

Module 11: Toward Zero Deaths

Benjamín Colucci-Ríos, PhD, PTOE, FITE, JD

April 12, 2016

benjamin.colucci1@upr.edu

Good Afternoon!



Acronyms

BAC Blood Alcohol Concentration

EMS Emergency Medical Services

GDL Graduated driver license

HFG Human Factors Guide

HSM Highway Safety Manual

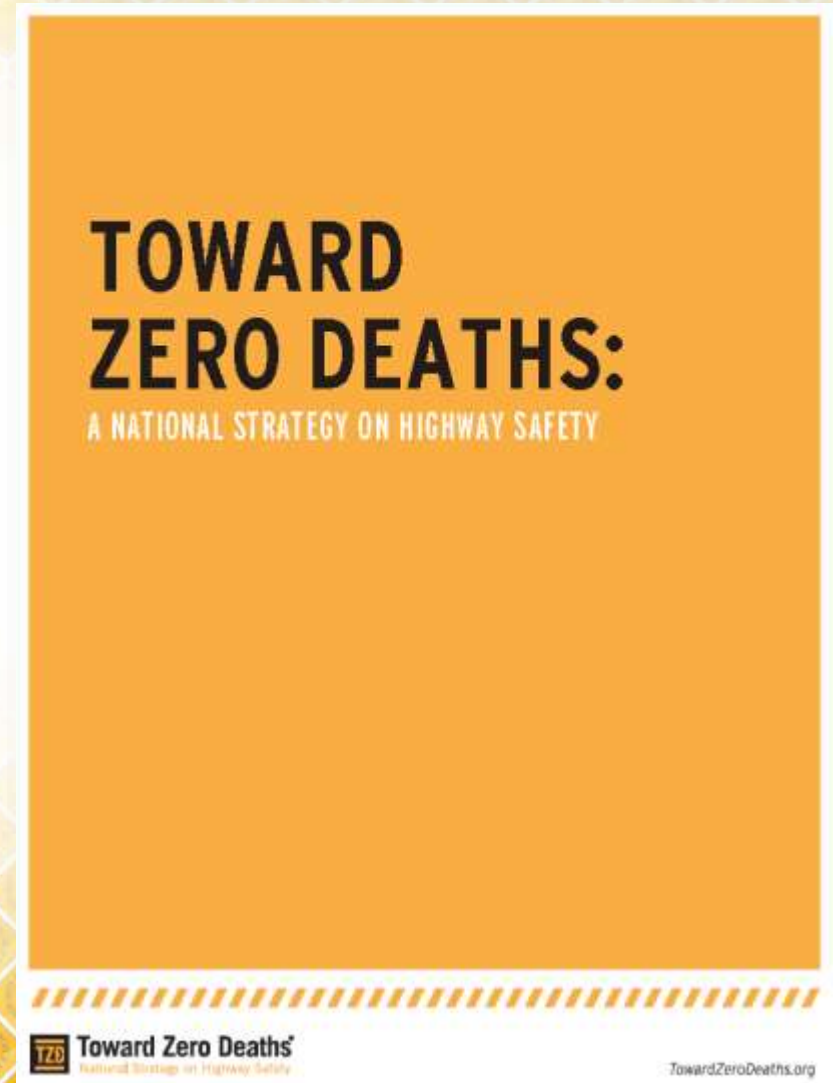
TSC Traffic Safety Culture

TZD Toward zero deaths

VMT Vehicle Mile Traveled

Primary Source of this Presentation

- TZD National Strategy
- Toward Zero Deaths is the United States' highway safety vision
- Led by the TZD Steering Committee
 - Develop safety plans that prioritize traffic safety culture and promote the national TZD vision
- To obtain this manual, please visit:
www.towardzerodeaths.org/strategy/



