



DEPARTMENT
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Measures and countermeasures aimed at road users

Traffic psychology 1
PCH/DP1

Matus Sucha

Presentation 5





Content

1. Alcohol-Impaired and Drugged Driving
2. Seat Belts and Child Restraints
3. Aggressive Driving and Speeding
4. Distracted and Drowsy Driving
5. Motorcycle Safety
6. Young Drivers
7. Older Drivers
8. Pedestrians
9. Bicycles



Traffic safety measures at glance

1. Traffic safety visions and strategies on national level, implementation and financing (Vision 0, Sustainable traffic safety)
2. Traffic infrastructure (planning, reconstructions, maintenance, audits and safety)
3. Vehicles and ITS (vehicle constructions, motorcycle drivers protection, ADAS)
4. Education, training and campaigning
5. Enforcement and deterrence (incl. demerit point system)
6. Fitness to drive assessment and rehabilitation
7. Post accident care (e-call, first aid, psychological counseling)

Traffic safety measures that work

What to consider in all cases:

1. Effectiveness (demonstrated to be effective by several high-quality evaluations with consistent results)
2. Cost (requires extensive new facilities, staff, equipment, or publicity, or makes heavy demands on current resources)
3. Use (most of EU countries vs. few EU countries)
4. Time (long = more than 1 year, medium, short = less than 3 months)

Workshop

- A. What lays behind risky behaviour? How to influence based on psychological knowledge?
 - B. Groups of risky behaviour / road users with common countermeasure approach?
 - C. Concrete countermeasures for each group?
- 1. Alcohol-Impaired and Drugged Driving
 - 2. Seat Belts and Child Restraints
 - 3. Aggressive Driving and Speeding
 - 4. Distracted and Drowsy Driving
 - 5. Motorcycle Safety
 - 6. Young Drivers
 - 7. Older Drivers
 - 8. Pedestrians
 - 9. Bicycles

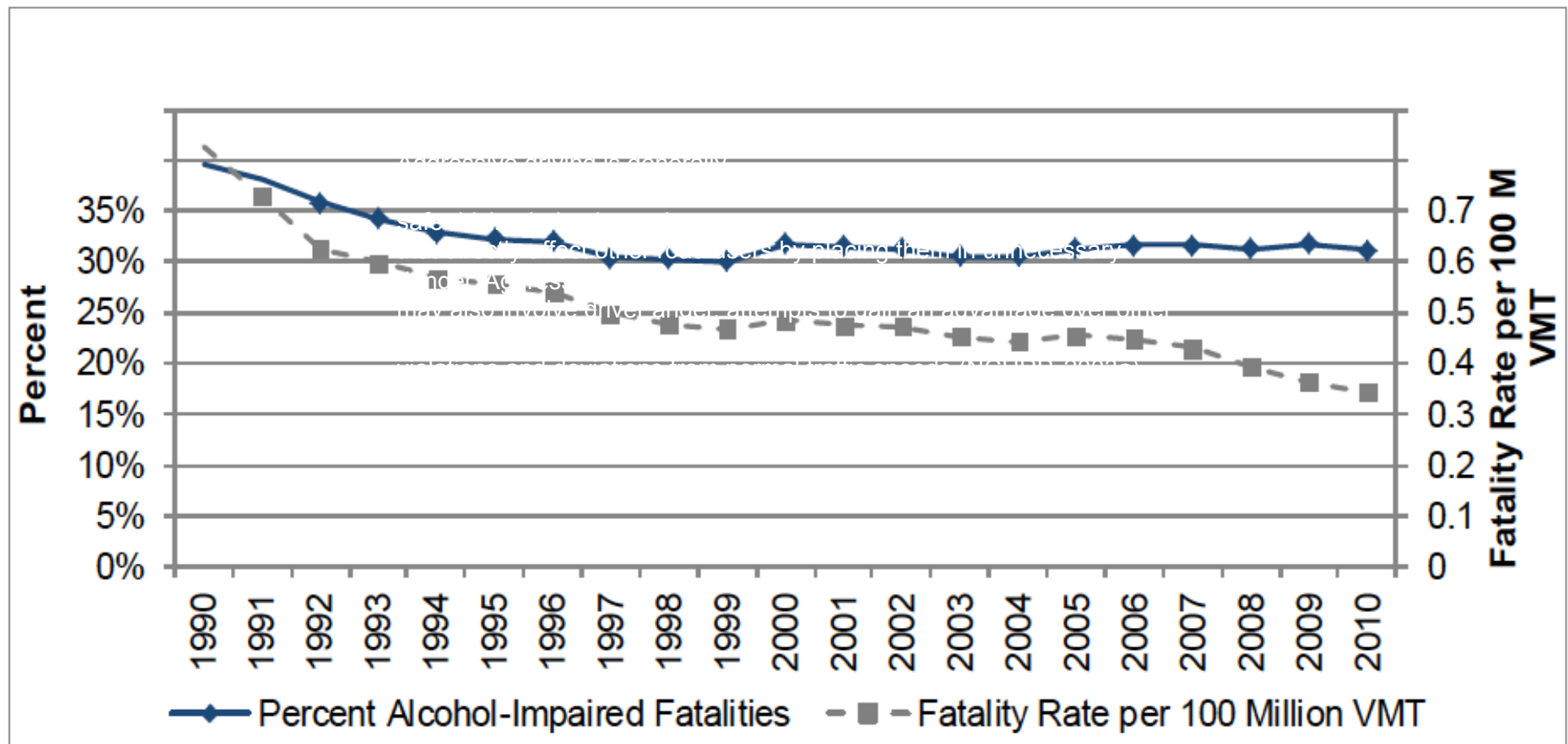
1. Alcohol-Impaired and Drugged Driving

Trends. Alcohol-impaired driving **dropped** steadily from 1982 to the mid-1990s. A study showed that much of this decrease could be attributed to **alcohol-related legislation** (e.g., .08 BAC, administrative license revocation, and minimum drinking age laws) and **to demographic trends** (e.g., the aging of the population and the increased proportion of female drivers) (Dang, 2008).

