the chest even in
2 the young. And so the chest seems to predominate in the rear seat
3 more than it does in the front seat. And so that's one clue.

4 And then we started looking at restraint performance in
5 the rear seat and there are challenges in the rear seat that are
6 unrelated to the lack of an airbag. An airbag is a load path but
7 there are other load paths in the front seat that are not in the
8 rear seat, like a knee bolster. And we have quite a bit more
9 flexibility -- and certainly, Dr. Rouhana can speak to this more
10 than I can, probably, but the design of a front seat is much more
11 able to be changed than the design of a rear seat. The rear seat
12 is tightened to the chassis of the vehicle. It has huge
13 consequences if you try to change it.

14 And so a front seat, a driver's seat, the seat pad is
15 very ingeniously designed to restrain your pelvis. It's an
16 extremely important part of the restraint system. In the rear
17 seat it's difficult to get that same kind of pelvic restraint and
18 so in the rear seat testing we've seen, it's actually been pelvic
19 motion that has been, I think, the most concern to us because that
20 tends to load the lower portion of your chest; it tends to keep
21 the torso reclined which increases neck bending moments and things
22 like that. And so the rear seat poses some challenges.

23 A lot of them -- actually, this inflatable belt
24 addresses very elegantly, ones that Dr. Rouhana didn't mention,
25 things like restraining the pelvis. Actually, it helps restrain

1 the pelvis if you inflate the shoulder belt. And so there are
2 things being done back there along those lines. And so I think --
3 and a lot of -- good news is a lot of restraint manufacturers see
4 this as the next market. They see this as an area where they can
5 sell some technology and so there is quite a bit of work in this
6 area.

7 CHAIRMAN HERSMAN: And I don't know if the slide's still
8 up out there, but I'm -- and I apologize. I'm just not
9 understanding exactly what the data's telling us and I think, in
10 particular, I'm stuck on the zero to five. I think these age
11 groups, the passenger age groups, zero to five are not in the
12 front seat so explain to me what's going on here. And really,
13 we're hoping that 6 to 8 aren't in the front seat and the 9 to 12
14 aren't in the front seat. So help me understand what these two
15 colors are showing us and where the passengers are.

16 DR. KENT: So yeah, the -- well, they're not supposed to
17 be, but they are.

18 CHAIRMAN HERSMAN: Okay.

19 DR. KENT: So there are children in the front seat. And
20 so what that is, is comparing the relative fatality risk of kids
21 in the front seat versus kids in the rear seat. And what we see
22 is that it's about 50 percent more effective to be in the rear
23 seat for children. But that actually is true across the age range
24 up to about age 50. It's about, you know, 50 percent safer to be
25 in the rear seat than in the front seat. So there are kids in the

1 front seat. We encourage parents to put them in the back, but
2 there are still kids in the front.

3 CHAIRMAN HERSMAN: Where's the airbag, though?

4 DR. KENT: So in this case, the blue line is
5 representing cases where there is an airbag that deploys in the
6 front seat. The red line is from older vehicles where there's not
7 an airbag that deploys in the front seat. And so it's a little
8 bit confusing. It's not really the reason I was putting this
9 slide up.

10 But the rear seat, the decrease in rear seat
11 effectiveness is more pronounced if there's an airbag because the
12 airbag provides more benefit to the front seat. And so it makes
13 the rear seat seem proportionately less safe just because it makes
14 the front seat more safe. So the effect is bigger if there's an
15 airbag, which is why I have the blue lines. But the point's the
16 same, it's just the magnitude's a little greater if there's an
17 airbag.

18 DR. ROUHANA: One thing that might help with the
19 confusion is that this was a study done by NHTSA published in
20 2005, so the data is more than 5 years old; it's probably more
21 like 10 years old. And there were a lot more kids in the front
22 seat 10 years ago than there are today, so --

23 CHAIRMAN HERSMAN: Yeah, as a child passenger safety
24 technician, I just don't like to see any, you know, data that's
25 showing us kids in the front seat and that -- you know, that the

1 airbags are effective. That kind of is a challenge depending on
2 how they're restrained. But what I was curious, Mr. Rouhana, does
3 the belt with the airbag provide the same benefit or have you been
4 able to quantify that when you were talking about a combo airbag
5 and seatbelt versus the seatbelt that has the integrated airbag in
6 it?

7 DR. ROUHANA: We have tested -- I showed that one slide
8 with a standard belt. That standard belt test, I believe, had an
9 airbag in it and we reduced the chest deflection over that system.
10 We've also tested this in side impact and compared to the
11 inflatable belt; a standard belt by itself; and a standard belt
12 plus a combo airbag, side airbag, head and thorax airbag, and we
13 even see reductions in side impact of chest deflections from the
14 inflatable belt, so I think we will have a much more effective
15 system for the people in the rear seat.

16 CHAIRMAN HERSMAN: Great. And thank you very much for
17 sharing that video with us and it did go very quickly, so I see,
18 Jana, that you're very close to that slide again and I don't know
19 if -- I'm going to pass off to Dr. Garber, but if we could show
20 the video again while we're transitioning? You know what, it's
21 okay if you can't -- Dr. Garber, do you have some additional
22 questions?

23 DR. GARBER: Yeah, if I could -- just a couple of
24 follow-up things that I wanted to sort of get on the table. We've
25 talked a little bit, and I think Dr. Wang, in particular,

1 addressed to a certain extent the issues of exercise. I mean,
2 you'd love to have your patients exercise for a couple of months
3 before they get into their accidents.

4 Can you comment more specifically on what the effect is
5 of exercise in the older population with regard to those types of
6 markers of fragility and frailty like bone mineralization and
7 muscle mass and what that does as far as their ability to
8 withstand some of these impacts? I know that surgeons are fond of
9 talking about physiological versus chronological age, and perhaps
10 tell us what it would mean for an 80-year-old who's exercising,
11 doing weight training, running, those sorts of things, versus a
12 60-year-old who, perhaps, is sedentary.

13 DR. WANG: And I have a discussion slide which will come
14 up here shortly. I'm not sure I can answer exactly your question.
15 The question of whether -- you know, how exercise affects core
16 muscles, but we haven't studied that in a prospective fashion. We
17 certainly see that in our patients with a history of good
18 activity, that they appear to have good core muscles and we've
19 kind of made that association.

20 The other thing that we've done is we've studied
21 patients that are in the ICU, that large cohort I showed you that
22 had a very high mortality rate. We know that the psoas muscle can
23 change acutely within the course of a couple weeks of being
24 critically ill. It can decrease by cross-sectional area by 20
25 percent or so. So we certainly know that it can drop very

1 substantially in size. How quickly it can go back up, we haven't
2 sorted out yet and we have a number of studies which we're
3 prospectively going forward to try to study that.

4 So this slide is something that's kind of, I think helps
5 to drive home the point, if I haven't already driven the point
6 home, that age and comorbidities are insufficient, okay, and that
7 condition is much better. So what we did is look -- and I
8 mentioned that we've studied this in aortic surgeries, in liver
9 transplant surgeries, and multiple surgeries, and what we've found
10 that the psoas muscle is by far the best predictor, far better
11 than age or comorbidities.

12 And what was interesting is we took the 10 worst -- so
13 this is the 10 percent worst psoas area and we looked at how they
14 matched up compared to the 10 percent with the highest age and the
15 10 percent with the largest number of comorbidities. So in the
16 past we've always used age and comorbidities as our assessment of
17 frailty, okay, or fragility and what we found is that the psoas
18 muscle seems to indicate something different, okay. And in fact,
19 it's this psoas area which is by far the best predictor of poor
20 outcome.

21 DR. GARBER: And that leads to another question, is to
22 what extent does that or any other markers that you're looking at
23 represent a reflection of actual medical conditions that
24 individuals may have, the comorbidities that you're talking about
25 but also those aging-associated conditions such as emphysema or

1 cardiac disease or diabetes, how do you separate those from the
2 effect just of aging itself?

3 DR. WANG: Yeah, it's very difficult. I view this as a
4 psoas muscle. So in order to have a good psoas muscle you need to
5 have good nutrition, okay. You can't have chronic disease, which
6 is, you know, which is causing you to be ill and not being able to
7 exercise. So this is just a marker, okay, and it's very difficult
8 to separate out those other processes. And right now all this is,
9 is something that we have found this is by far the best marker
10 that we found so far and we're attempting to sort out the factors
11 that contribute to it.

12 DR. GARBBER: And then one last question for me is, we've
13 talked a lot about the data which are mostly fatality data with
14 regard to the older occupants, but we didn't really discuss too
15 much, except sort of referentially, what the effects are of even
16 relatively what we might consider minor injuries on long-term
17 disability for these occupants. I know that we've had some
18 discussions at some conferences about lower extremity injuries
19 particular in older adults. Even things as simple as sprains and
20 contusions may result in long-term kinds of disability, and I'd
21 like you to discuss that just a little bit, if you can.

22 DR. WANG: It's hard to speak about it in generalities.
23 What happens is that in these patients and the more frail -- and
24 I'm going to get away from the use of the word elderly, but in the
25 very deconditioned patients, very small injuries are able to just

1 push them over the edge. So we oftentimes see -- and typically,
2 these frailer, more deconditioned patients are the elderly. But I
3 mentioned multiple patients with a couple rib fractures end up
4 with the pneumonia. And certainly, when we did -- in our CIREN
5 population, I think about 80 to 85 percent of our fatalities had
6 rib fractures and in quite a substantial portion, all they had
7 were rib fractures.

8 Now, we also have a substantial number of patients who
9 have sustained what we would consider relatively minor orthopedic
10 injuries, okay. But again, because they're deconditioned, what
11 ends up happening is that they're unable to get up to weight
12 bearing very quickly. They end up going to a nursing home, being
13 bed-bound for very substantial periods of time and end up with one
14 complication of another and they end up being readmitted. So even
15 small orthopedic injuries can lead to fairly -- can lead to very
16 poor outcomes in a sufficiently deconditioned patient. We see
17 this over and over again, so this is a very common anecdote. I
18 can't give you the exact sort of injury and what its effect is in
19 more detail.

20 MR. RIDELLA: The point about less severe injuries, we
21 tend to focus on fatalities and higher AIS scale injuries, but
22 lower extremity injuries tend to be on the lower side, the AIS-2+
23 injuries. Mild traumatic brain injury is an area that doesn't get
24 a whole lot of research in this field, does in others, sports,
25 obviously, but something that we think we can handle on also by

1 doing further research on and see where that goes in the future,
2 so that's one area we're going to focus on, also.

3 DR. GARBER: Thank you. Those are all the questions
4 I've got.

5 CHAIRMAN HERSMAN: Dr. Poland.

6 DR. POLAND: I think I just had maybe two more
7 questions. But first, let's show that video again. I think Jana
8 has it ready so we can see the belts inflating in the rear seat.

9 (Video played.)

10 DR. POLAND: And Dr. Rouhana, those are six-year-old
11 children?

12 DR. ROUHANA: The dummy on the left is a six-year-old
13 child in the booster seat and on the right is a small adult female
14 representative of the fifth percentile of the female population in
15 size and weight.

16 DR. POLAND: We'll be interested to hear more about that
17 when you come to our child passenger forum next month. I've heard
18 some information about these belts also being potentially
19 beneficial in rollover crashes. First of all, I guess, is that
20 true and is there any consideration for having this type of a
21 restraint system in the front seat?

22 DR. ROUHANA: Well, currently we have airbags in the
23 front seat and those are mandated by Congress, so we believe that
24 there would be marginal incremental benefit from putting the
25 inflatable belt in, as well, because we also have load-limiters

1 and pretensioners in the belt system. And we haven't really
2 assessed the rollover performance of the belt systems at this
3 time, although I believe NHTSA has.

4 DR. POLAND: Okay. And then my last question: In the
5 first panel we talked a lot about crash rates and when crash rates
6 started to increase and it looked like we were seeing some
7 increases around the 70-year-old range and then maybe some more
8 increases around the 80-year-old range, or possibly it was the
9 fatality rates that we were looking at for that U-shaped curve
10 where we had high rates for the young and then -- was that
11 fatality rate that I'm talking about -- so, and then a higher
12 fatality rate for the old. Is that when injury tolerance starts
13 to decrease? Is it at that 75-year-old range or is it earlier
14 than that?

