

Teen Driver Safety: Recent advances and challenges

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Overview

- Magnitude and characteristics
- Risks factors
- Smart vehicle technology
- Graduated Driver Licensing (GDL) systems
- Parental role

Key points

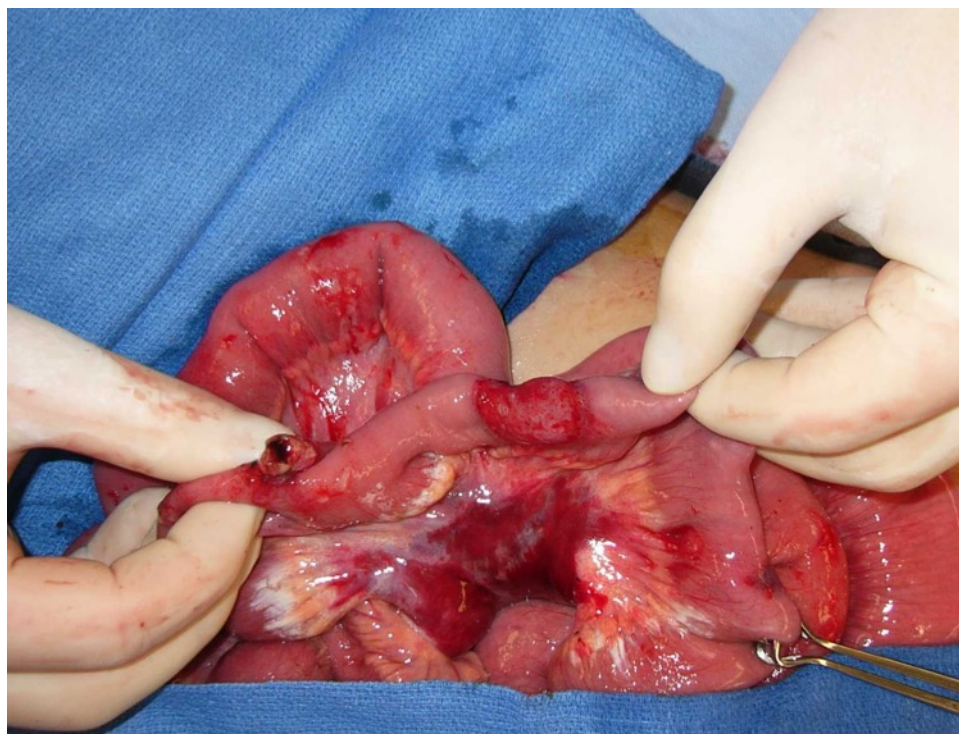
- Teen drivers have crash rates 4X higher than older drivers
- Graduated licensing systems reduce risk and are effective
- Parents need to actively monitor teen drivers

Teen drivers











Why teen drivers are everyone's issue



- 3,000,000 new teen drivers each year
- Teen driver crash rates are 4x that of safest drivers
- Teen driver crashes kill and injure more passengers, other drivers, pedestrians than teens
- "Nowhere else do we mingle so freely with others as when driving." - *Tom Vanderbilt*