However, during this period there also was substantial **public attention** to the issue of alcohol-impaired driving, a growth of grassroots organizations such as Mothers Against Drunk Driving and Remove Intoxicated Drivers, increased Federal programs and funding, State task forces, increased enforcement and intensive publicity, all of which combined to help address this critical traffic safety problem.



1. Alcohol-Impaired and Drugged Driving



Source: NHTSA, 2012a



1. Alcohol-Impaired and Drugged Driving

Four basic strategies are used to reduce alcohol-impaired crashes and drinking and driving:

1. **Deterrence:** enact, publicize, enforce, and adjudicate laws prohibiting alcohol-impaired driving so that people choose not to drive impaired;
2. **Prevention:** reduce drinking and keep drinkers from driving;
3. **Communications and outreach:** inform the public of the dangers of impaired driving and establish positive social norms that make driving while impaired unacceptable;
4. **Alcohol treatment:** reduce alcohol dependency or addiction among drivers.

1. Alcohol-Impaired and Drugged Driving

Enforcement

Strong evidence that enforcement in **traffic leads to benefits in public health** (Tay, 2005).

Deterrence assumptions:

- people must **know the rules**
- must be able **to use this knowledge**
- benefits of **rule breaking must be less** than cost of threat

Deterrence theory - deterrence increases as a function of:

- certainty
- severity
- imminence of punishment

2. Seat Belts and Child Restraints

Research has shown that **correctly using an appropriate child restraint or seat belt is the single most effective way to save lives** and reduce injuries in crashes. Lap and shoulder combination seat belts, when used, reduce the risk of fatal injury to front-seat passenger car occupants by 45% and the risk of moderate-to-critical injury by 50% (NHTSA, 2001).

NHTSA estimates that correctly used **child restraints** are even more effective than seat belts in reducing fatalities. Child restraints reduce fatalities by 71% for infants younger than 1 year old and by 54% for children 1 to 4 years old in passenger cars.

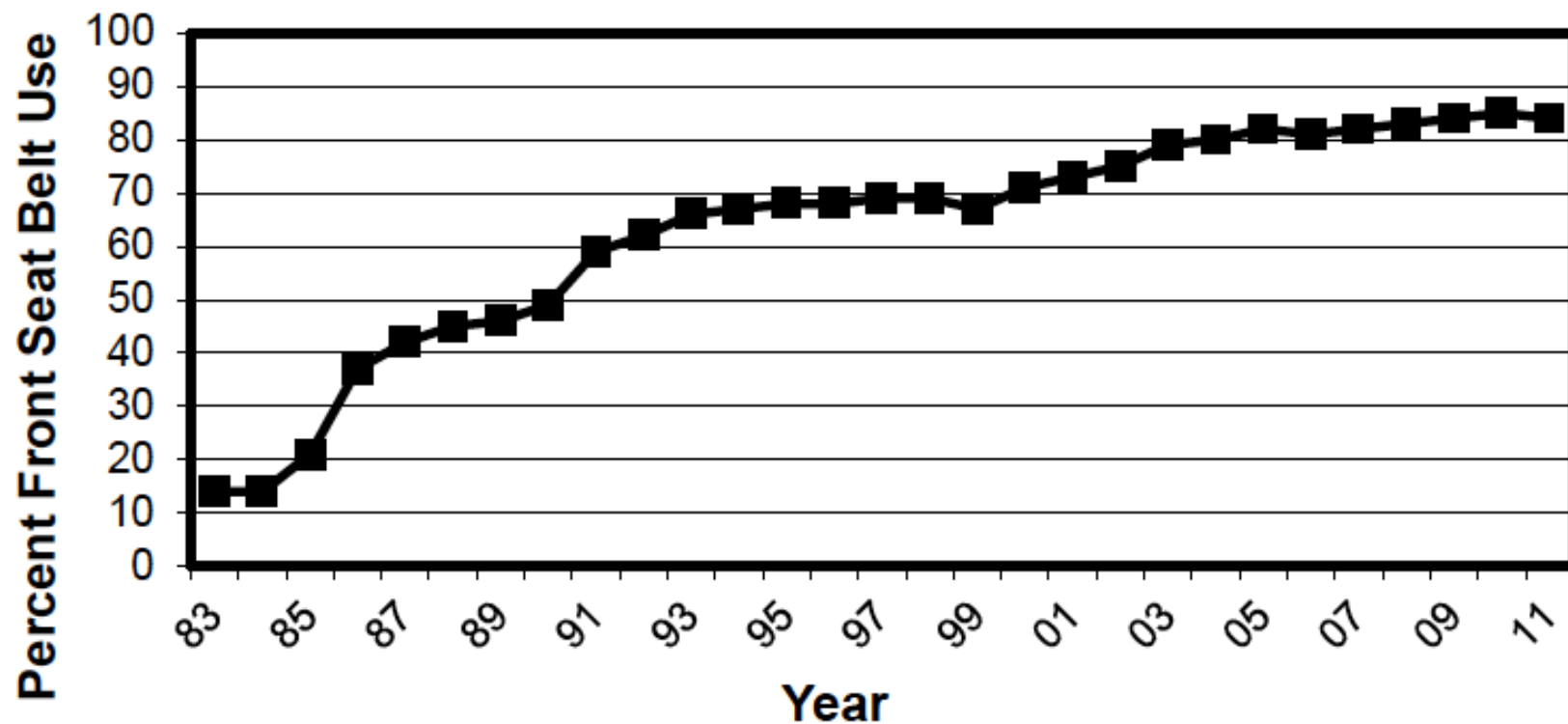


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U.S. Seat Belt Use: 1983-2011



Source: NHTSA, National Occupant Protection Use Survey (NOPUS)

2. Seat Belts and Child Restraints

The **most effective strategy** for achieving and maintaining high belt use is **highly publicized high-visibility enforcement of strong occupant restraint use laws.**

The effectiveness of high visibility enforcement has been documented repeatedly in the United States and abroad. The strategy's three components – **laws, enforcement, and publicity** – cannot be separated: effectiveness decreases if any one is weak or lacking (Nichols & Ledingham, 2008; Tison & Williams, 2010).