15 DR. ROUHANA: It really depends on what injury you're
16 talking about. For bony injury, I think we see an increase from
17 about the age of majority on as you start losing bone mass.
18 However, as -- I think maybe Dr. Kent showed the organs, the
19 abdominal organs -- or maybe it was Dr. Wang, I don't remember who
20 -- don't age quite the same way and so for lung injury, unless
21 it's secondary to a rib fracture, we wouldn't expect to see a
22 major change with age.

23 DR. KENT: Yeah, but, you know, overall risk of
24 fatality, given a similar kind of an insult -- I showed those
25 plots relative to age 20. They go up from age 20. So it starts,

1 and you can see biomechanical consequences of aging in the early
2 20s, unfortunately; you know, things like calcification of the
3 costal cartilage starts to show up very young and that predisposes
4 you to thoracic injury. So unfortunately, it's pretty young.

5 DR. POLAND: So even at age -- after age 20, we're
6 starting to see some decreases associated with lost tolerance to
7 injury just because we're getting older?

8 DR. KENT: Yes.

9 DR. POLAND: Thank you very much. Thank you, gentlemen.
10 I appreciated having the opportunity to speak with you on this
11 panel. I think I could talk about it all day long, but we've just
12 about reached the end of our panel session. Thank you, Chairman
13 Hersman.

14 CHAIRMAN HERSMAN: Thank you. This has been a great
15 panel, very informative. Thank you for your slides, your data,
16 and the presentations, the videos. All of it was great.

17 I did want to recognize Ms. Haas. If you could please
18 stand in the back? Ms. Haas did -- was awarded an honorable
19 mention at the 2010 Los Angeles International Film Festival for
20 the video that we got to see at lunch and I'm sure that you all
21 can understand why. She also, in 2003, was a founding member of
22 one of my very favorite programs and that's the oral history
23 project that's called StoryCorps. So I could totally hear those
24 two gentlemen sitting down to tell us their stories on a program
25 like StoryCorps. Thank you for sharing with us that excellent

1 video.

2 And Ms. Haas will be available if you all would like to
3 talk to her during the break. So thanks so much to our panelists
4 and we will adjourn.

5 We actually get a very generous break of 30 minutes so
6 you can go get a cup of coffee or a soda and we'll come back at
7 3:00 for the last panel of the day.

8 (Off the record.)

9 (On the record.)

10 CHAIRMAN HERSMAN: Welcome back for our last panel of
11 the day. We'll be examining highway and vehicle designs targeted
12 to improve the performance of aging drivers. FHWA has nearly a
13 decade of experience with the Highway Design Handbook For Older
14 Drivers and Pedestrians and is preparing to release their next
15 edition in 2011.

16 The panel today will look at what we've learned and
17 where we're going with highway design guidelines for aging drivers
18 and then we'll also consider the role of advancing automobile
19 technology in improving safety for aging drivers and pedestrians,
20 with opinions from both researchers and manufacturers. In
21 addition to the specifics of the infrastructure and vehicle design
22 changes, the panel will consider the more general question of how
23 technology will shape the future of public policy and drive
24 innovation.

25 Dr. Robert Molloy and Mr. Dennis Collins are leading the

1 panel this afternoon. Dr. Molloy, will you please introduce the
2 panelists?

3 DR. MOLLOY: Certainly. Our first panelist is
4 Dick Schaffer with the Federal Highway Administration. He's the
5 aging road user program manager at Federal Highway and he's
6 developing the latest update to the 2001 Highway Design Handbook
7 For Older Drivers and Pedestrians.

8 You can give us your presentation.

9 MR. SCHAFFER: Excuse me. Thank you, Dr. Molloy,
10 Chairman Hersman.

11 I'd like to preface my remarks by saying the handbook is
12 really a document that is all involved in gains in safety and
13 mobility. We really are working towards the countermeasures for
14 older road users and which will benefit all users, not just simply
15 the older road user, because we have all drivers of all ages on
16 our roadways. And this is also designed to leave engineers and
17 road designers with some flexibility with modal needs conflict
18 between pedestrians, for example, between bicyclists and even
19 between pedestrians, predominately. And we're also trying to
20 reach a balance between different modes.

21 First of all, we're going to be growing. As you know,
22 the baby boomers -- and I'm just on the edge of that -- is coming
23 of age for when it comes around to getting to 65 and we're going
24 to grow from 40 million up to 71.5 million by 2030 and we're going
25 to be a large piece, if you will, of the road users.

1 And at the same time, we're looking at how, you know,
2 everything is affected, cognitively, physically, with the road
3 user and at the same time, we're looking at -- let's see, move
4 ahead here -- how the 1998 older driver handbook, design handbook
5 -- if you really look at it, that's our first document. That was
6 done over 12 years ago and that's the first practical information
7 source on the older driver, and it gives recommendations on
8 design, operations, and traffic engineering. And it does include
9 pedestrians within the intersection area.

10 Three years later that was updated into the 2000 Highway
11 Design Handbook For Older Drivers and Pedestrians. So just wanted
12 to look -- and it's spanning the data and recommendations on older
13 pedestrians and drivers. It was based on recommendations from
14 local and state level practitioners and that's why we really
15 wanted to update it because they saw, from 1998, they were missing
16 a few things.

17 Now, since then, 2001, we have an older driver training
18 course. This is taught by our resource center in which we take
19 this around the country to really show traffic engineers and
20 traffic specialists how to -- why this is important and how to use
21 it.

22 Now, we're looking at updating this in 2011. We're
23 going to incorporate new research and the 2009 MUTCD. That's a
24 very important part of our entire document because that's what we
25 reference and that had to be really included and it's why we

1 couldn't do this beforehand. It expands the range of applications
2 to -- from the 2001 handbook and it identifies innovative
3 techniques and best practices, and those, for example, where there
4 may not be hard research -- because this has been a research
5 document, it still is -- but we definitely want to show around the
6 country where there may have been -- there surely are some
7 practices that local communities have used, taking some of those
8 measures.

9 And it's going to be looking at a web-based version and
10 it's going to improve the access to info in use by professionals
11 for all users. This is why we're looking at not just the driver,
12 we're looking at the older pedestrian, surely, and any particular
13 other modes.

14 Now, we're looking at intersections where the highest
15 conflict exists for not just all road users, but surely the older
16 road user. They're looking at -- most of the actual crashes and
17 collisions occur within those intersections. That's also where
18 most of the pedestrians, elder pedestrians, are simply because
19 they follow the actual marked crosswalks more than those younger
20 than them.

21 Interchanges where you have off-ramps and on-ramps to
22 freeways where accelerations and de-accelerations, braking, have
23 to be done very quickly and getting on and off the freeway
24 relatively quickly. Roadway segments where you're looking at
25 maybe a continuous left turn lane, other particular measures that

1 are recurring on that roadway that need to be looked at. And we
2 want to provide pedestrian refuges for sure where those exist and
3 where they're needed simply because pedestrians need a place where
4 they can be within the roadway and they can move safely across
5 that roadway. And we've also promoted the countdown pedestrian
6 signals, which you will find in the 2009 MUTCD.

7 Dr. Molloy.

8 DR. MOLLOY: Thank you. Thank you very much for that
9 presentation.

10 Our next presenter is Dr. Joe Coughlin. He is director
11 of the U.S. Department of Transportation's New England University
12 Transportation Center. He's based at MIT. He's also the founder
13 of the MIT AgeLab, doing research on the impact of aging on
14 automobile design and public policy. You can give us your
15 presentation.

16 DR. COUGHLIN: Thank you very much, Madam Chair and
17 ladies and gentlemen. Thank you for having me.

18 I'd like to briefly discuss the convergence, if you
19 will, of new technology and older age and have us think about some
20 design considerations that we may want to think about in the
21 future of the car as well as the future of the rest of us. If the
22 auto industry is asked and researchers are asked, this is
23 essentially what we're looking for: We'd like to get the driver
24 out of the front seat. We'd like to have something that looks a
25 lot more like avionics than we would like to have what we

1 currently think is the car.

2 This is not new. This was something that was developed
3 in the 1939 World's Fair and it's continuing to be the trajectory
4 of what we're looking for today.

5 And this is who we think we're designing it for. We
6 think we're designing it for the new, the fun, the lead adapter of
7 every technology. But ladies and gentlemen, the actual buyer
8 looks a little different because, you see, the high tech, the high
9 design and indeed, the high price, goes into cars that are bought
10 most often by the 55 plus. Therefore, the new lead adapter of new
11 technology is not the young and the fun, but those of us who are
12 older and still fun. But the problem is we no longer have a
13 mental model, shall we say, of how these new technologies work in
14 a car and how it changes how we drive.

15 We have new systems that are going to require us to
16 relearn how to drive. If you think about it, the car has been
17 remarkably the same for decades, at least to the driver. Under
18 the hood, it's different. But now it is changing dramatically
19 inside. No one told us essentially how to drive antilock brakes;
20 no one has prepared us for active safety. So let me talk about
21 three things: load, learning, and longevity. These are the three
22 ideas I'd like to leave you with.

23 First, driver workload certainly changes over time.
24 This is a picture inside of our Aware Car that detects different
25 biological, physiological, and eye-tracking activities of the

1 driver. Technology adoption does increase, believe it or not,
2 with older adults. It gives them greater confidence. Our work
3 with The Hartford shows, with survey data nationwide, that older
4 adults, if it is related to safety, will use technology. They're
5 also more likely to self-regulate using the technologies that are
6 likely to distract.

7 But there are natural age changes that require us to
8 change how we get to the driver overall. More importantly, we
9 have just discovered some recent data in our own lab that
10 indicates that certain disease categories may change how we're
11 actually able to manage workload in the car.

12 Moreover, there seems to be an issue of distraction of
13 these new technologies, not in the way you think, but younger
14 drivers trust new technology almost implicitly, to the point where
15 they no longer look to see if there's a toddler or a truck behind
16 them. They wait for the warning to go off. Our research also
17 shows, however, that older drivers will use the technology but
18 will be distracted if the technology system goes off and it's not
19 readily apparent as to why it did.

20 Longevity. This is an issue, if you will, of thinking
21 about the car overall and how we age. The fact is, is that
22 birthdays do not kill; health conditions do. As we live longer,
23 we will have greater comorbidity. We will be taking more
24 medications. 110 million Americans already, regardless of age,
25 have one chronic disease; 60 million with two.

1 Can we imagine a car that not only detects how you're
2 driving but detects your state, your well-being? And so our
3 driver well car -- and this is one of the vehicles we have
4 instrumented out, indicating how we can manage the idea of how
5 older drivers tend to be safe drivers because they self-regulate
6 their behavior. Can we envision a car that will help coach and
7 monitor overall well-being for the driver and change its
8 performance in real time to match the driver and have cues,
9 whether it's an orb or a light such as this, to actually say that
10 you're running out of your performance range or you should be
11 improving your overall performance behind the wheel?

12 Let me end with a few recommendations on product policy,
13 process, and policy. First off, we need to conduct research, if
14 you will, on how we understand and adopt technology across the
15 lifespan. This has not been done in the auto area, let alone in
16 many other areas. More importantly, we need to develop
17 quantifiable guidelines to mitigate the impact and interactions of
18 design, workload, and age on driver performance.

19 Stimulate lifelong education with technology included.
20 That is, that if a car is going to be changing as rapidly as we
21 think it's going to be, just because you're 25 no longer makes you
22 a good driver because you recently graduated from a driving
23 program. This is something we need to think about across the
24 lifespan.

25 Related to that, reinventing the car delivery

1 experience. The way we buy our car today is no different than,
2 frankly, our parents and grandparents: We take the car; we're
3 excited; the dealer's excited; here's the air conditioning; here's
4 the entertainment system; here's how you adjust the seats and here
5 are the keys. We need to do more of what we see in Europe and
6 some other places where the delivery experience is an education
7 experience that gets you familiar with the new technology, of what
8 to expect and how to drive.

9 Lastly, a policy issue, which is recognizing -- I
10 believe we have a new emerging class of driver. In law, what we
11 talk about is a reasonable man standard. With the aging of the
12 population, with far more women on the road, we now need to
13 engineer not just to the reasonable man standard who happens to be
14 5'10", 25 years old, and 165 pounds, but to a reasonable older,
15 smaller woman standard and what that means in terms of design, as
16 well as technology.