Agenda

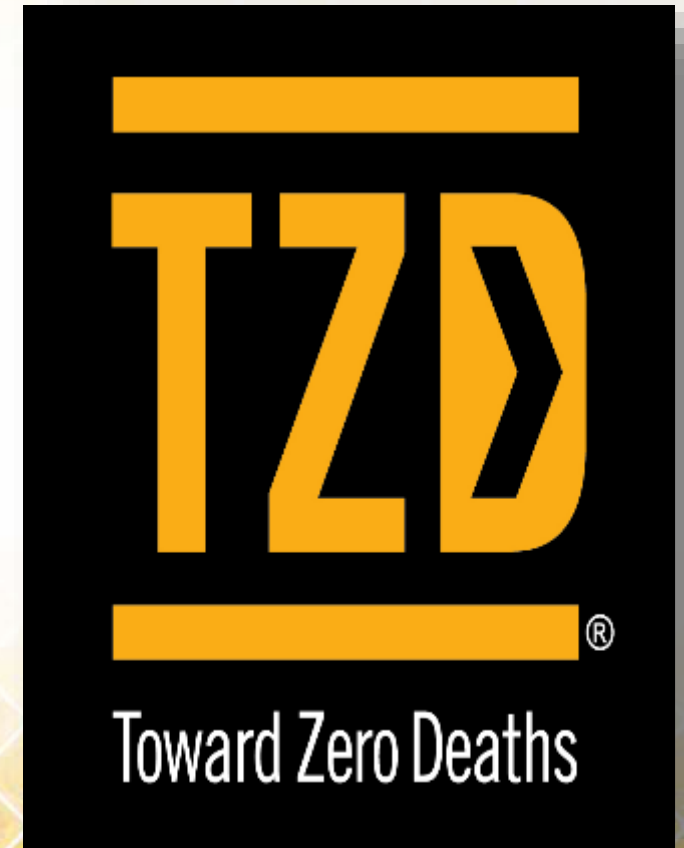
- The Toward Zero Death Vision
- The Challenges Ahead
- Key Areas
 1. Safer Drivers and Passengers
 2. Safer Vulnerable Users
 3. Safer Vehicles
 4. Safer Infrastructure
 5. Enhanced Emergency Medical Services
 6. Improved Safety Management
- Safety Culture
- Let's Get to Work



1. The Toward Zero Deaths Vision

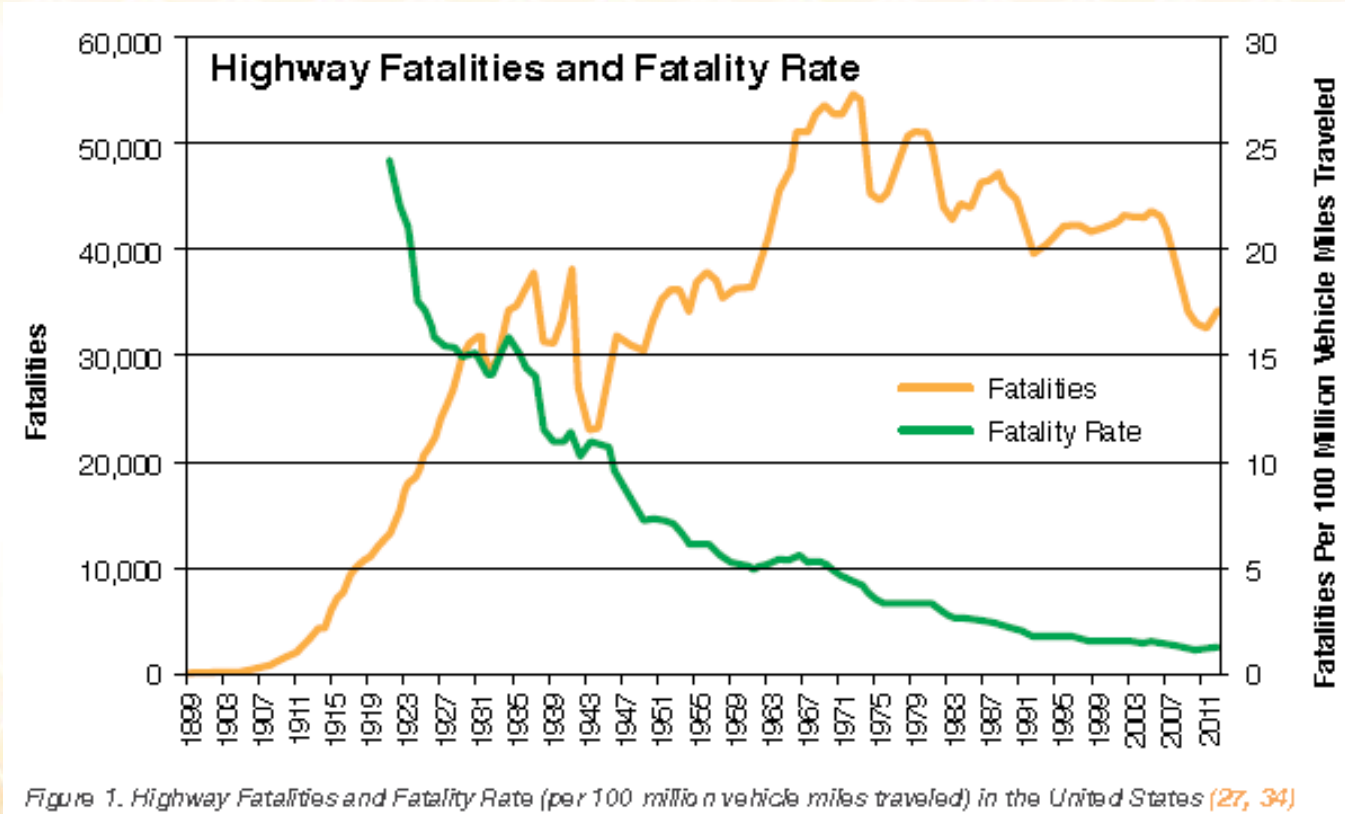
What is Toward Zero Deaths (TZD)?