3. Aggressive Driving and Speeding

Aggressive driving is generally understood to mean driving actions that **markedly exceed the norms of safe driving** behavior and that **directly affect other road users by placing them in unnecessary danger**. Aggressive driving may also involve driver anger, attempts to gain an advantage over other drivers, and **deliberate** violations and deviations from normal traffic speeds (NCHRP, 2003a).

Multiple violations that encroach on others' safe space, such as **driving much faster than prevailing speeds, following too closely, making unsafe lane changes, and running red lights**.

3. Aggressive Driving and Speeding

Aggressive driving, speeding extensively, and red-light running all involve **traffic law violations**. Therefore, **deterrence through traffic law enforcement** is the basic behavioral strategy that has been used to **control them**. This strategy involves the same components used to deter alcohol-impaired driving or seat belt nonuse: **highly publicized and highly visible enforcement of practical, sound, and broadly accepted laws**.

Environmental and vehicular measures also can be effective. As examples, traffic **calming measures** can reduce speeds, especially on local roads (TRB, 1998), but these must be carefully implemented so as not to shift speeding or safety problems to other locations.

3. Aggressive Driving and **Speeding**

It is important to distinguish extensive **speeding much over the limit** (20 km/h and more) – which is accounted for aggressive driving, and speeding slightly over the limit (up to 20 km/h) which might be accounted as **unintended or culturally acceptable behavior** (as a social norm).

The high speeds in our road transport system are a **general problem of almost all car drivers**.



3. Aggressive Driving and **Speeding**

- Relationship between speeds and accidents: **Göran Nilsson** did a series of analyses that lead to what is called the **exponential law** (among others, Nilsson 2000)
- Studies on selected road sections in different countries: showed a **systematic relationship between average speeds on road sections and the number of accidents**.
- Empirical studies in Sweden, Denmark, USA, Australia, the Netherlands among others
- Relationship between changes of the speed level (average speed) and changes in accident numbers is the following:



3. Aggressive Driving and **Speeding**

$(v_1/v_0) \rightarrow$ number of accidents

$(v_1/v_0)^2 \rightarrow$ number of injured road users

$(v_1/v_0)^3 \rightarrow$ number of severely injured road users

$(v_1/v_0)^4 \rightarrow$ number of killed road users

v_0 = speed before change, v_1 = speed after change

Speed change: 90 \rightarrow 91 \rightarrow +1,01

All injury accidents: 1400 \rightarrow 1431 \rightarrow +2,20

All accidents with severely injured: 500 \rightarrow 520 \rightarrow +3,40

All fatal accidents: 100 \rightarrow 104 \rightarrow +4,50



3. Aggressive Driving and **Speeding**

$$N_{FA1} = N_{FA0} (V_1/V_0)^4 = 100 (91/90)^4 = 100 * 1,045 = 104,5$$

N_{FA0} = number of fatal accidents at the old speed (= "before") = 100

N_{FA1} = number of fatal accidents at the new speed (= "after")

V_0 = speed level before = 90

V_1 = speed level after = 91

In this special case there is an **increase in fatal accidents of 4,5% while the increase in speed was only 1,011%.**



3. Aggressive Driving and Speeding

1. Laws

Countermeasure	Effectiveness	Cost	Use	Time
1.1 Speed limits	★ ★ ★ ★ ★ [†]	\$	High	Short
1.2 Aggressive driving laws	★	\$	Low	Short

[†] When enforced and obeyed

2. Enforcement

Countermeasure	Effectiveness	Cost	Use	Time
2.1 Automated enforcement	★ ★ ★ ★ ★	\$\$\$ [†]	Medium	Medium
2.2 High-visibility enforcement	★ ★	\$\$\$	Low ^{††}	Medium
2.3 Other enforcement methods	★ ★	Varies	Unknown	Varies



3. Aggressive Driving and Speeding

3. Penalties and Adjudication

Countermeasure	Effectiveness	Cost	Use	Time
3.1 Penalty types and levels	★ ★	Varies	High	Low
3.2 Diversion and plea agreements	★	Varies	Unknown	Varies

4. Communications and Outreach

Countermeasure	Effectiveness	Cost	Use	Time
4.1 Public Information supporting enforcement	★ ★ ★	Varies	Medium	Medium

4. Distracted and Drowsy Driving

Distracted driving and drowsy driving are common, though both are **difficult to define, measure, and sometimes observe**. Both distracted and drowsy driving result in large part from **lifestyle patterns and choices**: they are **societal issues** rather than just driving and transportation system issues.

For these reasons, **few behavioral highway safety countermeasures have been shown to reduce distracted or drowsy driving**, although a number of new countermeasures are currently being developed and evaluated.

4. Distracted and Drowsy Driving

Distraction occurs when a **driver's attention is diverted away** from driving to some other activity. A distraction can be produced by something a **driver sees or hears, some physical task not directly involved in driving such** as eating or operating the car radio, or mental activities such as conversations on a cell phone (NHCRP, 2005, Section III).

NHTSA has previously estimated that **driver distraction is involved in 16% of all fatalities** (NHTSA, 2010a). The true role of distraction in crashes may be even **higher** because pre-crash distractions often leave no evidence for law enforcement officers or crash investigators to observe, and drivers are understandably reluctant to admit to being distracted following a crash.

4. Distracted and Drowsy Driving

Among the behaviors that drivers reported doing on at least some trips (Tison, Chaudhary, & Cosgrove, 2011):

- 80% talked to other passengers;
- 66% adjusted the car radio;
- 51% used a navigation system;
- 46% ate or drank;
- 41% made or accepted phone calls;
- 30% used a portable music player with speakers;
- 27% interacted with children in the back seat;
- 26% used a smartphone for driving directions;
- 22% changed CDs, DVDs, or tapes;
- 10% read e-mail or text messages;
- 6% did personal grooming;
- 6% sent text messages or email.