17 And then lastly, developing public standards around
18 human automation, learning and trust, acceptance across the
19 lifespan for the car and beyond.

20 Thank you very much for the time.

21 DR. MOLLOY: Thank you very much, Dr. Coughlin.

22 Our next presenter is Mr. Thomas Broberg, Senior
23 Technical Advisor for Safety with the Volvo Car Corporation. He's
24 been on the management team of Volvo Car Safety Center since 1999
25 and he's also pursuing a doctorate right now looking at safety in

1 the aging population.

2 Your presentation, please.

3 MR. BROBERG: Thank you. Thank you, Madam Hersman,
4 Chairman. It's a great pleasure to be here.

5 Actually, I deliberately changed the title here to All
6 Drivers and the Vehicle Design for All Drivers. And why is that?
7 Well, at Volvo, we have our own internal vision and that is that
8 in the future, cars should not crash. We've also set up an
9 ambition to work towards this vision, and that is that by 2020, no
10 one should be killed or injured in a new Volvo.

11 The strategy to move in that direction is quite
12 holistic. We're looking, of course, into the crashes and what
13 happens before the crashes, but we also divided the events before
14 a potential collision into different phases. And these different
15 phases, of course, have challenges as we move back in time before
16 a collision and how it relates back to the driver.

17 Well, what we know -- and this specifically in relation
18 to the older drivers in Sweden and at Volvo, it's quite similar to
19 what has been shown here previously today with the statistics data
20 showing the frequency of collisions, the high increased risk of
21 injuries, the bathtub curve, as well as self-cessation for older
22 drivers. And the knowledge, of course, is coming back to this,
23 studying real-life accidents and to use that as a basis for how we
24 better understand both accident causation and, of course, injury
25 risk and injury causation.

1 This specific accident here, which I've picked, is one
2 of our recent -- it's a Volvo against another car. In one of the
3 cars you had an 18-year-old driver with a three-month old license
4 and in the other, you had a 73-year-old driver and a 75-year-old
5 passenger. The young driver actually came over on the wrong side
6 of the road and the old driver tried to swerve out, actually hit
7 the curb of the road, but could not avoid the collision. Luckily,
8 in this event, the outcome was good, so all the participants have
9 recovered.

10 But of course, we have to ask ourselves what actually
11 caused this collision. Would technology have helped, in this
12 case, the younger driver, to avoid the collision? And in other
13 circumstances, it could have been the older driver that was the
14 cause of this accident.

15 So the challenge here, really, for us is to understand
16 and know the driver, because we're all different. We're all
17 different as human beings. There are 5 billion variants of us out
18 there. And when we design technology in our vehicles, we really
19 have to understand the differences between us, or if there is any
20 differences in our behavior when we drive our motor vehicles. So
21 this is really the challenge, as we see, when we move to the
22 future.

23 And this relates, of course, to all drivers, but more
24 significantly to the growing population of older drivers, to
25 really understand the factors that are necessary there. And what

1 we do is to try to build knowledge, and that's actually one of my
2 main subjects working with safety at Volvo, is looking into the
3 aspects of the older driver population and driver behavior related
4 to the older drivers. What factors are important? And when we
5 know those factors, how should we address them from a technical
6 perspective?

7 Well, we do have some knowledge already today in
8 relation to what is causing accidents. There are a few big ones,
9 distraction being one, of course; alcohol involvement; drivers
10 falling asleep. And of course, we're addressing this and this is
11 just a few examples of technologies that are in the cars today.

12 And as you see here, we're actually addressing all the
13 different phases that we have in our strategy with different types
14 of technologies. And what's really the emphasis here is to push
15 it to the left, try to help drivers stay out of a critical
16 situation in the first place.

17 We have already launched technologies that help drivers
18 avoid collisions in certain circumstances, crashing into
19 pedestrians and so forth. We have dynamic systems that help
20 drivers if they're in a critical situation, like if the car is
21 sliding and you have dynamic stability and traction control to
22 help you stay on the road. But we're also looking into how we can
23 assist drivers to be in a good state, both from a distraction
24 point of view with actually trying to reduce the workload from the
25 car for the drivers with, for instance, our IDI system,

1 Intelligent Driver Information system; likewise, the driver alert
2 control addressing drowsy drivers or unconcentrated drivers. So
3 the car can actually recognize what the driver, how the driver's
4 actually performing with the vehicle.

5 And this is actually one of the keys here. We're
6 starting to give a car senses. Today the cars can see and they
7 can also feel. They can feel what the driver's doing or actually
8 what the driver's not doing. And in certain situations, where
9 it's appropriate, the car can actually help the driver avoid
10 collision autonomously.

11 So the basis of knowledge is really how we proceed in
12 order to meet our future, the crash-free future, take us down to
13 zero. And the knowledge of driver behavior and how drivers adapt
14 to technologies is a key enabler for us as we move forward. And
15 we also have to humbly, of course, recognize that when our company
16 was founded 80 years ago, cars were driven by people, they are
17 today, and of course, they will be also in the future. And it's
18 with that basis that we have to design technology. So we have to
19 design technology around the human being and not the other way
20 around. And the key there is understanding the human being.

21 Thank you.

22 DR. MOLLOY: Thank you very much, Mr. Broberg.

23 Our next presentation will be given by Dr. David Eby
24 with the University of Michigan Transportation Research Institute.
25 He's a research scientist and head of the behavioral sciences at

1 that institute. Dr. Eby's topics of research include driving and
2 dementia, older driver decision-making, risky behaviors among
3 young drivers, use and nonuse of safety restraints, impaired and
4 distracted driving, and the use of in-vehicle technology to
5 advance, enhance safety and mobility.

6 Proceed with your presentation, please.

7 DR. EBY: One of the good things about going last in a
8 session is most of the points that you want to make have already
9 been made, so I'll go over this quickly.

10 The presence and use of advanced technology in vehicles
11 is increasing. We've already heard that in several presentations
12 today. And this includes technology that is original manufactured
13 technology, technology that's built into cars -- some of the
14 technologies that we were just hearing from Volvo -- but also
15 ematic technologies. Cell phones and smartphones can do all sorts
16 of things and people bring those into cars to help them drive,
17 such as navigation systems, and all of these technologies are
18 going to be much more common in the future.

19 We know the U.S. population is aging, so is the
20 population of many other Western countries, and with that aging
21 comes functional declines based on medical conditions and
22 medications that can impact safe driving. And advanced
23 technologies have the potential to increase the safety of older
24 people, as well as their quality of life.

25 Now, we've heard a lot about different kinds of

1 technologies. There's all sorts of technologies that are
2 available. Here are some example technologies. I know the most
3 about route guidance systems. These are systems that provide
4 turn-by-turn instructions to people as they drive. They use GPS
5 signals to locate vehicles and the design features can vary
6 widely, including providing turn signal turn symbols for people,
7 but also voice controls to let people know, without having to look
8 at the displays, what the next maneuver is.

9 There's also night vision enhancement systems. These
10 are systems that use infrared technology that can detect warm
11 bodies out in the roadway, especially under limited view
12 conditions like fog or nighttime, so animals, pedestrians and so
13 on, and that information can then be displayed to the driver,
14 letting them -- warning them of those animals and people out in
15 the roadway.

16 There's a whole different -- there's a whole set of
17 crash warning systems. There's forward collision warning systems,
18 lane departure warning systems, curve speed warning systems.
19 These are all systems designed to help a person prevent getting
20 into a crash. They use various kinds of sensors, radars to let
21 you know where traffic is in front of you, sensors that can pick
22 up where lane markings are so that it can determine what position
23 in the lane you have, and then provide warnings. In some cases
24 these warnings can be as simple as an auditory alert; they can be
25 a haptic alert where there's a shaking; or in more advanced

1 systems there can also be some control of the vehicle like braking
2 that takes place without the driver having to do anything.

3 Finally, there are automatic crash notification systems.
4 These are systems that, in the event of a crash, information is
5 sent directly to an emergency responding system, and that
6 information can be fairly sophisticated including some of the
7 dynamics that are recorded in a crash.

8 So our research findings, as well as findings of others,
9 show that older people like these advanced technologies and
10 especially the ones that help them go to places that they might
11 not be comfortable going to, as well as the technologies that help
12 improve safety.

13 Older drivers also use these technologies as much as
14 drivers of other ages. So they can use them, they do use them,
15 and in the case of navigation systems, our research shows that
16 they're used even more than with the younger populations. Older
17 drivers report that many of these technologies actually make them
18 feel more confident while driving and less stressed while driving,
19 which helps them be comfortable going to places and other
20 destinations. It increases their driving space.

21 Older drivers do report difficulty understanding symbols
22 and the warnings more so than for younger people, and so I think
23 we still have some work to do on developing those symbols and
24 warnings. Older drivers report more difficulty using these
25 systems, especially the systems that require some sort of input.

1 And older drivers have also told us they would not purchase
2 technology that's labeled for older people.

3 Advanced technology, to be useful in this population, it
4 needs to be affordable and that, I think, comes with economies of
5 scale. They need to be easy to use and intuitive so if you learn
6 how to use one kind of navigation system, hopefully that
7 information will translate to some other kind of navigation
8 system. The system should enhance safety or at least not decrease
9 safety and it should not increase distraction in the long term.
10 By the long term, I mean many of these new technologies can be
11 distracting until you learn how to use them, so research needs to
12 check out the distraction levels over much longer terms than even,
13 say, a few weeks and see if it still causes distraction.

14 Technology should recognize and accommodate how older
15 drivers drive and self-regulate. For example, in our studies with
16 navigation systems, we found that people, some older people wanted
17 to co-navigate. They had a spouse that was in the passenger seat,
18 the spouse operated the device and the device we were using, the
19 device could not be manipulated when the vehicle was in motion and
20 that bothered the co-drivers. So there are some differences in
21 the way people drive and technology should take that into account.

22 And finally, older drivers take longer to learn how to
23 operate advanced technologies. We found that it can take quite a
24 bit longer for them to understand the technologies. However, once
25 they do learn how to use the technologies, they can use them just

1 as well and understand them just as well as younger people.

2 People told us, at the hand-off procedure, for example,
3 with a new car, what they wanted was a hands-on demonstration so
4 they can work through it and then they wanted to come back in a
5 few weeks and ask more questions. We need to keep this in mind
6 when we're implementing new technologies. Thank you.

7 DR. MOLLOY: Thank you all very much for your
8 presentations.

9 My first question builds upon a theme that you've talked
10 about throughout your presentations, technology, and we're at a
11 time now where technology is becoming much more affordable and
12 realizations of intelligent transportation systems are becoming
13 actually something we can see potential benefits for cars talking
14 to each other, cars protecting themselves. How do you think the
15 work in ITS has included -- how well has it included the aging
16 driver in its research and development?

17 MR. SCHAFFER: From a roadway perspective, we've talked
18 about that for some time. In our 2001, for example, we addressed
19 ITS directly. Again, this is a guidance document. It is one that
20 we truly recommend that ITS work for the benefit of the aging road
21 user as well as for the pedestrian. But taking, for example, some
22 of those directional signs, that -- we recommended flat out that
23 they be no more than two-phase. You get too much information in
24 multi-phase signs. It really can affect any drivers, especially
25 the aging driver, their attention to the roadway. And so you get

1 two phases, you're not going to be having your attention off the
2 roadway very long. So that's something we really strongly looked
3 at.

4 We also were the ones that recommended that a change
5 that finally led to the countdown signals in the 2009 MUTCD, so
6 therefore pedestrians could truly see, not just senior
7 pedestrians, but all pedestrians could know exactly how long they
8 have to get across the roadway.

9 And so those are some ITS applications I did want to
10 mention from a roadway point of view that have really been used
11 and as far as guidance and actually turned into some standards.

12 DR. COUGHLIN: If I may respond, as well? I would argue
13 that in the last 20 years from when ITS became ITS from
14 intelligent vehicle highway systems, that the use of information
15 technology has been largely in how to improve the operation of the
16 infrastructure and in some cases to get the vehicles to talk to
17 each other. I would also submit it's only been in recent years
18 that ITS has been used as what does it do for the actual consumer,
19 not the state highway department, not the federal government or
20 anyone managing the congestion on the highways, but to the actual
21 user. To that end, I think that the older driver is somewhere in
22 that list but I don't see a very big push there.