- A National Strategy on Highway Safety.
- A tool for helping to unite the efforts to reduce fatalities and serious injuries relating to traffic crashes.



TZD Vision

- To reduce fatalities and serious injuries on roads to zero
- In 2012, there were 33,561 fatalities and 2.36 million injuries on our roads
- Through 2011, fatalities had decreased 26 % over the previous 6 years, resulting in the lowest number of fatalities since 1949



TZD Vision (Cont.)

- Highway safety stakeholders—including government agencies, private industry, safety advocates, associations representing professionals, and individuals—are committed to reducing fatalities to zero



Source: www.fhwa.dot.gov

A National Safety Strategy

- Federal transportation laws require each state to develop a strategic highway safety plan that focuses all state safety partners
- But is missing a specific single vision that brings together all the various stakeholders nationwide with a role in highway safety
- TZD will bring these stakeholders together, and defines the common vision that will drive their individual and collaborative efforts.

Uniting Safety Stakeholder Efforts

- The National Strategy is intended to
 - Identify the key safety focus areas
 - Unite all efforts of a wide array of stakeholders nationwide
- TZD builds on what these safety stakeholders already do by encouraging continued use of proven programs and countermeasures in a very proactive, multidisciplinary manner.



National Strategy On Highway Safety®
PROUD PARTNER
TowardZeroDeaths.org

Encouraging a Transportation Safety Culture

- TZD National Strategy encourage change in the nation's highway safety culture
 - Exploring what influences road users who too often make unsafe decisions
 - Why and how these influences have such an impact
- Changing the safety culture is a complex challenge
 - The process for changing values and attitudes must involve safety as a valued factor in every transportation decision, whether personal or organizational.



Source: www.mdt.mt.gov



2. The Challenges Ahead

Current Challenges

- Significant challenges for eliminating traffic fatalities and serious injuries
 - The size of the nation's roadway network
 - The number of road users
 - The variety of road user types
 - The complexity of the driving combine to present
- National data are used to identify strategies that needs
 - Further research and development
 - More widespread implementation
 - Policy changes

Current Challenges (Cont.)

- The table shows
 - A sample of crash characteristics and contributing factors
 - The percentage of fatalities that involve these characteristics in 2012, a year in which there were 33,561 fatalities
- It is important to look at recent trends in crashes with specific characteristics, as this can indicate growing concerns

| | 2012 Fatalities | Percent of 2012 Total |
|------------------------|-----------------|-----------------------|
| Roadway departure | 18,887 | 56% |
| Unrestrained occupants | 11,189 | 33% |
| Alcohol-impaired | 10,322 | 31% |
| Speeding* | 9,944 | 31% |
| Intersections | 8,768 | 26% |
| Motorcycles | 4,957 | 15% |
| Pedestrians | 4,743 | 14% |
| Large trucks | 3,921 | 12% |
| Distraction | 3,328 | 10% |
| Bicyclists | 728 | 2% |

* 2011

Table 1. Sample of crash contributing factors (44, 36)

Future View

- As factors that affect transportation decisions change over time, it can be expected that these changes may affect highway safety



Future View (Cont.)