4. Distracted and Drowsy Driving

The obvious way to reduce distracted or drowsy driving crashes is **to convince or require drivers to get enough sleep and to pay attention to their driving.**

These are very difficult goals. Drowsy driving may result from **lifestyles** that include **insufficient or irregular sleep** (shift workers, for instance) or from medical problems – issues beyond a driver's immediate control.

Many drivers consider some distractions, such as eating or drinking, listening to the radio, or talking on a cell phone, to **be important and common activities** and are unlikely to give them up.

Moreover, studies indicate that drivers themselves **are poor judges** of the performance decrements that result from distracting activities (Horrey, Lesch, & Garabet, 2008).

4. Distracted and Drowsy Driving

Behavioral strategies to reduce distracted or drowsy driving attempt **to remove some of the underlying causes or to promote awareness of the risks.**

Generally, the standard behavioral countermeasures of laws, enforcement, and sanctions, which are used successfully for alcohol impairment, seat belt use, aggressive driving, and speeding, are **not effective** for distracted or drowsy drivers.

One exception is for **young drivers**: some graduated driver licensing provisions help reduce distracted and drowsy driving **by limiting the number of passengers, prohibiting nighttime driving, and restricting cell phone use** (see Chapter 6, Sections 1.3 to 1.5).



4. Distracted and Drowsy Driving

Distracted or drowsy driving that is related to a **driver's job** may be reduced through employer **policies and programs**.

Drowsy driving caused by **medical conditions** such as sleep apnea or by drugs or medications may be addressed **through policies, communications, and outreach**.

Environmental strategies can address both distracted and drowsy driving. **Rumble strips**, both on the shoulder and the centerline, have demonstrated their effectiveness in preventing crashes caused by inattention or drowsiness.

4. Distracted and Drowsy Driving

Vehicular strategies also affect driver distraction and drowsiness. In-car televisions, vehicle location and route-finding systems, and other new technologies in vehicles may create **more potential distractions** (Hedlund, Simpson, & Mayhew, 2006).

On the other hand, in-vehicle technology in the future may be able to **detect** driver distraction or drowsiness, by monitoring driver performance, and then alert drivers (Donmez, Boyle, & Lee, 2007; May & Baldwin, 2009; Papadelis et al., 2007). Such driver assistance technologies include **lane departure warning, crash-imminent braking, and forward collision warning**.

1. Laws and Enforcement

Countermeasure	Effectiveness	Cost	Use	Time
1.1 GDL requirements for beginning drivers	★ ★ ★ ★ ★ [†]	\$	High	Medium
1.2 Cell phone and text messaging laws	★ ★	\$	Medium	Short
1.3 High Visibility Cell phone/text messaging enforcement	★ ★ ★ ★	\$\$\$	Low	Medium
1.4 General drowsiness and distraction laws	★	Varies	High ^{††}	Short

[†] Effectiveness proven for nighttime and passenger restrictions

^{††} Included under reckless driving; use of explicit drowsiness and distraction laws is low

2. Communications and Outreach

Countermeasure	Effectiveness	Cost	Use	Time
2.1 Drowsy driving	★	\$\$	Unknown	Medium
2.2 Distracted driving	★	\$\$	High	Medium

3. Other Countermeasures

Countermeasure	Effectiveness	Cost	Use	Time
3.1 Employer programs	★ ★	\$	Unknown	Short
3.2 Education Regarding Medical conditions and medications	★	Variable	Unknown	Medium

5. Motorcycle Safety

A motorcycle offers riders almost **no protection in a crash**. Crash data confirm these observations. NHTSA estimates that per vehicle mile traveled, motorcyclists are about **25 times** more likely than passenger car occupants to die in traffic crashes. Motorcyclists are killed at a rate of 21.45 per 100 million vehicle miles traveled (VMT) as compared to 0.87 fatalities/VMT for passenger cars (NHTSA, 2011a).

Speeding is more prevalent in fatal crashes involving motorcycle operators than among other types of motor vehicle operators. 35 percent of all motorcycle riders involved in fatal crashes in 2009 were speeding, compared to 23% of passenger car drivers (NHTSA, 2011a). In 2009, **30% of the motorcycle riders killed in crashes had BACs of .08 g/dL or higher** (NHTSA, 2011a). **Forty-three percent** of fatally injured motorcyclists were **not wearing helmets** (NHTSA, 2011a),

5. Motorcycle Safety

The most important objectives for improving motorcycle safety are **to increase helmet use, reduce alcohol impaired motorcycle riding, increase proper licensing and the promotion of lifelong learning through the completion of rider training courses.** These objectives are all difficult to accomplish.

Another objective is to **increase other drivers' awareness of motorcyclists** by increasing **the visibility** of motorcyclists and by **educating other drivers** on the importance of sharing the road with motorcycles.



5. Motorcycle Safety

1. Motorcycle Helmets

Countermeasure	Effectiveness	Cost	Use	Time
1.1 Universal coverage state motorcycle helmet use laws	★ ★ ★ ★ ★	\$	Medium	Short
1.2 Helmet use promotion programs	★	Varies	Unknown	Varies
1.3 Helmet law enforcement; noncompliant helmets	★	\$	Unknown	Medium

2. Alcohol Impairment

Countermeasure	Effectiveness	Cost	Use	Time
2.1 Alcohol impairment: detection, enforcement, and sanctions	★ ★ ★	Varies	Unknown	Varies
2.2 Alcohol impairment: communications	★	\$\$	Medium	Medium



5. Motorcycle Safety

3. Motorcycle Rider Licensing and Training

Countermeasure	Effectiveness	Cost	Use	Time
3.1 Motorcycle rider licensing	★	\$	High	Medium
3.2 Motorcycle rider training	★	\$\$	High	Varies