23 I've seen many papers talk about how it can be of help,
24 but we really need to start asking ourselves at what point do you
25 become an older driver with respect to technology, given the fact

1 that this is coming faster, it is becoming cheaper and is out
2 there in the cars. I would submit to you that a 25-year-old
3 driver is as antiquated as a 75-year-old driver given the speed
4 which these will be deployed.

5 MR. BROBERG: Yes, if I may add, as well? I think one
6 of the aspects, I mean, when we started to get the infrastructure,
7 when we started to get the possibilities, I think we still need to
8 put the human aspect of it, the interaction with the driver as
9 such. Not only related, of course, to the older drivers but to
10 all drivers.

11 And I think Dr. Coughlin here will agree in the sense
12 that there is actually -- well, we need to learn more as to how we
13 can actually both use interaction with the driver to help the
14 driver stay alert as well as to make sure not to overload the
15 driver with information or interaction to have worse performance
16 in those cases. So there are two aspects and I think the lack
17 there is really knowledge from a behavioral science point of view.

18 DR. EBY: It's my opinion that in the last decade we
19 have begun to recognize that we need to design for older drivers
20 these ITS technologies, not only design for them but also try and
21 understand how they might use them and what benefits they might
22 get from using these various technologies. In the past 10 years I
23 have seen a lot of interest in that and research is just starting.
24 Sometimes it takes a long time to get research funded, projects
25 going. I know the work at UMTRI, we always have an older driver

1 group now. We didn't do that in the past but now we do. So I
2 think things are changing, but we still have a long way to go.

3 DR. MOLLOY: And following up on what you've talked
4 about in the last decade, in the video we saw at lunchtime, we saw
5 a gentleman who basically aged with his car and continued to drive
6 a Model T. And in fact, in some of the basic operations of the
7 vehicle, the operation of vehicles are basically the same as it's
8 been for quite some time. I just wanted you to comment on any
9 changes you've seen in the last 5 to 10 years that have been
10 changes to vehicles that have assisted older drivers.

11 MR. BROBERG: Well, of course, the changes, I think,
12 we've been trying to do, again, not only related to the older
13 drivers, have been to look at the aspects of how we can make the
14 interaction with the driver more intuitive. So for instance, if
15 you're in a situation where we want you -- if you're in a critical
16 situation and we want you to act in a correct way and you have a
17 very limited time to do that, the interaction with the car has to
18 be extremely intuitive. It has to be in your backbone. So that's
19 one of the principles that we've applied.

20 And the other end of that and coming back to my holistic
21 picture of how we work with safety, when you're in circumstances
22 where you're driving normally, so to speak, and you have more time
23 to do the interaction, it's very much a question of the state of
24 the driver and trying to understand that. And it's just recently
25 that we're starting to get the technical platform in the sense of

1 having sensors in the car feeling the environment but also feeling
2 what the driver is doing and what the driver is not doing in
3 different situations. That gives us enablers to actually address
4 these issues.

5 And as I said in my presentation, we started with some
6 of the obvious ones, maybe not specifically addressing older
7 drivers, but our hypothesis is that if we do something for all
8 drivers it will benefit the older drivers and, more specifically,
9 the research that we do related to understanding the older driver
10 and the older driver behavior, the hypothesis there is if we
11 understand the factors that are important for this group, growing
12 group of drivers and we do something to address those factors, it
13 will not only benefit the older drivers but also the younger ones.

14 DR. COUGHLIN: I think one of the adages that is true in
15 the industry and is always worth repeating is that you cannot
16 build an old man's car because if you do, a young man will not buy
17 it but neither will an old man. So with respect to Mr. Broberg's
18 comments about making ageless technologies, that is absolutely the
19 case, but let's talk about the technologies that we're seeing
20 change that gentleman's car, the Model T. The Model T today is
21 not only, as Mr. Broberg said, is going to sense how you're
22 driving and know what's going on outside the vehicle, but it's now
23 going to communicate to you in a variety of ways. It will vibrate
24 you from the underside. Your wheel will start to shake. You will
25 hear warnings. Essentially, as we age our channels get a little

1 blurred whether it's the diminished hearing, vision and the like,
2 now the car's going to be feeling and talking very loudly in
3 multiple ways.

4 I would suggest that the 25-year-old driver has not been
5 trained how to do data fusion in that sense the way a checked out
6 pilot has been, but most certainly someone who has been driving
7 for 40 or 50 years, which makes them in many cases a better
8 driver, that developed judgment is now going to be challenged to
9 learn anew and that's probably the greatest change. So as the car
10 cockpit changes dramatically, the driver has remained the same and
11 that's where the disconnect, both in terms of policy and personal
12 use, is arising.

13 MR. COLLINS: I have a question for the entire panel.
14 As an actual investigator, I'd like to know that if we go out to
15 an accident and we think driver age or driver performance may play
16 a role, what features of the vehicle or highway should we be
17 looking at both to help you in your understanding of the problems
18 and to help us in our determination of probable cause.

19 MR. SCHAFFER: Let's talk about the roadway, first of
20 all, that to the investigators, including the police, are actually
21 going to be looking at. And they're going to be looking at yes,
22 the age of the driver; they're going to be looking at the cause of
23 the actual collision or crash. So therefore, they're going to be
24 looking at some particular factors that led to this particular
25 collision or crash and, as such, that's where true treatments that

1 we are recommending, everything from stenciling along the roadway
2 -- intersections especially are an area that -- there's so much
3 conflict area in it that older drivers need a lot of conspicuity
4 -- excuse me. They really need to really see things much better
5 than normal. And so therefore, that's why stenciling really
6 matters and that's why slowing them down really matters and for
7 walking. Those things really do matter and so if they're there,
8 those would truly help. But actually in investigation of those
9 accidents or collisions and crashes, that's what we would be
10 looking at, as any ways to improve that particular roadway or that
11 particular intersection.

12 DR. COUGHLIN: I would look at two things. The first
13 thing is, is that I would hope that investigations both on the
14 local level and certainly on the national level would not be in
15 search of DWO, Driving While Old; that, in fact, what we want to
16 look at is what was the condition of that driver, what was their
17 chronic disease condition, were they taking medications, are there
18 issues that were not age-specific that impacted their performance,
19 much the way it would be if you looked at a commercial carrier,
20 aviation, or anything else.

21 Secondly, I think we need a new level of discovery
22 brought to the car that we already have in other modes, which is
23 looking at both the failsafe of the technology and whether the
24 technology actually worked or was being used appropriately. So
25 both in terms of looking at disease and as well as looking at how

1 the technology is being used would be two things I would focus on.

2 MR. BROBERG: I agree there and I also -- coming back to
3 the second panel today, talking about the condition of the driver.
4 I mean, from our perspective, working both with protective measure
5 or counter-measurement as well as preventative counter-
6 measurements, the condition of the driver in the sense of the
7 aspects that were brought up by the second panel but also brought
8 up here by Dr. Coughlin.

9 And what I would also urge is to have a standard sort of
10 methodology applied and -- when it comes to in-depth
11 investigations related to the actual causation of the collision.
12 Because looking at in-depth investigations, as we do, we usually
13 know -- well, when we follow a trail there's usually a number of
14 possible causations of that collision, and in order to be able to
15 analyze it, you need to have a good structure. And we've been
16 working for quite some years to develop methodologies in order to
17 address this and we are cooperating with Chalmers University and
18 other stakeholders within an organization called SAFER in
19 Gothenburg, where we have an in-depth investigation team that
20 looks into this and that has now collected, I think, more than 600
21 or 700 accidents and analyzed, in-depth analyses with interviews
22 with all parties involved and made and applied a very structured
23 methodology in order to see the different possibilities of
24 causation and which ones are the most common ones. So that's the
25 aspect from our perspective.

1 DR. EBY: I would just like to reiterate some of the
2 points. First of all, I agree, we should not be looking at this
3 in terms of whether it's an aging driver crash but more in terms
4 of whether or not this is a crash that potentially resulted from
5 declining abilities that resulted from an age-related medical
6 condition or medications taken to treat that condition. And some
7 things that you might be able to look at besides what's already
8 been said is looking at potentially cues to certain self-
9 regulatory practices.

10 For example, one practice that we've seen, people have
11 told us about, is people that have glare recovery problems
12 sometimes wear sunglasses at night. If it's a nighttime crash,
13 their sunglasses -- these are things that might point toward a
14 functional decline in the absence of having actual medical
15 information or driving evaluation information. So that's just
16 sort of an extreme example of the kinds of self-regulatory
17 behavior that you might be able to look at.

18 MR. COLLINS: Thank you. Mr. Schaffer, can you talk
19 briefly about what elements in the design guide have been most
20 effective in reducing accidents or collisions?

21 MR. SCHAFFER: Thank you for that question. Yes. What
22 has led to a number of treatments, not just guidelines that these
23 are, but treatments in the Manual on Uniform Traffic Control
24 Devices, we feel have led to safety improvements and, hopefully,
25 less crashes and collisions at those particular locations both

1 among drivers and pedestrians.

2 And first, I'd like to speak of intersections where the
3 majority of those collisions and crashes occur, and that is where,
4 in particular, stenciling that particular environment, everything
5 from stop lines to making sure that you have good retro-
6 reflective, not only signals, but also signals in place. And what
7 I mean in place, right over the actual lane that they're going to
8 be using.

9 As we age, it has definitely become a problem to people,
10 especially when you have at least one turn lane, if not more, for
11 them to understand where that lane is and then to be able to
12 stencil that lane really does matter, and so a mixture of putting
13 those right over the lane as well as stenciling does matter.

14 Another thing that can help the pedestrian and has
15 worked quite well is reducing the right turn radii. What that
16 does is it reduces the speed in which you can take that particular
17 right turn, and as well as there's other guidance in the document
18 that reduces that speed and at the same time helps the older
19 pedestrian because there's a lot less speed there and there's a
20 lot less -- and generally can help save on the crossing distance.
21 But if they don't on crossing distance, they can also look at a
22 pedestrian island, for example, where they can use that to
23 actually as a refuge island to where they can truly use that for
24 safety purposes.

25 So there's a number of countermeasures that have been

1 recommended that truly have led to, one, a standard that's
2 occurring, and a standard that is not only being done for the
3 older driver, that is being done just across the country. That's
4 why they're in the manual itself now and are being done all over
5 the country in all different locations regardless of the age of
6 the population. And so we really feel that that's been truly a
7 success as well as a success in making it safer for the aging
8 driver and pedestrian.

9 MR. COLLINS: What elements, again to Mr. Schaffer, what
10 elements of the 2001 design guide didn't show the anticipated
11 improvement either for older drivers or for drivers in general?

12 MR. SCHAFFER: Didn't show. Well, I think that when you
13 don't have changes in that manual that, in 2000, for example, that
14 weren't there -- the recommendations we made in 2001, for example,
15 because of the way the -- it's a guidance document. They take
16 years, in other words, to actually get into, one, to train, to go
17 along and train the trainers, if you will, around the country; and
18 secondly, to actually get into the MUTCD.

19 That takes years. It's not something that's done and so
20 it takes years, one, to train and get those roadway -- the
21 intersections as well as the -- all segments of the roadway
22 improved in those particular areas, as well as then to get them
23 applied. So when they get around, finally, to where they are
24 being used commonly, takes many, many years. So that is just a
25 process.

1 And secondly, I wanted to point out that it's a balance.
2 It is not something that you can just say, oh, we're going to do
3 this for the driver because we want to think about the flow of
4 traffic, but you also have to look at the balance between the
5 modes. And I think that's something that we have been very
6 successful in doing. But at the same time, things do take time,
7 if you will, and that is something that's just, I think, the
8 nature of it, but -- the nature of everything, and that over time,
9 we have seen a reduction in those collisions and an improvement in
10 the roadway for seniors.

11 MR. COLLINS: For the 2011 design guide, what are some
12 of the new elements that you're including to manage or reduce
13 risks for drivers? If you can give us a little sneak preview, I
14 guess.

15 MR. SCHAFFER: I can give you a slight sneak preview and
16 basically, to start off, we are using the 2009 manual. Now, yes,
17 we made recommendations, the countdown signals and the like, we've
18 done that. But we've also made -- so those are there, but we now
19 can use that manual directly and say these are right there and use
20 them. And but the other thing is we're looking at how best
21 practices are being done around the country that -- and really
22 looking at what particular treatments -- I'll call them treatments
23 or counter-measures are really the most effective.