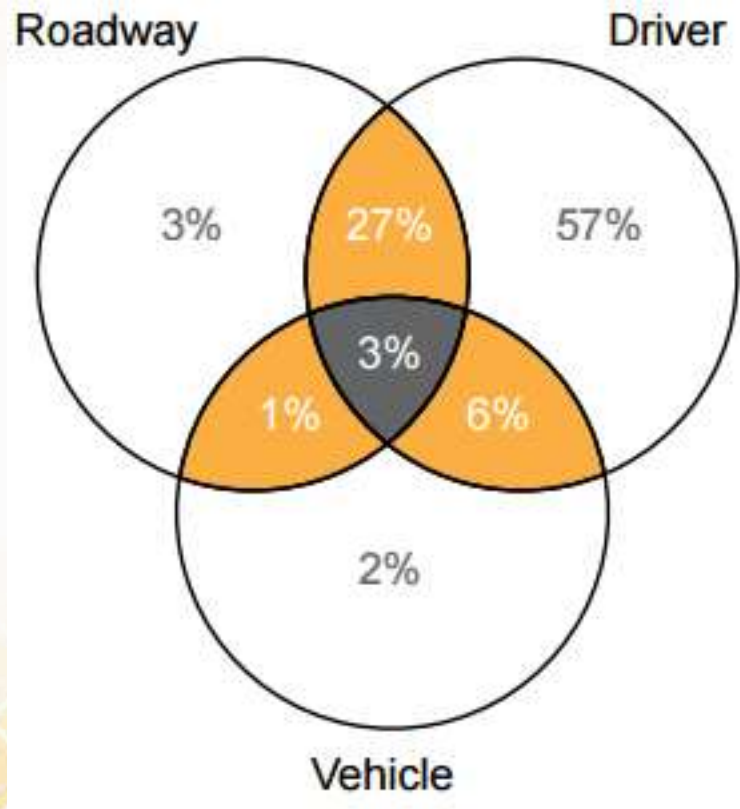
- Factors that affect how people travel
 - **Demographics** – Over the next 20 years, the number of people over age 65 will nearly double
 - **Travel behavior and activity** – with incomes expected to grow more than 40 percent by 2030, increases in travel will result
 - **Freight Traffic** – Truck VMT is expected to grow at least as much as passenger vehicle VMT
 - **Technology** - New technologies that modify the way people travel or reduce the need to travel



3. Key Areas

- 3.1 Safer drivers and passengers
- 3.2 Safer vulnerable users
- 3.3 Safer vehicles
- 3.4 Safer infrastructure
- 3.5 Enhanced emergency medical services (EMS)
- 3.6 Improved safety management and data processes

Crash Contributory Factors



| | Human | Vehicle/ Equipment | Physical Environment | Socioeconomic |
|-------------------|--|---|--------------------------------------|--|
| Pre-Crash | Poor vision or reaction time, alcohol, speeding, risk taking | Failed brakes, missing lights, lack of warning systems | Narrow shoulders, ill-timed signals | Cultural norms permitting speeding, red light running, DUI |
| Crash | Failure to use occupant restraints | Malfunctioning safety belts, poorly engineered air bags | Poorly designed guard-rails | Lack of vehicle design regulations |
| Post-Crash | High susceptibility, alcohol | Poorly designed fuel tanks | Poor emergency communication systems | Lack of support for EMS and trauma systems |

3.1 Safer Drivers and Passengers

- The element of the transportation system that contributes most frequently to the occurrence of traffic crashes is the driver
- Changing road user behavior is difficult and involves different but coordinated approaches
 - Educating drivers on appropriate behaviors
 - Requiring or prohibiting specific behaviors
 - Warning drivers when their behavior may result in a crash or injury
 - Intervening to counteract or prevent the specific behavior.



3.1 Safer Drivers and Passengers (Cont.)

- Of all the risky behaviors that drivers and vehicle passengers demonstrate, the three most prevalent are
 - Traveling unrestrained
 - Alcohol-impaired driving
 - Speeding
- Each of which consistently accounts for approximately 30 % of total fatalities



Source: www.medicaldaily.com

3.1 Safer Drivers and Passengers (Cont.)

- 1 Increase restraint use by drivers and passengers.
- 2 Reduce speeding-related fatalities.
- 3 Reduce impaired driving fatalities.
- 4 Reduce driver distraction-related fatalities.
- 5 Increase safety of young drivers. Increase safety of older drivers.

3.1.1. Increase restraint use by drivers and passengers

- Targeting education, enforcement, and other programs to specific safety issues in which teens are overrepresented.
- Strengthening graduated driver license (GDL) laws.



3.1.2 Reduce Speeding-Related Fatalities

- Speeding contributes to both the occurrence of crashes and to their severity
- Biggest problem: there is not a way to prevent these, the prevention is in each individual
- The best way to approach these problem is through education and law enforcements



3.1.3 Reduce Impaired Driving

- About one-third of all crash fatalities involve a driver with a BAC over the legal limit of 0.08 g/dL
- In 2012, over 10,300 people died in crashes in which a driver had a BAC of 0.08 or higher
- Increasing use of checkpoints would be expected to reduce impaired driving.
- Intense treatments for repeat offenders.