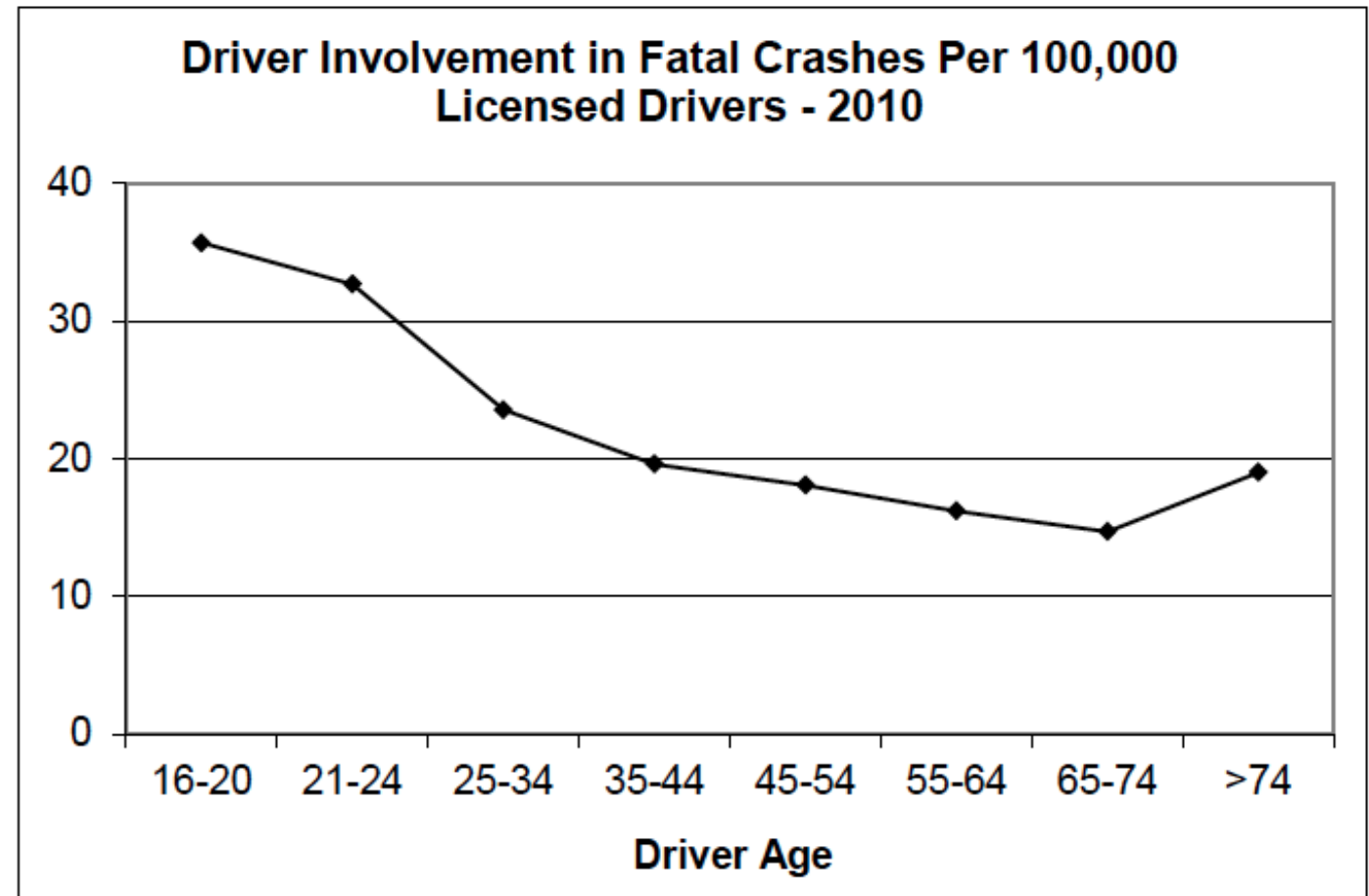
4. Communications and Outreach

Countermeasure	Effectiveness	Cost	Use	Time
4.1 Conspicuity and protective clothing	★	Varies	High	Medium
4.2 Other driver awareness of motorcyclists	★	Varies	High	Medium



6. Young Drivers

Motor vehicle
crashes are the
**leading cause
of death** for
teenagers in
most countries.



Source: Traffic Safety Facts 2010 (NHTSA, 2012b, Table 62). FARS data.

6. Young Drivers

Graduated driver licensing addresses both the inexperience and immaturity of young drivers. GDL provides a structure in which beginning drivers gain substantial driving experience in less risky situations. GDL's effectiveness in reducing crashes has been demonstrated many times (Russell, Vandermeer, & Hartling, 2011; Shope, 2007; Simpson, 2003; Williams, Tefft, & Grabowski, 2012).

6. Young Drivers

Driver education was developed to teach both driving skills and safe driving practices. Based on evaluations to date, school-based driver education for beginning drivers does a good job at teaching driving skills, but does not reduce crashes. Rather, some research has suggested that it lowers the age at which teenagers become licensed, and therefore **increases exposure**, **so its overall effect is to increase crashes** (Roberts et al., 2006; Thomas, Blomberg, & Fisher, 2012; Vernick et al., 1999).

6. Young Drivers

Parents play a key role in their teenagers' driving. Parents can be involved explicitly and formally through GDL requirements such as minimum hours of supervised driving practice, or they can be involved voluntarily and informally.

Recently, **technologies** have become available to assist parents in monitoring their newly licensed teen driver.

Young drivers are subject to **two traffic laws** that apply only to them: GDL and the zero tolerance BAC laws.

Enforcement is critical if these laws are to have any effect. It has been suggested that a vehicle **decal** identifying a driver as “young” and subject to GDL requirements, may be beneficial for enforcement reasons.