24 And that's what we're looking at producing is a document
25 where really, they can see, the transportation specialists, the

1 engineer, can truly see what's really most effective and how they
2 can balance. Because this is a guidance document, it's somewhat
3 flexible, and it does give them an understanding that, you know,
4 you can do these things for the driver and not really harm the
5 pedestrian in the process. So we really feel that's why this
6 document is going to be, one, much more multi-modal and much more
7 comprehensive than any of the documents, any of the handbooks,
8 excuse me, that we've had before.

9 So that, I think, is going to be a great change and
10 secondly, we will be able to show while, you know, these best or
11 innovative practices that are being done at places across the
12 country that are using treatments that have been very successful.
13 And so this is why I think this document is now gone into the --
14 even beyond where we were before, to be much more multi-modal and
15 much more comprehensive in addressing the aging road user.

16 MR. COLLINS: Thank you.

17 CHAIRMAN HERSMAN: National Institute on Aging and if I
18 could just remind everyone, for the cameras, to introduce yourself
19 with your name and your organization.

20 MR. KING: Thanks. This is Jonathan King from the
21 National Institute on Aging asking the questions from our table.
22 The first was asked by John Maddox from NHTSA and it's: What
23 vehicle design requirements should regulators consider to minimize
24 distraction for older drivers?

25 MR. SCHAFFER: I can start off with -- you might want to

1 talk to them, but I want to address, really, what you're looking
2 at on the roadway, itself, if you don't mind, simply because
3 that's where a lot of -- if you will, you get around to a lot of
4 conflict area. I'll point out intersections. And I'm sure you've
5 seen certain intersections are just loaded with signs --

6 MR. KING: Yeah.

7 MR. SCHAFFER: -- just loaded. It's Sign City and
8 you're wondering, my God, where do I go? Well, that's an issue,
9 to be very honest, and how that's addressed is very important and
10 that's why we address that. And also the fact that as we age, one
11 of the nicest things about a sign can be, is basically can you see
12 it? Can you see it day and can you see it at night, no matter --
13 and that's where its retro-reflectivity, which was definitely
14 recommended in the 2001 edition and is continuing on, is surely
15 important and back plates, et cetera. Those are the types of
16 things in signage we really are pointing out so everybody can see
17 the signs and --

18 DR. BRUCE: Mr. Schaffer, could I hear the question
19 again? Wasn't it --

20 MR. KING: It was on vehicle design, but this is okay,
21 too.

22 MR. SCHAFFER: Okay, I'm speaking out of -- but I just
23 wanted to point out on the roadway --

24 MR. KING: No, I think that's important too, yeah.
25 Because that's clearly a part of the distraction is obviously the

1 signage and the fact that, oh, wait, was that where I was supposed
2 to turn and then you're not looking.

3 Does anyone have an answer to the vehicle design
4 requirements question?

5 MR. BROBERG: Yeah, I should probably answer that,
6 working with vehicle design. Driver distraction, of course, is a
7 hot topic and it's also a very, very complex topic. We have
8 started to address it with advanced collision warning
9 technologies. We've also addressed, as I said in my presentation,
10 the aspect of driver workload so the car actually senses how busy
11 the driver is and withholds unnecessary information that could
12 cause distraction. For instance, when you're in the middle of a
13 left-hand turn in a city environment, you don't need to know that
14 you're running out of washer fluid. That's --

15 MR. KING: Right.

16 MR. BROBERG: -- sort of information you don't need so
17 we don't have to give that. So the car is actually recognizing
18 this itself.

19 I would actually like to come back to this from what I
20 said before, this being a complex issue, because there is actually
21 a balance between how you keep the driver attentive and engaged
22 while driving. You don't want to reduce the workload too much
23 because then you may actually end up in a state where you're
24 becoming drowsy or tired or unconcentrated or you put your
25 attention to something else.

1 So we would like to change and maybe not from
2 distraction but talk more about inadequate attention allocation is
3 a better word for it. So I think we need to really understand
4 that balance, and I know for sure at MIT you've been looking into
5 some of these aspects. But there is actually a balance of what
6 we're doing. Distraction being a major cause, yes, we have to
7 address it and we are addressing it in the terms of both having
8 the car brake itself if you're about to collide into another
9 vehicle, even another -- well, a vulnerable road user like a
10 pedestrian, today we have that technology. And that, of course,
11 helps drivers, not only the older ones but drivers in complex
12 situations where you have a lot of different road users or if
13 you're in a heavy traffic environment.

14 But really, we can do only so much with a car to help
15 drivers, but we also have to look at what the drivers are doing
16 that are not related to the car, and it can be anything around the
17 car and it can be anything that the drivers bring into the car.
18 So what we can try to do is, again, try to assist the driver in
19 the situations to keep a balance of their attention and try to
20 keep their attention looking forward and their hands on the
21 wheels.

22 DR. COUGHLIN: If I may just -- if I may, I would
23 suggest that right now we do not have enough data to know whether
24 it's age or disease, so from my researcher's point of view, I
25 would say we need to get better data out there to see how driver

1 distraction changes and workload changes across the lifespan. We
2 have some preliminary data in my shop that seems to indicate, and
3 my colleagues have developed, that disease such as diabetes,
4 particularly in the motor carrier industry and places like that,
5 may have a very big impact on how much you're able to manage
6 behind the wheel.

7 That said, the other part of consumer electronics that
8 has now entered the car -- we seem to think that this technology
9 is something that the car industry is developing; they're, rather,
10 migrating it from avionics and the consumer electronics industry.
11 What we should be looking at is not an age-specific fix, but
12 personalization. Do you want that system on? Do you want that
13 display that large or that small? So rather than trying to say
14 one fits all, what we should be looking at is what the baby
15 boomers are very good about, it's all about me, so make it
16 personalized.

17 DR. EBY: I just wanted to reiterate a few points. We
18 were talking about workload management systems and there is work
19 going on, on the systems right now, the SAVE-IT project just
20 completed a couple of years ago, that was designed to basically
21 come up with a system that can detect what's going on out in the
22 environment where the traffic is, what the potential workload
23 produced by the environment might be and then predict what the
24 workload is for that driver.

25 Now, I will say that those studies are all very much in

1 their infancy and we don't know, as was just mentioned, we don't
2 know how workload changes with age and with some of these medical
3 conditions. So the system needs to be eventually smart enough to
4 be able to adjust itself to that driver and a lot more research
5 needs to be done in that area. But I think this is how we're
6 going to manage distraction in cars with all these new
7 technologies coming in.

8 MR. KING: Thank you. And actually, some of your
9 answers actually addressed substantially the first part of the
10 second question, but the second part may still be open. As
11 vehicles get smarter and safer, do we see potential for drivers to
12 be less attentive to the driving task? And I think that was
13 already addressed. Also, essentially to forget how to be alert,
14 much as we have now forgotten many other things like how to use
15 actual maps. And then similarly, what sorts of behavioral
16 adaptation effects are we expecting to see with these smarter
17 cars? And this was from Beth Alicandri from FHWA.

18 MR. BROBERG: I would say there's still much more we
19 need to learn from this. The approach that we're taking so far is
20 that we try to promote good behavior from drivers. So for
21 instance, if we implement a technology, say, for instance -- well,
22 lane departure warning, we promote that you use your blinker. And
23 there are some studies -- I think UMTRI has done some studies
24 looking at that and see that it actually helped drivers use their
25 blinker even more because then they didn't get a warning every

1 time they left their lane to change their lane.

2 We're also addressing if you take the auto brake
3 technology, as such, we do not want to encourage behavior where
4 you know that the car will brake for me so I don't have to pay
5 attention, so we intentionally make the brake intervention very
6 harsh and very, very late, so we put it outside your comfort zone.
7 So if you're an attentive driver, you will actually think you are
8 about to crash. And we've studied that, of course, using driving
9 simulators, to understand that we promote that behavior in the
10 sense that, yeah, the driver will brake. If he knows that he's
11 about to impact something, the driver will actually brake before
12 the system does. So we're approaching it from that perspective.
13 But it's really from the adaptive behavior there's really much,
14 much more research required.

15 And we just launched a study in Sweden where we have 100
16 Volvo cars with all the latest technologies and they will be
17 driven for a long period of time and actually, during the first
18 four months, the drivers were not able to use any of these
19 technologies; we turned them off. And then after four months, we
20 turned them on. And we're just in the midst of analyzing that
21 data so we can actually see this, for the same drivers, if there
22 is a change in behavior with and without these new technologies.
23 But there is definitely more that needs to be done here.

24 MR. KING: That's wonderful. We get, at NIA, a lot of
25 grant applications, needless to say, on older drivers and driving

1 and from this session and the session tomorrow morning, I
2 anticipate many, many more. So I would have lots of questions,
3 but I think I'll defer them all, except for one, which started
4 coming in to us a few weeks ago due to a story in the New York
5 Times about the self-driving car that Google's putting together
6 and people started asking us how far away is this really going to
7 happen and what should we do about it.

8 And I think, from what I've heard from the panel, the
9 idea is that's not necessarily what we want because that's really
10 truly insulating the driver from the driving experience and could
11 be well what we don't want to have happen. Nevertheless, is this
12 something we could see in the near future and, if so, what should
13 we be doing to prepare for it?

14 MR. BROBERG: Well, we're actually looking into the same
15 aspects and we are involved in a research project in Europe called
16 SARTRE, which is actually looking into self-driving cars more from
17 a platooning perspective to where the driver can actually connect
18 to a road train so that you can do your ordinary business,
19 typically on your way to work. You're in a line of cars and
20 you're just driving and that's actually just consuming time.

21 So the idea here, being that we can help you both drive
22 more safely if you connect to a road train and plus you have the
23 convenience of being able to do your e-mails or do your SMSs and
24 your daily work on your commute to work. And also, since the
25 technology is quite advanced, we're able to make the traffic flow

1 more dense so we can add more cars on the road, so to speak, so
2 you have a better flow. And also, you have the environmental
3 aspects of fuel consumption.

4 So the idea here is that you connect to a road train
5 where you have a commercial driver, a train driver, up front and
6 then as you go, come to your exit, you actually disengage from the
7 train. The aspects with these technologies is that it's a choice
8 of the driver. The driver is making the choice that the car will
9 drive automatically for you.

10 I think in the pure basis of the automobile is the
11 freedom to be able to drive wherever you want, whenever you want.
12 So that's going to be hard to take away. But there are some
13 situations where actually autonomous driving can be both
14 convenient for you. It's something that a lot of drivers may
15 choose, but it's still the choice of the driver and the driver is
16 always in control.

17 DR. COUGHLIN: One comment and one warning. The comment
18 is, is that what you buy in your showroom today is at least 10
19 years old and so in terms of the speed of having an autonomous
20 vehicle here, I'm not quite sure when that'll be, but the premise
21 of my initial presentation was that's where researchers, the
22 industry, and many who are concerned about human error behind the
23 wheel would like us to go.

24 The warning is the following: the road to autonomy is
25 going to be wrought with many errors and many accidents. How do

1 we govern an infrastructure that has a mixture of robotic drivers
2 and individual drivers? How do we learn how to use these
3 technologies as they enter the vehicle? So really what we're
4 looking at right now, we're literally looking at older drivers as
5 becoming the lifestyle leaders of this new autonomy technologies
6 over the next 10 to 20 years. So the baby boomers, we are the
7 guinea pigs of the future.

8 MR. KING: Our question time is up. Next table.

9 CHAIRMAN HERSMAN: Thank you. AARP for the second
10 table.

11 MS. LYNOTT: Jana Lynott with AARP and also contributing
12 questions from our table is the American Occupational Therapy
13 Association and the American Optometric Association.

14 And my first question comes back to road design and I
15 think -- but really, from the perspective of all panelists,
16 because I think your expertise has something to contribute, each
17 of you.

18 In the last panel session we learned that fragility is a
19 bigger issue than frailty and so we should really be trying to
20 reduce the number of severe crashes, severe and fatal crashes, as
21 much as possible. And there's considerable research that shows
22 how excessive vehicle speed for a given environment, be it an
23 urban thoroughfare or a two-lane rural highway, leads to increased
24 crashes and severity of crashes.