3.1.4 Reduce Driver Distraction

- In 2012, 3,328 people died in crashes involving a distracted driver
- Cell phone while driving, talking with other passengers, eating, and programming a navigation device are common distractors
- Two types of countermeasure
 - Infrastructure-based strategies, such as center line and edge line rumble strips
 - Technology-based solutions, which have the potential to minimize or immobilize the use of devices inside the vehicle



3.1.5 Increase safety of young and older drivers

- In 2011
 - 4,347 drivers aged 15 to 20 were involved in fatal crashes, and 1,987 teen drivers were killed in crashes
 - 17 % of highway fatalities involved drivers that were 65 or older
- Younger drivers
 - Multidisciplinary approach used for other road users, including strengthening laws and educational programs and using technology to prevent risky behaviors
- Older drivers
 - Focus on functional capabilities related to motor skill coordination and response time, rather than chronological age



3.2 Safer Vulnerable Users

- **Pedestrians and Bicyclists**

- Alcohol—for either driver or pedestrian—played a role in 48 percent of traffic crashes that resulted in pedestrian fatalities.



- **Motorcyclists**

- The number of motorcycle have double every decade. Motorcyclist have a six times that of passenger car occupants.



- **Highway Workers**

- Those who work in the roadway environment are exposed to greater risk of being killed or seriously injured.



3.3 Safer Vehicles

- While vehicles are rarely the sole cause of fatal crashes, they do provide opportunities for protecting occupants
- Vehicle technologies discussed in this section address both passenger vehicles and commercial motor vehicles through strategies to prevent crashes and lessen the severity of crashes that do occur



3.3.1 Alert Drivers to Risks

- In-vehicle technologies can reduce the risk of crashes by alerting drivers to risks they are taking (*such as speeding*)
- Prevent specific behaviors (*such as impaired driving or speeding*)
- Monitor driver actions in order to provide feedback at a later time



3.3.2 Assist drivers who are at risk of a crash

- Side object detection systems use radar, laser, LIDAR, computer vision, or ultrasonic scanning technology to warn drivers of objects beside them in their blind spots.
- Lane departure warning systems provide audio, visual, and/or tactile alerts to drivers when they cross lane markings or are drifting off the roadway.
- Forward collision warning
 - Systems analyzes radar signals to determine the distance and relative speed between the vehicle or object ahead



3.3.3 Protect Vehicle Occupants During Crashes

- The automotive industry, researchers, and regulators are continuously working to increase the protection that vehicles provide during crashes
- Improved strength of vehicles to mitigate side impact and rollover crashes would lessen the severity of these types of crashes
- In a front impact crash, the front of the vehicle and engine compartment absorb much of the energy of the crash



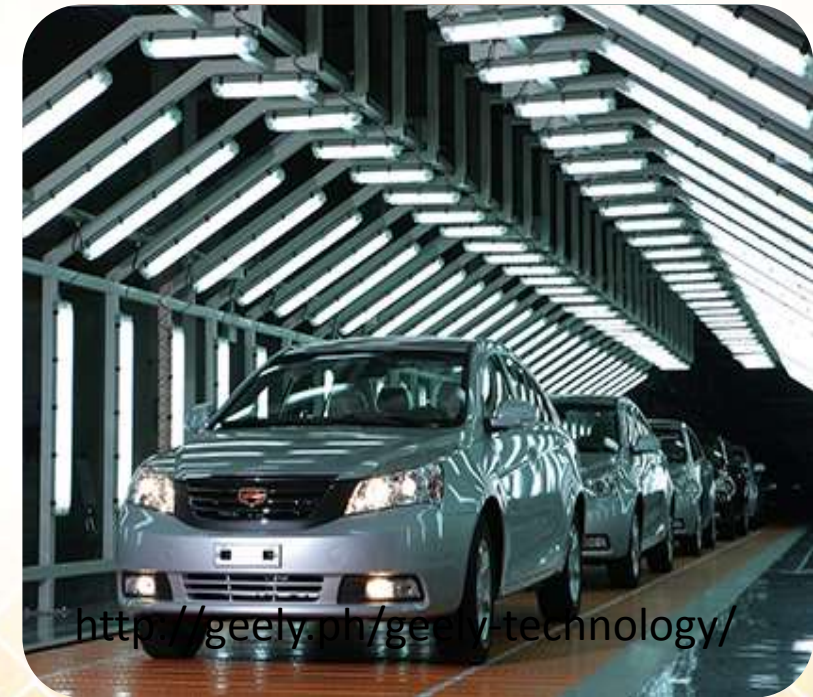
3.3.4 Enable communication with other vehicles and the roadway

- Vehicle-to-vehicle (V2V) and vehicle-to infrastructure (V2I) technologies are being developed to facilitate
 - Communication
 - Control
 - Visibility
- Among vehicles and the roadway



3.3.5 Ensure Vehicles Continue to Perform as Designed

- Ensuring state passenger and commercial vehicle inspection programs are supported by inspector training on the vehicles and the safety systems installed, which is critical to the success of inspection programs.
- Compiling all registration, titling, brand, damage, and repair information on a vehicle's history in one record.
- Informing consumers on the means to access vehicle title information, so they can determine whether a used vehicle they are purchasing has been previously damaged and/or repaired.