1. Graduated Driver Licensing

Countermeasure	Effectiveness	Cost	Use	Time
1.1 Graduated driver licensing (GDL)	★ ★ ★ ★ ★	\$	High	Medium
1.2 Learner's permit length, supervised hours	★ ★ ★ ★ ★	\$	High	Medium
1.3 Intermediate - nighttime restrictions	★ ★ ★ ★ ★	\$	High	Medium
1.4 Intermediate - passenger restrictions	★ ★ ★ ★ ★	\$	High	Medium
1.5 Cell phone restrictions	★ ★	\$	Medium	Medium
1.6 Belt use requirements	★ ★	\$	Low	Medium
1.7 Intermediate - violation penalties	★	\$	High	Medium

2. Driver Education

Countermeasure	Effectiveness	Cost	Use	Time
2.1 Pre-licensure driver education	★	\$\$\$	Medium	Long
2.2 Post-licensure driver education	★	\$\$\$	Low	Long



6. Young Drivers

3. Parents

Countermeasure	Effectiveness	Cost	Use	Time
3.1 Parent roles in teaching and managing	★ ★	\$	Medium	Short

4. Traffic Law Enforcement

Countermeasure	Effectiveness	Cost	Use	Time
4.1 Enforcement of GDL and zero-tolerance laws	★ ★ ★	\$\$	Unknown	Short



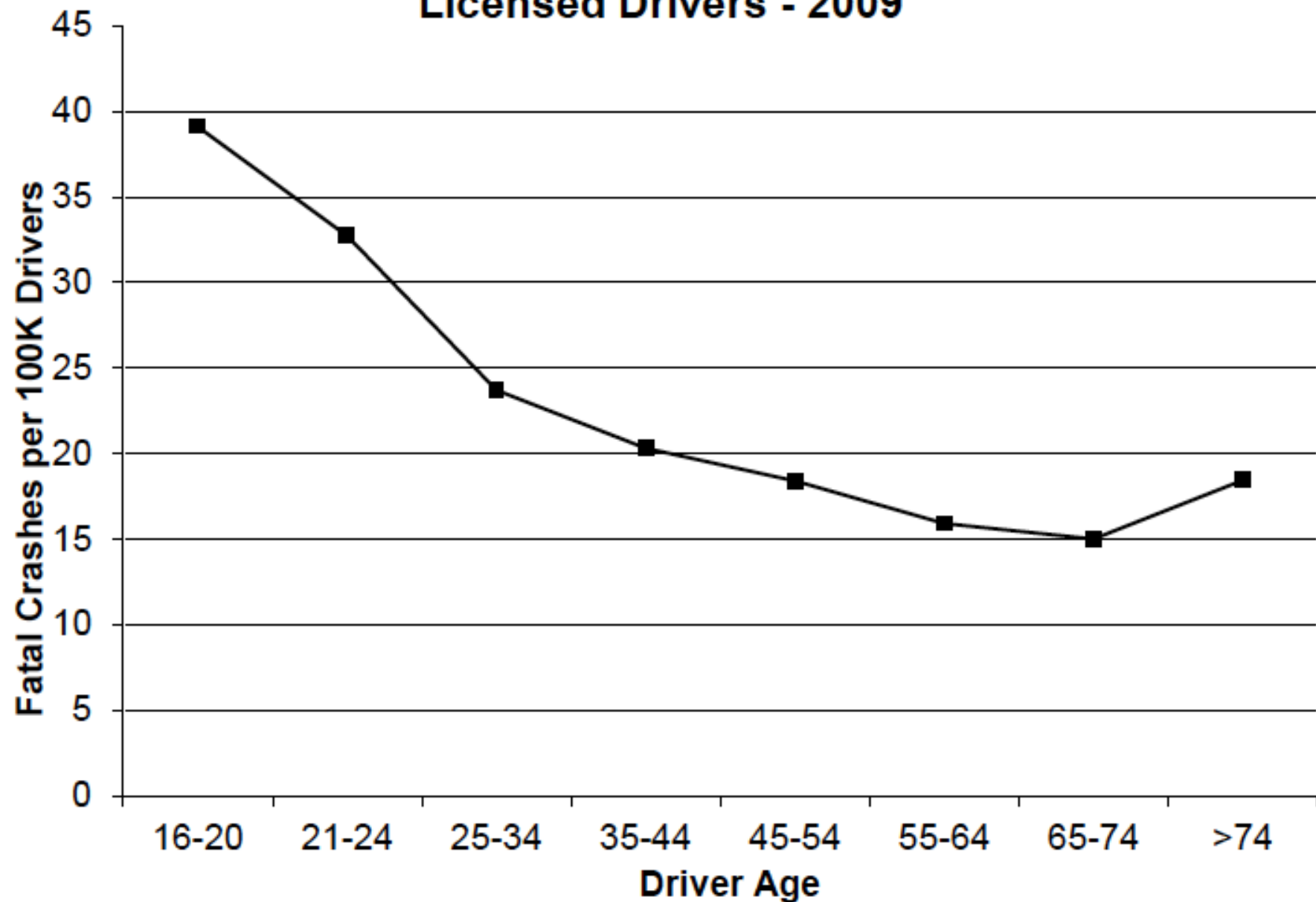
7. Older Drivers

As **drivers age**, their physical and mental abilities, driving behaviors, and crash risks all change, though age **itself does not determine driving performance**. Many features of the current system of roads, traffic signals and controls, laws, licensing practices, and **vehicles were not designed to accommodate older drivers**.

People 65 and older; number and proportion of total populations

65 & up year	resident population		licensed drivers		drivers in fatal crashes	
	million	%	million	%		%
1982	26.8	11.6%	16.8	11.2%	3,894	7.0%
2010	40.3	12.7%	33.7	16.1%	5,560	12.5%
2030	72*	19.3%*	57- 61**	> 20%**	?	?