Magnitude of the Problem

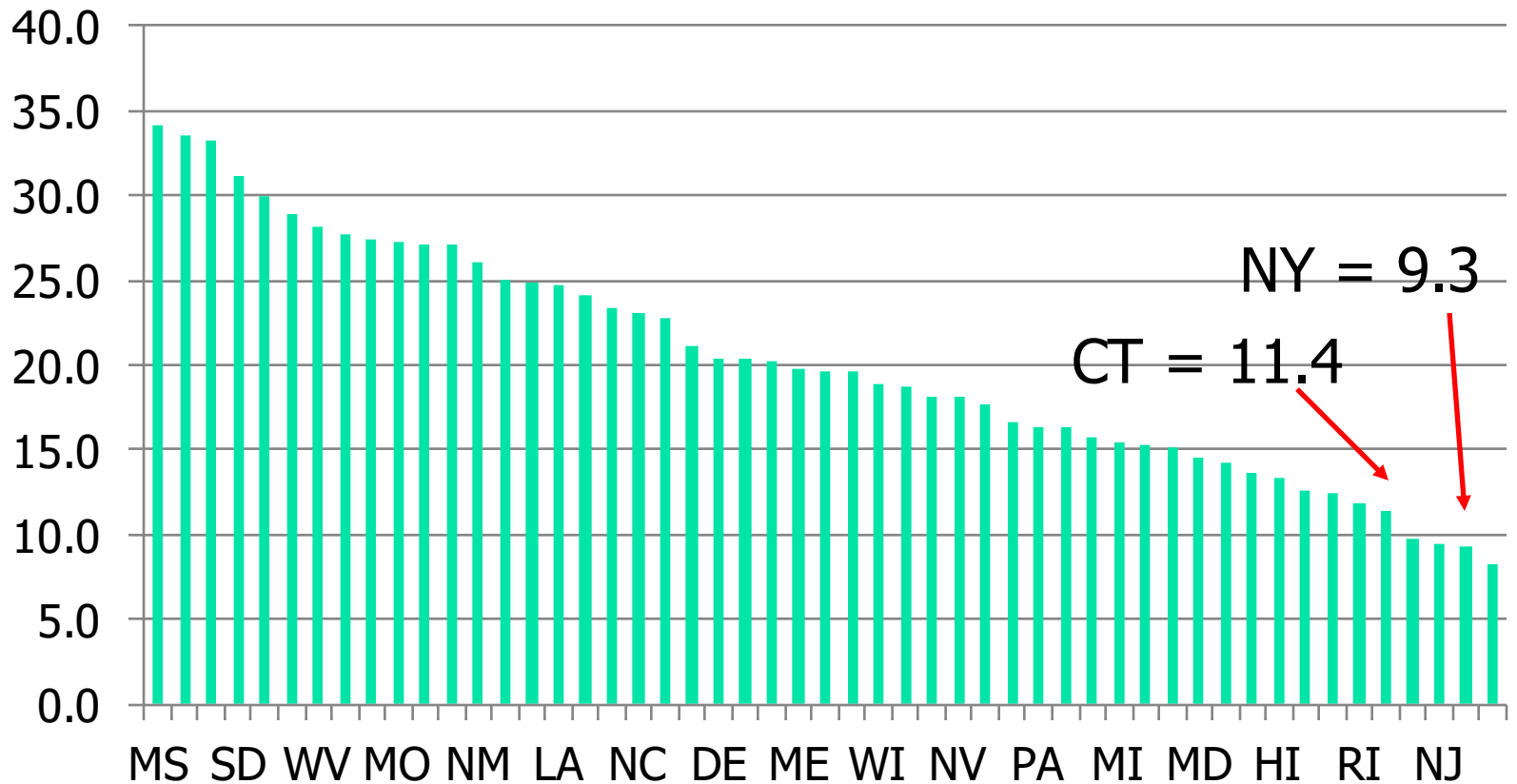
- Leading cause of death for 13-19 yr olds
- 2,550 deaths/yr
- 27,000 hospitalizations
- 299,000 ED visits

Leading causes of death among teenagers, U.S., 2013

	Male	Female	Total
Motor vehicle	1,662	888	2,550
Suicide	1,538	503	2,041
Homicide	1,291	199	1,490
Malignant neoplasms	460	359	819

CDC, (WISQARS), 2013 fatal injury data.