3.4 Safer Infrastructure

1

Install Countermeasures to Mitigate Crashes and Reduce Injury Severity

2

Adopt Advanced Cross-Cutting Technologies

3

Improve Design Practices to Maximize Safety Benefits

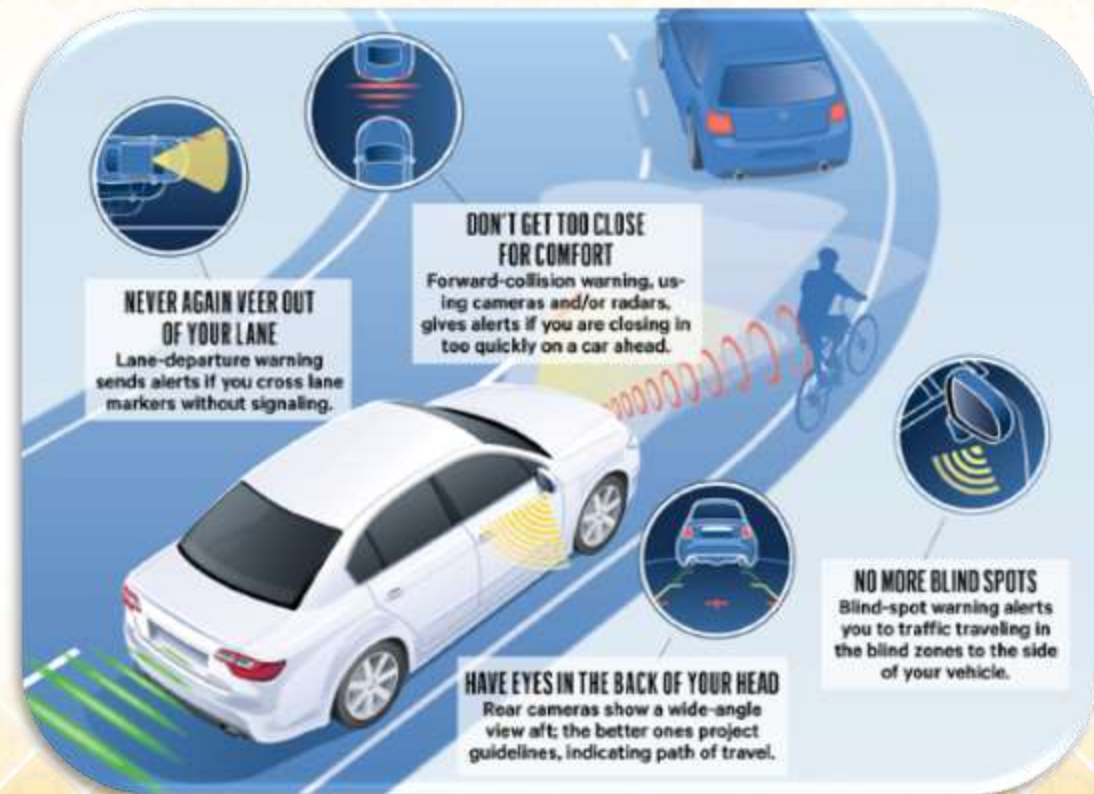


3.4.1 Install Countermeasures to Mitigate Crashes and Reduce Injury Severity

- Signing and pavement markings with retroreflective properties
 - to improve guidance along the roadway, especially in and around curves.
- Use shoulder and centerline rumble strips and stripes
- Improve driver awareness of intersections by installing or improving signs, pavement markings, and lighting.
- Design roadside to include appropriate hardware
 - cable median barrier
 - crash cushions
 - guardrail end treatments

3.4.2 Adopt Advanced Cross-Cutting Technologies

- Advanced in-vehicle computers and monitoring, communications, and sensing technologies allow vehicles to communicate with each other and with the roadway infrastructure
 - Prevent crashes
 - Mitigate the impacts of crashes that do occur
 - Improve emergency response.
- One example is devices installed at high-speed intersections that sense the presence of a vehicle approaching the intersection.