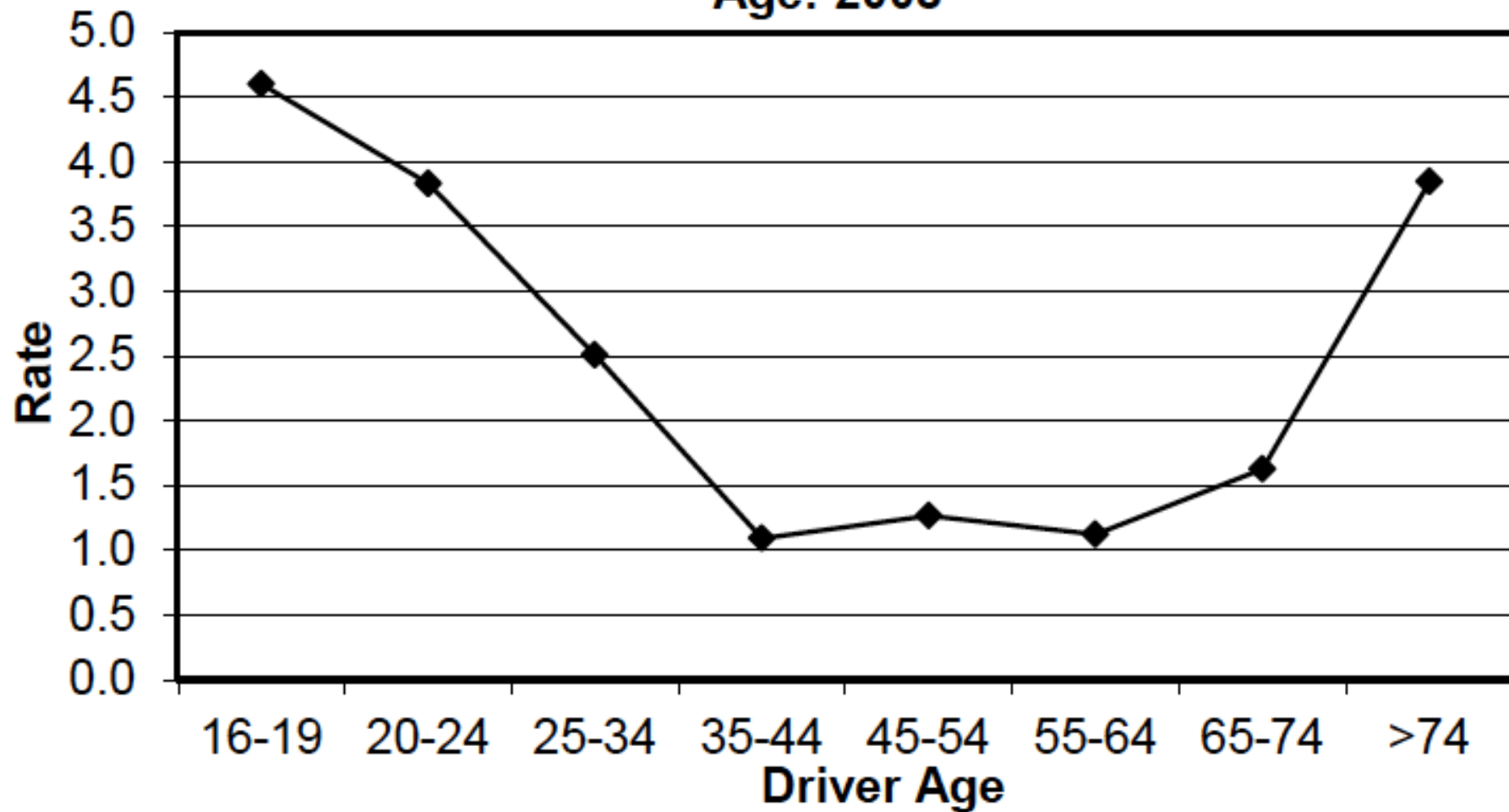
Driver Involvement in Fatal Crashes per 100,000 Licensed Drivers - 2009



Source: Traffic Safety Facts 2009 (NHTSA, 2011, Table 64)



Fatal Crashes per 100 Million Miles Traveled by Driver Age: 2008



Source: Insurance Institute for Highway Safety [IIHS] (2012)

7. Older Drivers

The **overall goal** is to enable older drivers to **retain as much mobility through driving as is consistent with safety on the road for themselves, their passengers, and other road users.**

1. **Educate and train** older drivers to assess their driving capabilities and limitations, improve their skills when possible, and voluntarily limit their driving to circumstances in which they can drive safely.
2. Help drivers **adapt to medical** or functional conditions that may affect driving, through treatment (such as eyeglasses or cataract surgery to improve vision) or through **vehicle adaptations.**
3. **Identify older drivers who cannot drive safely**, in certain situations or at all, and restrict or revoke their driver's licenses.
4. **Increase seat belt use**, because seat belts are even more effective for older than for younger occupants.

1. Communications and Outreach

Countermeasure	Effectiveness	Cost	Use	Time
1.1 Formal courses for older drivers	★ ★	\$	Low	Short
1.2 General communications and education	★ ★	\$	Unknown	Short

2. Licensing

Countermeasure	Effectiveness	Cost	Use	Time
2.1 License screening and testing	★ ★ ★ ★	\$\$	High	Medium
2.2 Referring older drivers to DMVs	★ ★ ★ ★	\$\$	Low	Medium
2.3 License restrictions	★ ★ ★ ★	\$	Unknown	Short
2.4 Medical advisory boards	★ ★	Varies	High	Medium
2.5 License renewal policies	★ ★	\$\$\$	Medium	Medium

3. Traffic Law Enforcement

Countermeasure	Effectiveness	Cost	Use	Time
3.1 Law enforcement roles	★ ★ ★	Varies	Medium	Varies

8. Pedestrians

Pedestrians accounted for **13% of total traffic fatalities and 3% of total injuries** (NHTSA, 2012). Of the pedestrian casualties:

- **Children** 15 and younger accounted for 7% of the pedestrian fatalities in 2010 and 23% of all pedestrians injured in traffic crashes;
- 19% of those killed **were adults 65 and older**;
- 69% of those killed **were males**;
- 33% of pedestrians fatally injured had a **BAC of .08 or greater** (NHTSA, 2012).



8. Pedestrians

Pedestrian crashes can be classified **into types** based on pedestrian and motor vehicle pre-crash actions and crash location:

1. The largest major grouping was crashes occurring at or **within 50 feet of an intersection**, accounting for 32% of all crashes. Of these intersection crashes, 30% involved a **turning vehicle**; another 22% involved a **pedestrian dashing into the intersection**, and 16% involved a **driver violation** (e.g., running a red light).
2. The second major grouping was crashes occurring in the **middle of a block**, accounting for 26%.
3. Only 7% of the crashes involved a **pedestrian walking along a roadway** not on a sidewalk.