25 Now, several European countries, Sweden being one of

1 these, have dramatically reduced their urban road fatality rates,
2 in particular, in large part because of reduced overall road
3 design speeds. And so my question for the panel is have you
4 considered whether traffic calming measures such as narrower
5 travel lanes, roundabouts, tighter turn radii, might actually
6 benefit older drivers in urban areas, in particular, one, because
7 it may reduce the severity of crashes; two, because it should
8 essentially provide increased reaction time by providing a slower
9 speed environment? So I throw that out there.

10 MR. SCHAFFER: Jana, good question. And basically, we
11 understand that lower speeds are to the benefit, especially within
12 an urban environment and urban intersections, towards all users,
13 especially the aged.

14 Now, having said that, this particular document, as
15 you're well aware, looks at particular treatments of which speed
16 is really just one of the particular elements which specifically
17 is looked in the manual as far as what warrants -- you know, will
18 bring down that speed. And that gets around to, yes, road diets,
19 complete streets, those particular mannerisms or treatments are
20 for the whole roadway, not just one particular road intersection
21 or roadway segment but, you know, entirely -- in other words, to
22 look at that entire speed there.

23 Now, having said that, really that's why we're looking,
24 in this particular document, of where our particular treatments in
25 part or as a whole have been used to make such an environment, you

1 know, whether it's a senior zone or any particular environment,
2 have been used, you know, around the country to make things
3 better, or treatments, if you will, that are not in -- you know,
4 we haven't seen -- there's no hard research; they're innovative,
5 they're totally innovative. So we're looking at that and truly to
6 see, because what we have already noticed is, for example, whether
7 you're going to Tampa, Florida, or you're going to New York City
8 or Houston or, you know, places in Arizona, to where they truly
9 have slowed things down and used a number of our treatments
10 already to make it easier to drive around as well as to walk.

11 So it's a number of treatments, if you will, used but
12 not in -- you know, if you will, part in, you could call that in a
13 road diet, but more just in the effect of making it safer.

14 DR. COUGHLIN: Certainly, for any age group, the enemy
15 of the driver is clutter and complexity, so if the roads can be
16 made in such a way where they're calm but still make sense, but
17 also balance the demands that are going on that road. There are
18 many experiments that have been out there to try to traffic calm
19 and, in fact, what has often happened is to increase the stress of
20 the drivers in that area, trying to maintain the trucks, the
21 bikes, the pedestrians, and the cars all in one place. So done
22 well with balance to mitigate clutter and complexity will help the
23 older driver who has true difficulty managing that and the younger
24 driver who's trying to have a cheeseburger on the cell phone and
25 drive at the same time.

1 MR. BROBERG: Yeah, you were referring to Sweden and the
2 Swedish Road Administration and their work with their vision. And
3 again, yeah, we have a number, increased number of roundabouts in
4 Sweden and there's actually a study showing that, yeah, that
5 decreased the severity of the collision but it also increased the
6 number of collisions. You had more rear end collisions. And
7 consequently, we have developed a brake technology that addresses
8 this in low speed, city safety.

9 But more importantly, when we're working with our
10 vision, we realize that if we're going to strive for a crash-free
11 future, we have to cooperate. We can't do it with the car alone.
12 The infrastructure is a very important part of it and also, of
13 course, understanding the human being and the driver. So we
14 actually started out in Sweden and we actually have an agreement
15 with the Swedish Road Administration, not only to conduct research
16 together in order to understand and get the know-how, but we also
17 split responsibilities.

18 So we have clearly declared what we think that we are
19 able to do with the car and what we think that they are required
20 to do with infrastructure, and that has been very positive on
21 their part because then we can focus our resources and actually
22 get more gain and address more issues together. It's no use that
23 we're working on the same issue with different kinds of measures
24 when we can actually split responsibilities. So they can focus
25 their financing plan for the future, as well as we can make sure

1 that we have -- meet our ambition and our vision.

2 DR. EBY: I'll just comment on roundabouts. I know, in
3 many jurisdictions, at least in the U.S., roundabouts now are
4 becoming rather common. Five years ago, you never saw them. And
5 I think a mistake that many jurisdictions have made is they have
6 not had enough outreach to the people in the community on why
7 roundabouts are going in, why they're safer, and how to negotiate
8 them. These are new kinds of intersections and people don't know
9 how to negotiate them and even if there are signs, people are
10 still confused.

11 In the jurisdictions where they've had a significant
12 outreach, training, you know, going out to the various groups,
13 explaining why they're being put in, they're much more accepted.
14 And I think that's something that needs to happen much more often.

15 MS. LYNOTT: Thank you. Our second question is what are
16 the most important design elements to enhance or improve the
17 driver's vision and where can improvement be made in technology
18 such as night vision, driver behavior, when to wear or not wear
19 sunglasses, and other factors like medical care and vision
20 assessment?

21 DR. EBY: Well, I think the very first step is an
22 assessment of vision. Many visual problems can be corrected or at
23 least can be mitigated to some degree. Cataracts, for example,
24 almost always can be treated properly. Glasses and prismatic
25 lenses can help improve vision problems. So I think that's the

1 first place you go is actually try and improve the vision.

2 Given that, it's hard to do much in the vehicle in terms
3 of vision. You can try and correct night vision problems with
4 infrared systems, but that doesn't help you with all the other
5 problems with driving at night. I think self-regulation is an
6 excellent way to moderate vision problems in driving. If people
7 truly are feeling uncomfortable driving at night or driving in
8 certain situations, they should be evaluated and potentially
9 restrict their driving from those places.

10 MR. BROBERG: We do take that quite a lot into
11 consideration not only for the older drivers, of course, but for
12 all drivers, the ability to see others and see the traffic
13 environment. We have technologies to help drivers identify
14 vehicles in the blind spot. For instance, we're working with how
15 to design the base geometry of the vehicle in the sense of giving
16 the driver the possibilities to see and monitor what is around
17 you.

18 We're also taking into consideration where we present
19 the information for the driver about the car and the speed, et
20 cetera. So all those elements, geometrical elements, are taken
21 into consideration. When it comes to some of these more advanced
22 technologies like night vision, for instance, that has to be,
23 again, presented in such a way that it's not actually a
24 distraction for the driver and I think we're starting to see more
25 and more mature technologies. Also, when it comes to driving at

1 night, the more advanced adaptive light type of technologies may
2 also be a help to feel more comfortable when you're driving at
3 night.

4 DR. COUGHLIN: I like the question because, frankly,
5 it's a nice segue to a larger discussion which should be around
6 driver well-being and the idea of what can we do physically,
7 nutrition-wise, what are the things we need to maintain in
8 ourselves to become a safe driver for a lifetime. So good eye
9 health is certainly the -- perhaps the first and perhaps obvious
10 but often ignored part of it.

11 The second part would be, of course, the new
12 technologies whether it's night vision, mirrors and the like, but
13 the third -- and I'm going to kind of crib from my colleague
14 Bryan Reimer at the lab -- you know, the eyes are a very good
15 indicator of where we allocate our attention. So one of the
16 things we should be looking at not just in terms of eye health,
17 but when we choose a car or when we design a car, how can we
18 information dim-out those things that require our attention? Are
19 there certain things that we simply just don't need?

20 We've done a number of experiments that we find,
21 ironically, there are some gender issues. Women, first and
22 foremost, overwhelmingly in our studies, wanted the clock right
23 dead-center. Why? Because they make more trips than men and
24 they're doing the daily tasks of the household in most cases. Men
25 want some other clutter in there. So we talk about eyes, it's not

1 just about health, it's not just about the technology, but it's
2 also an opportunity to rethink how we design and dim out and focus
3 in those things that are important.

4 MR. SCHAFFER: May I touch the last thing and thank you
5 all for on the vehicle. This comes around to technology on the
6 roadway and the roadway technology is very important, one, for the
7 aging driver to have a truly conspicuous environment and so that
8 conspicuity is just wonderful because you can see, you can see day
9 and you can see night.

10 And because nighttime glare and the like is very
11 difficult for aging drivers and for all drivers. When you can
12 know exactly where the roadway is in any particular environment,
13 you know where the signs are, you can, you know, you can tell
14 that, you can actually -- you know, the roadway signs, you can
15 see, all that matters. And so that makes a much more conspicuous
16 environment with your vision, to be able to see. So what we
17 really are promoting and have been for years with the handbook is
18 that environment.

19 MS. LYNOTT: Okay. And then I think, in the interest of
20 time, our final question, the federal highway design handbook is a
21 set of design treatment recommendations, and in light of
22 constricting state and local budgets to implement, you know, many
23 important things in the road environment, are there any one or two
24 particular recommendations and treatments in that handbook that
25 you feel should be regulatory in nature as opposed to merely a

1 recommendation? Is there anything that we really should be
2 pushing to have implemented?

3 MR. SCHAFFER: Everybody's looking at me. Okay. We
4 make recommendations. What it really comes down to, what comes
5 through, we recommend and that's where this is a guidance
6 document. And it is up to the national committee and others to
7 really determine whether or not this particular treatment needs to
8 be a standard. We don't do that. We just make really good, sound
9 recommendations and it is others, such as the national committee,
10 that will make those decisions. AASHTO, when it comes around to
11 the Green Book, et cetera, they're going to be looking at those
12 and that's why you'll see much different things in this coming
13 Green Book that's going to be coming out in the next year, as well
14 as in the AASHTO bike guide, as well as the pedestrian guide.
15 Those are a lot better treatments and a lot better
16 recommendations.

17 But we stay with -- again, this is a guidance document
18 and we're not elevating one or the other above and saying this is
19 our top recommendation. We don't go there. We just don't do
20 this. We leave that up to each particular engineer and to -- you
21 know, in our training as well as when it comes around to really
22 looking over time which, you know, to the national committee and
23 others, to determine which one of those truly should be a
24 standard.

25 MS. LYNOTT: Thank you.

1 CHAIRMAN HERSMAN: AAA will be asking the questions for
2 the next table.

3 MR. GRABOWSKI: Hi, good afternoon. I'm Jurek Grabowski
4 with the AAA Foundation for Traffic Safety and my table's
5 represented by the Alliance for Automobile Manufacturers, the
6 Insurance Institute for Highway Safety, and AAA. And we have
7 about five questions, so let's start.

8 One way older drivers compensate for their related
9 limitations is to select easier or safer roads to navigate. Also,
10 problem intersections are typically able to be identified by
11 mapping systems. Does the panel think that there would be value
12 in navigation systems that can provide a safer route setting in
13 addition to the current fastest route setting?

14 DR. EBY: I do think that that's the case and, in fact,
15 our University Transportation Center, M-CASTL, is working on a
16 project right now with Paul Green to develop something like that,
17 the idea being that the routing would be more appropriate for the
18 kinds of self-regulation that an older person might do based on
19 some sort of medical condition. So it's in its formative stages
20 but I think it's a great idea.

21 DR. COUGHLIN: One of the other projects we're working
22 on also with the University Transportation Center funds from DOT
23 is not looking at medical-related issues or whether it's older,
24 but how much does that particular route cause stress. So when you
25 go to your nav system that has fastest route, easiest route,

1 whatever it might be, we're actually mapping out how different
2 roads present different levels of stress and you can actually
3 color-code it on the road based upon the driving of our Aware Car.
4 So you could also say I want the fastest but least stressful
5 route.

6 CHAIRMAN HERSMAN: I think that might be called the
7 train.

8 (Laughter.)

9 DR. COUGHLIN: Yeah, is it on time?

10 CHAIRMAN HERSMAN: Yeah. I'm sorry to interrupt AAA.
11 Please continue. I was just thinking about my commute as you were
12 suggesting that and there really isn't a stress-free route for me
13 to get to work. Thanks.

14 MR. SCHAFFER: I just wanted to point out briefly, with
15 Federal Highway, and I'm not just pointing to the handbook here,
16 but the number of particular guidance documents and counter-
17 measures we promote and that is to give the engineer, to give the
18 transportation specialist and the planners tools in which to
19 evaluate how they can correct, you know, and guide their
20 populations to use particular roadways and to improve those
21 roadways over time. So it's really tools which we feel easily can
22 be done and that's why we promote those and market those at the
23 local and state level so our stakeholders can use those.