3.4.3 Improve Design Practices to Maximize Safety Benefits

- How transportation agencies make and implement safety decisions
- Efforts to collect data and improve accuracy are producing tools that
 - Help agencies analyze data
 - Estimate the effectiveness of possible safety countermeasures
 - Quantify their expected benefit in reducing crashes.
- While these advances in the science of infrastructure safety are not complete, information and tools that promote a systematic approach to safety are available.
- This approach is termed “performance-based design”

3.5 Enhanced Emergency Medical Services

1

Collaborate with Safety Partners to Improve Understanding of EMS and Identify Opportunities to Reduce Crashes and Save Lives

2

Improve Access to Higher Level Trauma Centers

3

Improve On-Scene Medical Care and Transport to Hospitals

4

Improve Incident Detection, 911 Access, and Enhanced 911 System Capabilities

3.5.1 Improve Incident Detection, 911 Access.

- Nationwide 911 services identify a caller's location when the call is dialed over a conventional land-based phone.
- Enhanced 911 (E911) technologies that can determine a cellular caller's location are becoming more common across the country.
- Advanced Automatic Collision Notification (AACN) technologies wirelessly transmit data that describe the location and crash severity to emergency call centers.



3.5.2 Improve On-Scene Medical Care and Transport to Hospitals

- The responders, emergency medical technicians (EMTs) and paramedics, usually trained to develop skills related to
 - Medical interventions
 - Devices
 - Medicines.
- The training uses the National Emergency Medical Services Education Standards created by NHTSA.
- The curriculum was updated in 2010 to discuss consistent care delivery in a prehospital setting
 - However, states are currently in varying stages of adopting these new standards.



3.5.3 Improve Access to Higher Level Trauma Centers

- Once a crash occurs, the clock starts ticking.
- The chance to save lives depends on
 - The time it takes for the EMS team(s) to reach the location
 - Evaluate the scene
 - Assess the extent and seriousness of injury(s)
 - Stabilize the victims,
 - Transport the injured to the appropriate medical or trauma center(s).



3.5.4 Collaborate with Safety Partners to Improve EMS

- Federal Interagency Committee on EMS ensures coordination among the federal agencies involved in emergency medical response.
- As a partner in managing highway safety, it is also important that the EMS community is involved in traffic incident management planning and training.



3.6 Improved Safety Management

- This section focuses on the challenges common to all key highway safety areas
 - Issues related to how safety stakeholder partners collaborate
 - Develop and implement appropriate safety initiatives
- To the finer points of collecting, using, linking, and maintaining accurate traffic safety crash data and systems
- To providing for a knowledgeable safety workforce.



3.6.1 Safety Partnerships and Planning

- In addition to helping build relationships, collaborating on safety activities can educate partners about one another's issues and raise awareness of the multiple perspectives involved in identifying and implementing effective safety programs.



3.6.2 Data, Data Systems, and Analysis Tools

- Law enforcement officers and organizations in safety data are responsible for collecting the crash data for safety evaluations and development of programs and initiatives.
- The success of using traffic safety data depends on efficiently collecting complete, accurate, and timely data, coupled with easy integration with different data sources and accessibility to the data for reporting and analysis.