8. Pedestrians

Countermeasures are primarily aimed at improving safety behaviors of pedestrians and drivers through **education and enforcement measures**.

Basic countermeasure principles include **reducing vehicle speed, which allows pedestrians and drivers more time to react and reduces impact forces if crashes do occur; reducing exposure** to known risky situations through behavioral and environmental countermeasures (without necessarily discouraging walking); and **increasing enforcement of pedestrian-friendly laws**.



8. Pedestrians

1. Pre-school-age Children

Countermeasure	Effectiveness	Cost	Use	Time
1.1 Children's safety clubs	★ ★	Varies	Unknown	Unknown
1.2 Child supervision	★	\$	Unknown	Short

2. School-age Children

Countermeasure	Effectiveness	Cost	Use	Time
2.1 Elementary-age child pedestrian training	★ ★ ★	\$	Unknown	Short
2.2 Safe Routes to School (SRTS)	★ ★	\$	High	Short
2.3 Child school bus training	★ ★	\$	High	Short



3. Impaired Pedestrians

Countermeasure	Effectiveness	Cost	Use	Time
3.1 Communications and outreach	★ ★	Varies	Low	Medium
3.2 “Sweeper” patrols of impaired pedestrians	★	\$\$	Low	Medium

4. All Pedestrians

Countermeasure	Effectiveness	Cost	Use	Time
4.1 Pedestrian safety zones	★ ★ ★ ★	\$\$\$	Low	Medium
4.2 Reduce and enforce speed limits	★ ★ ★	\$	High	Varies
4.3 Conspicuity enhancement	★ ★ ★	\$	Low	Medium
4.4 Targeted enforcement	★ ★ ★	\$\$	Low	Short
4.5 Driver training	★	\$	Low	Medium
4.6 Pedestrian gap acceptance training	★	\$\$	Unknown	Medium

9. Bicycles

Bicyclists accounted for **2% of total traffic fatalities** and 2% of total injuries (NHTSA, 2012). Of the 2010 bicyclist crashes:

- 86% of the bicyclists killed and 75% of those injured were **male**;
- About 21% of bicyclists killed **had a BAC of .08 g/dL** or higher and alcohol use by either bicyclist or driver was reported in more than 34% of fatal crashes (NHTSA, 2012).

The majority of bicyclist fatalities **occurred in urban areas (72%) and at non-intersections (67%)**.

9. Bicycles

Classifying Crash Types:

1. Half (51%) occurred at **intersections** or were related to intersections. The most common type of crash involved bicyclists riding out or through intersections and into the path of a motorist. The second most common type of crash involved motorists failing to yield at intersections.
2. Twenty-two percent of bicycle-motor vehicle crashes occurred at junctions with commercial and **private driveways or alleys**. Children were highly over-represented in these crashes.
3. Twenty-seven percent of bicycle-motor vehicle crashes occurred at **roadway sections with no special features** (meaning no intersections or driveways at the segment near the crash);



9. Bicycles

Several **strategies** may be used to decrease bicycle crashes and injuries.

1. Increase the use of properly fitted **bicycle helmets** by all bicyclists (enforcement of helmet laws to increase compliance).
2. Increase **the conspicuity of bicyclists**.
3. Reduce **distracted riding** or driving behaviors.
4. Decrease riding or driving while **impaired**.
5. **Enact laws** to facilitate safe, predictable, and efficient bicycling in traffic.
6. Increase **traffic law compliance** by both motorists and bicyclists.
7. **Educate** motorists and bicyclists on how they should interact safely with each other and what the relevant laws require.
8. Improve **bicycle handling skills** for bicyclists of all ages.

9. Bicycles

Several **strategies** may be used to decrease bicycle crashes and injuries.

Finally, the idea that **vulnerable road users' safety** may be improved by **increasing the numbers of bicyclists** (and pedestrians) is gaining **traction** and some empirical support. If there are more bicyclists on the road, it may enhance the likelihood that motorists will expect to see a bicyclist and be better prepared to respond appropriately.



9. Bicycles

1. Children

Countermeasure	Effectiveness	Cost	Use	Time
1.1 Bicycle helmet laws for children	★ ★ ★ ★ ★	\$\$	Medium	Short
1.2 Safe Routes to School (SRTS)	★ ★	\$	High	Short
1.3 Bicycle education for children	★ ★	\$	Unknown	Short
1.4 Cycling skills clinics, bike fairs, bike rodeos	★	\$	Unknown	Short

2. Adult Bicyclists

Countermeasure	Effectiveness	Cost	Use	Time
2.1 Bicycle helmet laws for adults	★ ★ ★	\$	Low	Short
2.2 Bicycle safety education for bike commuters	★	\$\$	Low	Medium



9. Bicycles

3. All Bicyclists

Countermeasure	Effectiveness	Cost	Use	Time
3.1 Active lighting and rider conspicuity	★ ★ ★	\$	High*	Varies
3.2 Promote bicycle helmet use with education	★ ★	\$\$\$	Medium	Medium
3.3 Enforcement strategies	★	\$\$	Unknown	Varies
3.4 Bicyclist passing laws	★	\$	Low	Short

*High for active lighting laws; unknown for promoting other conspicuity measures

4. Drivers and Bicyclists

Countermeasure	Effectiveness	Cost	Use	Time
4.1 Driver training	★	\$	Low	Medium
4.2 <i>Share the Road</i> awareness programs	★	\$\$	Unknown	Medium



Thank you for listening!

Based on: Goodwin, A., Kirley, B., Sandt, L., Hall, W., Thomas, L., O'Brien, N., & Summerlin, D. (2013, April). *Countermeasures that work: A highway safety countermeasures guide for State Highway Safety Offices*. 7th edition. (Report No. DOT HS 811 727). Washington, DC: National Highway Traffic Safety Administration.