24 MR. GRABOWSKI: Okay. So our second question, there is
25 some concern that with the integration of multiple crash avoidance

1 systems in a vehicle, some drivers, especially older ones, may not
2 be able to identify the actual crash threat that they're being
3 warned of or know how to react to that threat. Is this a
4 legitimate concern and how can this be addressed?

5 MR. BROBERG: Yeah, I think I should answer that. Yes,
6 I mean, it's a legitimate concern, of course, and we are already
7 addressing it. If we take, for instance, the number of different
8 warnings that you can have in a car, there is actually a priority.
9 So for instance, if you have a car that both has lane departure
10 warning and forward collision warning, you will have priority with
11 the forward collision warning, so you will not get simultaneous
12 warnings. Also, how the warning is executed is different and, of
13 course, if you're in a situation where you're about to collide
14 with a vehicle in front of you or a pedestrian, we want you to
15 brake, so we want to promote that kind of behavior.

16 First of all, we're assuming that you're distracted
17 because you're about to drive into something, so we want to grab
18 your attention with an audible signal. And then the next sign for
19 your cue for you is that you have a red light appearing in front
20 of you in the wind screen and that red light resembles the brake
21 light of another car and your natural reaction, when you see a
22 brake light in front of you is to apply the brakes. So that's
23 sort of how we logically, intuitively, try to address these issues
24 and also make sure that we have priority with the warnings.

25 And also, these priorities are coupled with the

1 intelligent driver information system in the sense that you will
2 not get other information that is disturbing for you in such
3 situations. So we have a thought process around that and we
4 evaluate it, when it comes to the critical situations, we use
5 driving simulators to evaluate different sorts of drivers, old as
6 well as young.

7 DR. COUGHLIN: I think one of things we should be
8 thinking about is that the future of the car is more a learning
9 vehicle where there's going to be an algorithm to detect that Joe
10 drives a certain way, his wife drives a certain other way, and the
11 vehicle will throw these warnings out based upon how far you
12 deviate from that and so that should, hopefully, clean up some of
13 the confusion that an older driver or any driver might feel.

14 MR. GRABOWSKI: Okay, our third question. In relation
15 to older drivers, what new types of data will be collected on the
16 driver's behavior in relation to the new technology and will that
17 be available to crash investigators and researchers and so forth?

18 MR. BROBERG: Well, we are currently heading a research
19 project where we're looking into these different aspects and as a
20 test bench we're using real cars in real traffic environments
21 where we monitor drivers over -- either in directed experiments,
22 directly. We use advanced eye-tracking equipment. We have longer
23 studies where we have drivers driving for a longer period of time
24 where we're trying to collect data, and this is a research project
25 where we have academia involved. All of that, of course, will be

1 published when the data has been analyzed and so forth.

2 And the approach so far has been to -- through in-depth
3 investigations that were made, looking into accident causation,
4 trying to address issues factor by factor and trying to understand
5 how important they are, why they're important, which are the most
6 important ones and, of course, with the ambition to understand how
7 we should address it. So that work is actually -- the work that
8 I'm heading is a five-year project and we're on our second year
9 now.

10 We're just about to launch a publication on -- where
11 we've studied how drivers, older drivers in relation to middle-age
12 drivers, how they observe and how they make observations when
13 driving into intersections. Intersections are one of the
14 situations where we find that older drivers are more involved in
15 collisions, relatively. So we're doing a lot of that and most of
16 that will be publicly available.

17 DR. COUGHLIN: I would strongly -- and perhaps I'm
18 misreading your question, but I would strongly urge the
19 stakeholders here before the public forum to take that as a policy
20 question, not as a technology question. Your car already knows a
21 lot about you. We don't have a black box, but we've got a baby
22 black box on board. So the policy questions now are how do we use
23 those data, how can we access that with respect to privacy and
24 then how will they be used in a court of law as well as insurance
25 proceedings? The question is not whether the data are out there;

1 the question is not whether or not insurance and other
2 investigators can use it; the question is can the policy process
3 catch up to where the technology is already today?

4 MR. GRABOWSKI: Okay, this is a question for Dick
5 Schaffer. What's the rate of implementation for the design
6 handbook guidelines across the United States? And are there any
7 barriers to implementation? If so, what are they and what
8 strategies are there for overcoming these barriers?

9 MR. SCHAFFER: We present, as I stated, out to our
10 stakeholders at the state and local level; we train them. This is
11 done by our resource center to really explain what, why they need
12 to, you know, to learn this and what it can do for them, you know.
13 So in other words, what the handbook is recommending and what it
14 truly can do for them. So this is being done around the country,
15 everything from roundabouts to intersection design to retro-
16 reflectivity, numbers of things that are recommended in here that
17 deal with intersections, the roadway segments and the like. It
18 varies by the state, honestly, of -- you know, particular measures
19 that are -- you know, taking those measures and actually
20 implementing, improving an intersection, building a new roadway
21 with these in mind.

22 So I can't give you, just to say, oh, one state does it
23 this way, this quickly, and one state does it this way, no. But
24 what I can say is that, yes, there is such a time. It's much
25 quicker, for the most part, when you go out and give this training

1 and, you know, to your states because they see it firsthand and
2 they get to understand it firsthand versus the time it takes for
3 it truly to get into the MUTCD is a lot longer and there, yes,
4 it's a standard, boom, you've -- you know, it's -- there's no ifs,
5 ands, or buts -- it's going to be used.

6 But when you've taken it in different places around the
7 country, most -- you know, it's going to be used there because
8 they get to a better understanding, where when it gets around to
9 the manual, that takes a good time for it to ever get to the
10 national committee to really say, okay, now we're going to be
11 looking into this, does this really fit, et cetera, et cetera, to
12 really where it's going to be getting into the next version of the
13 MUTCD.

14 So I think, process-wise, that's why we market it,
15 that's why we take it out and do these trainings with the resource
16 center out to the local level because we feel that we're going to
17 get much better response, that those recommendations are going to
18 be made quicker and those implementations made quicker.

19 MR. GRABOWSKI: And I think we're done.

20 CHAIRMAN HERSMAN: And the last table, AAMVA.

21 MR. MANUEL: My name is Tom Manuel and I'm from AAMVA,
22 and I have two questions. And the first one is -- and you kind of
23 touched upon this. Will the technologies have the capabilities to
24 calibrate or adjust for the varying abilities or skills of each
25 driver -- and what I mean, variabilities, the physical or

1 cognitive abilities -- or are the technologies more adjustments
2 for environmental factors?

3 DR. COUGHLIN: The vision that we have for the Aware Car
4 and the vision my colleagues have for the Aware Car is a vehicle
5 that can detect your well-being behind the wheel, your level of
6 stress, your level of fatigue, by looking at a variety of
7 biometric measures, whether it's eye movement, whether it's
8 looking at pulse-rate variations, skin conductants, and some other
9 indicators.

10 But it's more than just detecting, that's actually the
11 easy part. The question is can you display it to the driver in
12 such a way where you engage the driver and not disturb them or
13 annoy them. But then, can you have the vehicle refresh the
14 driver, can you refresh, rejuvenate, and renew driving
15 performance?

16 I think the move in technology in general, whether it's
17 your house or indeed in your car, are smart, high-performance
18 environments that will be able to identify variations on how you
19 individually drive from day to day and change performance based
20 upon that. So as we move in that direction, technology will start
21 to compensate for certain capabilities and also certain behavior
22 patterns.

23 MR. BROBERG: And if I may add, I mean, cognitive or
24 not, but looking at the alertness of the driver, we're already
25 monitoring that today, not specifically looking at the driver as

1 such, but looking at how the driver is actually using the vehicle
2 and how the driver is positioning the vehicle between the lane
3 markings. So we taught the car to recognize the typical driving
4 pattern between the lane markings of a tired or unconcentrated
5 driver. So we're starting to take humble steps in the aspects of
6 trying to assess the driver already today.

7 And I agree with Dr. Coughlin here that that will
8 proceed as we get more and more tools to be able to measure the
9 state of the driver and there's more things that we can do;
10 however, the big challenge for us is to understand how to execute
11 that in interaction with the driver. And that's where we need
12 more research in order to understand how drivers behave in such
13 situations.

14 MR. MANUEL: My second question is, is when you're
15 concerned -- there's a concern about the sudden loss of
16 consciousness or the sudden loss of ability to drive, like we saw
17 -- and we were just reminded about the incident in California a
18 few years ago, this complete collapse of ability to drive or
19 sudden loss of consciousness making you unable to drive. Are
20 there any emerging technologies that will address that?

21 MR. BROBERG: You mean the sort of like freak kind of
22 accidents? I would say it's extremely hard. Of course, you can
23 relate it back to some of the collision avoidance technologies,
24 but if -- we will never be able to prevent the driver from trying
25 to hit something because the basic philosophy on how we're

1 designing these technologies today is that the driver is always in
2 control, the driver is always in charge. So the car will never
3 take away control from the driver, so I think it's extremely hard
4 with the philosophy we have today to prevent these kind of
5 situations. I think there are other countermeasures that are
6 required from society and others to prevent this.

7 DR. COUGHLIN: On a technology level, I agree with
8 Mr. Broberg 100 percent on that with respect to technology in the
9 car, but the little secret that we don't like to talk about is
10 that the real technology to identify a driver that, quote, "has a
11 sudden catastrophe" is really rarely a sudden catastrophe. There
12 are a pattern of problems that are indicative that only their
13 family, their friends, and people who sit in the car with them
14 have seen over time. The tragedy that you speak of in California
15 had a long line of precursors that happened to them. So the best
16 technology in the world are our friends, our family, and the
17 people who sit in the seat next to us to identify changes in
18 behavior.

19 CHAIRMAN HERSMAN: Okay. Mr. Schaffer, if you could
20 share with me -- I know we're talking about older drivers, but you
21 raised the issue of pedestrians and what I'd like to understand is
22 our pedestrian fatality numbers. Are older walkers or older
23 pedestrians more affected in those numbers, as well, because of
24 frailty?

25 MR. SCHAFFER: Yes, they are. However, what we have

1 seen is a reduction in our pedestrian fatalities in this last
2 year. The question is, and we still don't know as to why.
3 However, we have a number of -- beyond the simple older
4 pedestrians, we have a number of countermeasures and tools to use
5 that will make a safer pedestrian environment for everyone, not
6 just the elderly pedestrian.

7 And so we have -- whether you prepare a pedestrian
8 safety action plan or a pedestrian road safety audit to truly
9 analyze what both the human factors and technical issues are in a
10 particular roadway segment or intersection, we have a number of
11 these tools that can be used, and we are promoting these strongly
12 around the country to make roadways much safer for pedestrians.
13 And that's beyond just simply what we have, you know, in the
14 handbook. So we are moving, I think, real strongly in the
15 pedestrian area to make roadways just safer for all pedestrians.

16 And we are seeing a reduction. We have to know more,
17 though, as to -- and move more to make sure that this continues,
18 you know, and we hope it will continue to drop, and that all ages,
19 not just the aging pedestrian, will be, you know, will be affected
20 simply because we know that the frailty -- they're walking much
21 slower, they're -- and so, you know, the crosswalks are now being
22 changed to where either they can be flexible, based on where a
23 person is, or they just simply, because of the '09 MUTCD, brings
24 them down to 3.5 feet per second to walk versus the old four feet
25 per second. So these are measures we're really using, both for

1 older pedestrians and for all pedestrians, to make it safer and to
2 reduce those fatalities.

3 CHAIRMAN HERSMAN: Do we see a U-shaped curve like we do
4 for drivers, where you have more fatalities of the very young and
5 the very old and not so many in the middle? Like on pedestrians,
6 is it similar to drivers with a distribution of the fatalities?

7 MR. SCHAFFER: Yes, I understand, and no, not as much as
8 far as the older pedestrians, and we don't see that. And there is
9 a number, yes, but not to the degree of the older driver, no.

10 CHAIRMAN HERSMAN: Okay, thank you.

11 MR. SCHAFFER: Um-hum.

12 CHAIRMAN HERSMAN: You know, I think going back to the
13 technology, I'm interested in the customization and the
14 conversation about customization. It sounded a little bit,
15 Mr. Coughlin, like we were talking about like our desktop and
16 being able to kind of put the things on that we use the most and
17 that are easily accessible to us. I wonder if there's the
18 potential, though, to make our cars too much fun or too friendly.