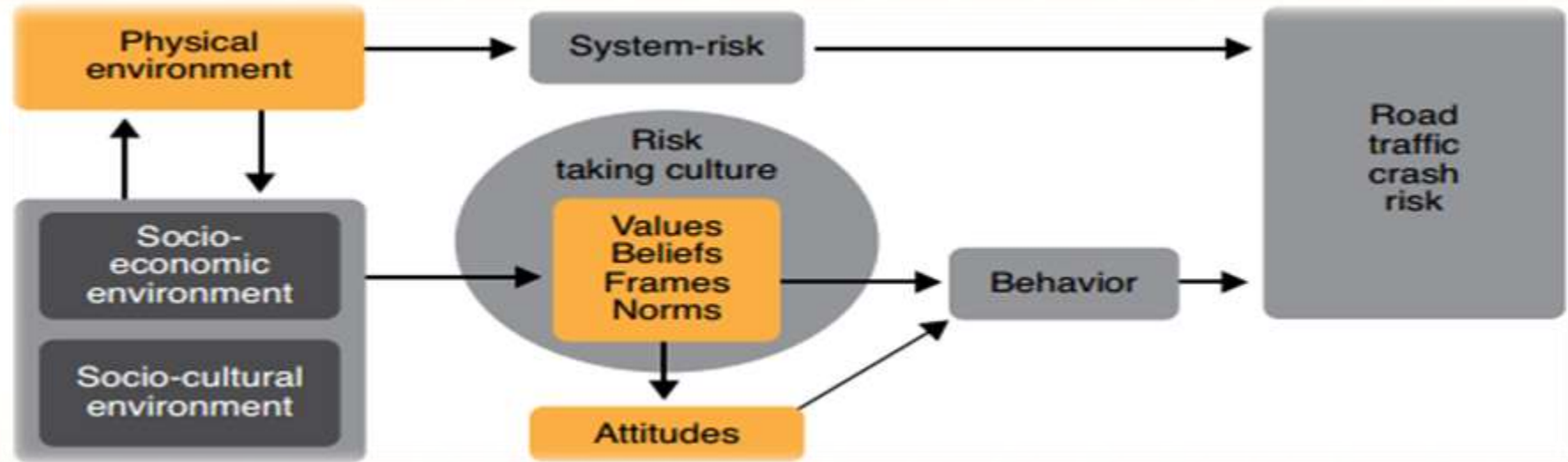


4. Safety Culture

- 4.1 Traffic Safety Culture Model
- 4.2 TSC Transformation Strategies
- 4.3 Social Environment
- 4.4 Creating a Traffic Safety Culture

4.1 Traffic Safety Culture (TSC) Model

TSC represents a new model that supports traffic safety priorities such as the Toward Zero Deaths (TZD) National Strategy.



4.1 TSC Model (Cont.)

- Strategies that can transform behavioral choices to improve traffic safety;
 - **Values:** Principles to which we aspire and use to define what is important to us.
 - **Beliefs:** How individuals perceive the way things work and interrelate, including the perceived probability and consequences of our.
 - **Frames:** Tendency to perceive and interpret a situation or information from a certain reference point, expectation, or belief system.
 - **Norms:** Perceptions of common behaviors amongst peer groups.
 - **Attitude:** Emotional reaction and perception of use associated with a behavior or object.

4.2 TSC Transformation Strategies

VALUES

The goal of a TSC strategy based on values is to promote behavioral choices by explicitly linking target behaviors and values

BENEFITS

The goal of the belief based TSC strategy is to provide direct experience that challenges and revises components of a belief system that foster unsafe behaviors

FRAMES

The goal of a frames-based TSC strategy is to shift an observer's reference point or expectation so that the observer interprets the situation differently

NORMS

The goal of this TSC strategy is to correct a misperceived norm so that individuals adopt and form existing positive norms that support a positive traffic safety culture within their social (peer) group.

ATTITUDES

The goal of an attitudes-based TSC strategy is to change the emotion or perceived effectiveness of a behavior

4.3 Social Environment

- It is possible to transform TSC by affecting the economic and social environment from which our culture emerges
- The transformation process begins once traffic safety becomes part of the collective conversation



4.4 Creating a Traffic Safety Culture

- It is necessary to raise awareness of traffic safety as a **critical public health problem**
- In order to enable the transformation process, a positive traffic safety culture must be established in all transportation-related organizations as a part of policy and practice for all disciplines



Source: www.cyclelicio.us



5. Let's Get to Work

- 5.1 Join the National Dialogue
- 5.2 Get Started
- 5.3 Spread the Message
- 5.4 Accept the Challenge

5.1 Join the National Dialogue

- To support widespread, aggressive, and proactive efforts to reduce fatalities and serious injuries
- We must build a substantial national dialogue on highway safety
- Its important to also focus on the programs and initiatives that are longer term and will require higher levels of resources



<http://www.towardzerodeaths.org/>

5.2 Get Started

- The next step for highway safety stakeholders is to consider how they fit into efforts to achieve the zero deaths vision
- How they can best inject new energy and commitment into both their own efforts and the nationwide initiative
- For entities that have not yet developed a strategic approach to their safety efforts
- This National Strategy could be used as a starting point



<http://www.towardzerodeaths.org/>

5.3 Spread The Message

Key Messages

1. Our nation's highway safety vision is Toward Zero Deaths, where even one traffic fatality is unacceptable.
2. The National Strategy on Highway Safety is the roadmap to reaching the TZD vision.
3. Creating a culture of safety is my personal and professional responsibility.
4. Traffic fatalities are a public health crisis.
5. I can help prevent traffic fatalities and serious injuries by how I drive, ride, bike, or walk today.

Everyone already has a goal of zero deaths for themselves and their families. Together, with efforts like TZD, we can make a national commitment to implement strategies, raise awareness, and change the behaviors that contribute to reducing traffic fatalities.

5.4 Accept the Challenge

- A highway system free of fatalities is a challenge that will require time and diligence
- We have more than 3.7 million reasons every year to accept this challenge and work together
Toward Zero Deaths



Secondary References

- <http://www.towardzerodeaths.org/>
- <https://www.linkedin.com/topic/safety-management-systems>
- <http://geely.ph/geely-technology/>
- <http://www.cmmonline.com/articles/230355-flawed-assumptions-of-performance-management>
- <http://www.bestreetsmart.net/>