19 I also heard Mr. Eby talk about co-drivers and I'm not
20 sure if that was the right term that you used, but a passenger
21 who's kind of assisting and gets blocked out of the guidance, the
22 route guidance, as the car's underway. I think I'm really kind of
23 torn in this area because, on the one hand, we do want to be able
24 to serve people well in their cars, but on the other hand, if we
25 make it too easy for people to work around some of these

1 protections -- I know in my minivan it has a lockout feature.
2 Once the car's underway you can't put in a new destination or you
3 can't continue to manipulate it. You actually have to stop and
4 pull over and take care of that. Yes, it's annoying when I'm in
5 the passenger seat.

6 You know, we're at a stop light trying to really quickly
7 get the information in before we have to start rolling again. It
8 is, it's annoying when I'm in the passenger seat and we're trying
9 to do it. But you know what? I also really value that
10 technology, because I know when my kids are driving in the car or
11 the babysitter's driving the car, that they can't do that while
12 they're driving.

13 And to me, I'm trying to figure out what's the tradeoff
14 between the convenience and the safety part of it and if you can
15 override it and say, well, I'm the passenger, I'm just
16 manipulating this because I'm the passenger. People are really
17 smart. They're going to figure out the way to override it when
18 they're the driver, too. How do we protect people from
19 themselves? I don't know. Who wants to take a crack at that?

20 DR. EBY: I'll take a crack at that. That was just an
21 example to show how older people potentially might use
22 technologies differently than younger people. I agree with you,
23 it's a nice -- it's probably a critical feature to lock out entry,
24 unless you have a way of knowing that this is a co-navigation or
25 copiloting situation. If you don't know, then locking out the

1 features while the vehicle's in motion makes great sense.

2 So it's a balancing act. I'm not saying I have the
3 solutions. I'm simply making the point that if you're going to
4 introduce technologies into these vehicles, you need to understand
5 the interactions that go on inside the vehicle and how people
6 drive of this age group. And that research needs to be done with
7 the new technologies.

8 CHAIRMAN HERSMAN: Right. And that cohort might be
9 responsible enough to actually make the right decisions, but what
10 happens when their grandkids are going to use their car? And you
11 know, we have a DVD player in the car, we have three kids, and so
12 it comes in really handy on long-distance trips. But I've heard
13 these movies so many times. I never get to see them; I just hear
14 them. So every once in a while, while my husband's, you know,
15 putting the gas in the car or something, you have to push the
16 parking brake in, in order for it to show up on the front screen.

17 Boy, it's really tempting to want to keep that thing up
18 and you think, well, I'm not really going to watch it, but you
19 just, you know, want to peek down. But it locks you out; it
20 doesn't allow you to do that. And I just feel like we see so many
21 people texting, you know, with a lot of cognitive distractions and
22 they're just increasing and now we have potentially people putting
23 Internet access and web right there in the car.

24 And so I really liked what Mr. Broberg said about
25 getting on the train, you know, on a train and being able to do

1 your work in the car. But until we have that feature, what do we
2 really want people to do when they're behind the wheel? What do
3 we want them to have access to? And maybe, Mr. Coughlin, when you
4 talk about personalizing things, how far do we go with that?

5 DR. COUGHLIN: Yeah, the notion of personalization, you
6 know, you mentioned a nice analog, the desktop. It's funny, you
7 can customize your house and you can customize your desktop, but
8 the second largest purchase in your life you have to take as the
9 designer gives it to you in most cases, except for color and
10 comfort. What I would envision is essentially what's evolving, is
11 a glass cockpit which allows you actually to pick what information
12 you want.

13 Now, as much as all of us would like to think that we're
14 individuals, we know that as industry gets to know us more, we're
15 all individuals probably in about six or seven segments. So
16 Microsoft or Apple knows that you can customize your desktop as
17 much as you want, but they know it's going to be within a certain
18 set of limits that the system can actually do. So I would suggest
19 that personalization is not only going to make an ageless, safer
20 car, but one that's more responsive, so that when you get into the
21 car, the data that you want, the information that you want, will
22 be in front of you and all the other stuff will be out.

23 We have a number of people who like to have a tachometer
24 even though they're driving an automatic. They want it to be on
25 their desktop, or on their dashboard. A lot of other people do

1 not. So I think the personalization may actually help us with
2 information dimming, as long as we know enough as to make sure
3 that people who are info junkies don't put too much on the
4 desktop.

5 MR. BROBERG: Just to address this from a manufacturer's
6 perspective, because, I mean, this is a fine line for us because
7 we have to make products that are appealing to the customer in the
8 sense that, yeah, this is something that I want to buy. And then,
9 of course, you don't want to annoy the customer, your buyer of
10 your product. At the same time, as you say, you want to protect
11 them from themselves, in the sense that we do have knowledge as to
12 what you should do and what you shouldn't do.

13 I think the way forward, therefore, is really how we use
14 our knowledge to package this in a sense so that you don't feel
15 that you're getting "don't do this", that you rather feel -- so
16 it's actually a matter of working with both the pinpoints in
17 combination with carrots to try to give you something else. But
18 this is a very intricate problem for us as to how we design the
19 future cars. And there's also only so much we can do, because we
20 can never prevent the drivers or the occupants in the car to do
21 whatever they want. So we have to be very, very clever when we
22 work around that.

23 CHAIRMAN HERSMAN: I wonder if there are any
24 international lessons that we think can be translated into the
25 U.S. environment or that were just so different that it's very

1 hard for us to adapt some of those changes.

2 I was over in Switzerland last week and you know, I'm a
3 transportation person, so it was just -- you know, it was like
4 being on another planet. You know, I came in on a train and
5 outside the train -- and, you know, it wasn't -- everything wasn't
6 in English, but, you know, we had to take a bus to get to a hotel
7 and, I'll tell you what, it was so easy, it was no problem. You
8 know, I wouldn't really even think about trying to take a bus here
9 in Washington on the Metro system half the time, trying to figure
10 out which routes and where the stops are. But this was very -- it
11 was very obvious, and it was very easy.

12 And so when I think of us, you know, kind of saying,
13 well, when people lose their ability to drive, they need to
14 transition to something else, well, if that something else isn't
15 easy, that certainly makes it hard. But everyone was walking.
16 There were hardly any cars. As far as pedestrian things,
17 everybody obeyed the street signals, you know, with the
18 crosswalks, and they all crossed at the crosswalks and nobody
19 jaywalked. It was really weird. I mean, the whole thing was just
20 like I really felt like I was on another planet.

21 There was a point where we got to a point where we
22 needed to cross a busy intersection and we could not figure out
23 how to get across the street. We couldn't find the crosswalk.
24 Well, they had built an underground passageway that you walked
25 under the street. So nobody crossed that street because it was

1 too big and, you know, it would stop the flow of traffic and there
2 were a lot of things going on.

3 How do we translate, potentially -- oh, and by the way,
4 on the last panel, the whole medical issue, I didn't see anybody
5 who was overweight because they were all exercising and walking.
6 And, you know, I actually felt pretty large while I was over
7 there. But all ages were out walking. You know, it was really
8 impressive. You know, there were clearly multi-generations,
9 younger people helping older people going for their walks, and
10 there just weren't very many cars. There were a lot of people
11 bicycling and they had bicycling lanes and it just really -- from
12 a transportation perspective, I was just so wowed and I felt like,
13 why can't we accomplish something like this in the U.S.?

14 And so, Mr. Schaffer, I ask you, is it impossible to
15 have that? Is that a transportation utopia that's just not going
16 to happen in the United States? We have such a different
17 relationship with our cars and the way that we move that we can't
18 do that?

19 MR. SCHAFFER: That's a very good question. They are
20 different cultures and we've seen this on a number of
21 international scans, which Beth happened to go on a number of
22 years ago on the older road user international scan. And that
23 was, correct, Japan and Australia, yes. And so we really wanted
24 to see how they do things for their elderly population. And at
25 the same time we've also done international scans for bike and

1 ped, which we just did recently in Europe. And so we have really,
2 at Federal Highway, looked at, internationally, what is being
3 done; how can we look at those here?

4 And that particular scan, getting around the older road
5 user, because -- and I'm not speaking for Beth, but basically what
6 we did find is that, you know, in Japan, it's a different culture.
7 They don't have anything like, as I recall, Beth, this older road
8 user. They just do things differently. And Australia's a bit
9 different. Of course, they drive like the Brits, on the other
10 side of the road and -- but they treat -- you know, it's a
11 different culture. And so that does reflect on how they treat --
12 you know, and they do walk more and that is affecting here.

13 Now, in this country we're learning, I believe, that we
14 do have an environment where it's not just the car, it's all
15 particular roadway users. So we can learn from these scans, if
16 you will, that -- and as well as just, you know, with the high
17 price of gas and just being able to be in a more livable
18 environment that's suitable for all modes and for all ages, that
19 you can get around and you can get around safely and effectively.
20 So that is something we're still working on. We're still taking
21 our lessons, if you will, from what we can do better here, as well
22 as learning from our foreign partners of how to do even better.

23 DR. COUGHLIN: If I may, the transportation system
24 reflects and reinforces a choice in lifestyle. It's less about
25 moving from point A to point B. And the Europeans and certain

1 Asian communities as well have had a tradition and development
2 patterns with the intensity and density that you speak of, that
3 are sometimes quaint and always kind of preserving a quality of
4 life that they've enjoyed long before the car even existed.

5 In sharp contrast, for hundreds of years, let alone the
6 last hundred years, the American culture has been not one built
7 around the car, but one built around space and wanting intensity
8 and density to be someplace else. It's only been recently, in
9 probably the last 20 years, that we've looked at the city and
10 urban life as something more desirable. It has taken us upwards
11 of 60 or 70 years to have the urban form such as it is. Today,
12 where 70 percent of people over age 50 live in the suburbs or
13 rural areas where transit alternatives, walking alternatives, not
14 only don't exist, but in my own town where I live, going for a
15 night on the town on Friday night would be a two mile walk to a
16 CVS; not exactly, you know, a party in that sense.

17 So we need not just to think about the transportation
18 system, but we need to think about what are the activities? What
19 are the things we want to do? How do we want to re-envision the
20 connectivity and engagement as we age, at any age, around that?

21 So yes, I enjoy visiting Germany, Switzerland, and
22 places that do feel storybook compared to Boston, where
23 transportation is a competitive sport in its own right. But what
24 we really have to renegotiate is how we choose to live with each
25 other.

1 And I guess the last comment is, is that one of the
2 challenges that we have as baby boomers now, turning 65 come
3 January, every 7 seconds one of us will turn 65, will we be able
4 to wake up one day at age 75 and say, you know, I've never been on
5 the bus, but I think I'll try it. I don't think that's going to
6 happen.

7 So if I could leave anything with the panel, we need a
8 sense of urgency. The older driver issue, the mobility around
9 transportation in an aging society, actually, I can pinpoint with
10 a footnote, was first put on the nation's agenda in the 1930s when
11 they were talking about the scourge of older drivers that would be
12 40 and over on the highways. Ladies and gentlemen, we've been
13 aging fast and I'm really worried that I'm going to be stuck with
14 going to CVS on a Friday night.

15 CHAIRMAN HERSMAN: Well, if you need to pick up your
16 prescription, it might not be a bad place to go, so --

17 (Laughter.)

18 CHAIRMAN HERSMAN: Well, this has been fantastic. I
19 know that we all have so many more questions. The dialogue is
20 superb. We really appreciate your expertise and your insights.
21 We thank all of the parties for their excellent questions. I have
22 to say, there were so many I got to mark off because you were
23 there first. And so thank you for your very good questions. We
24 have had a great day. We will convene again tomorrow morning at
25 9:00 for the rest of the panels. And so we stand adjourned.

1 Thank you.

2 (Whereupon, at 5:00 p.m., the hearing in the above-
3 entitled matter was adjourned, to be reconvened on the following
4 day, Wednesday, November 10, 2010 at 9:00 a.m.)

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CERTIFICATE

This is to certify that the attached proceeding before the
NATIONAL TRANSPORTATION SAFETY BOARD

IN THE MATTER OF: Safety, Mobility, and Aging Drivers

PLACE: Washington, D.C.

DATE: November 9, 2010

was held according to the record, and that this is the original,
complete, true and accurate transcript which has been compared to
the recording accomplished at the hearing.

Timothy Atkinson
Official Reporter