MV deaths per 100,000, 13-19y, 2000-2010, by state (n=58,404)



CDC, WISQARS

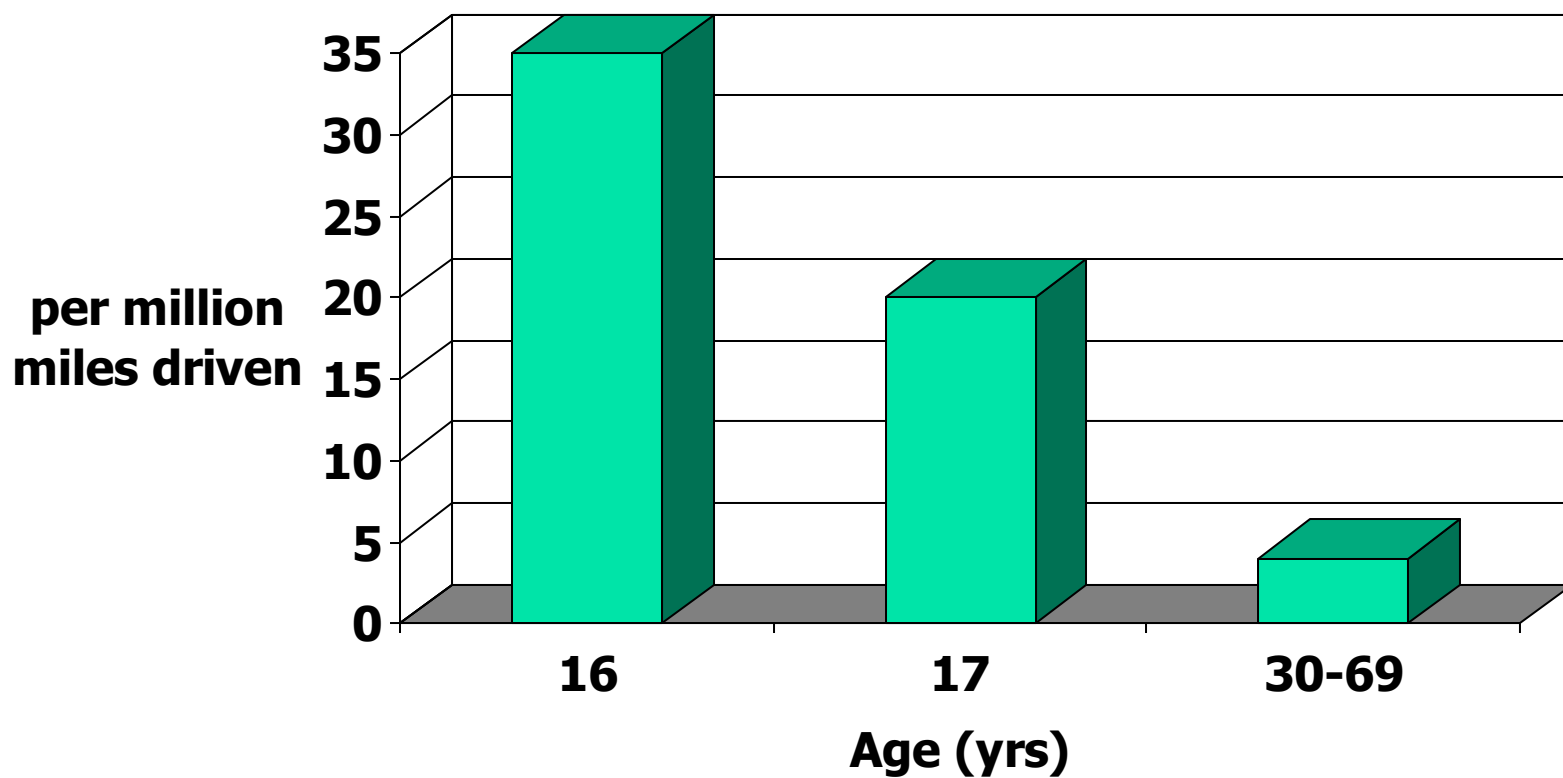
Teen drivers

- Represent 6% of all drivers but 14% of fatal crashes

Fatal teen car crashes

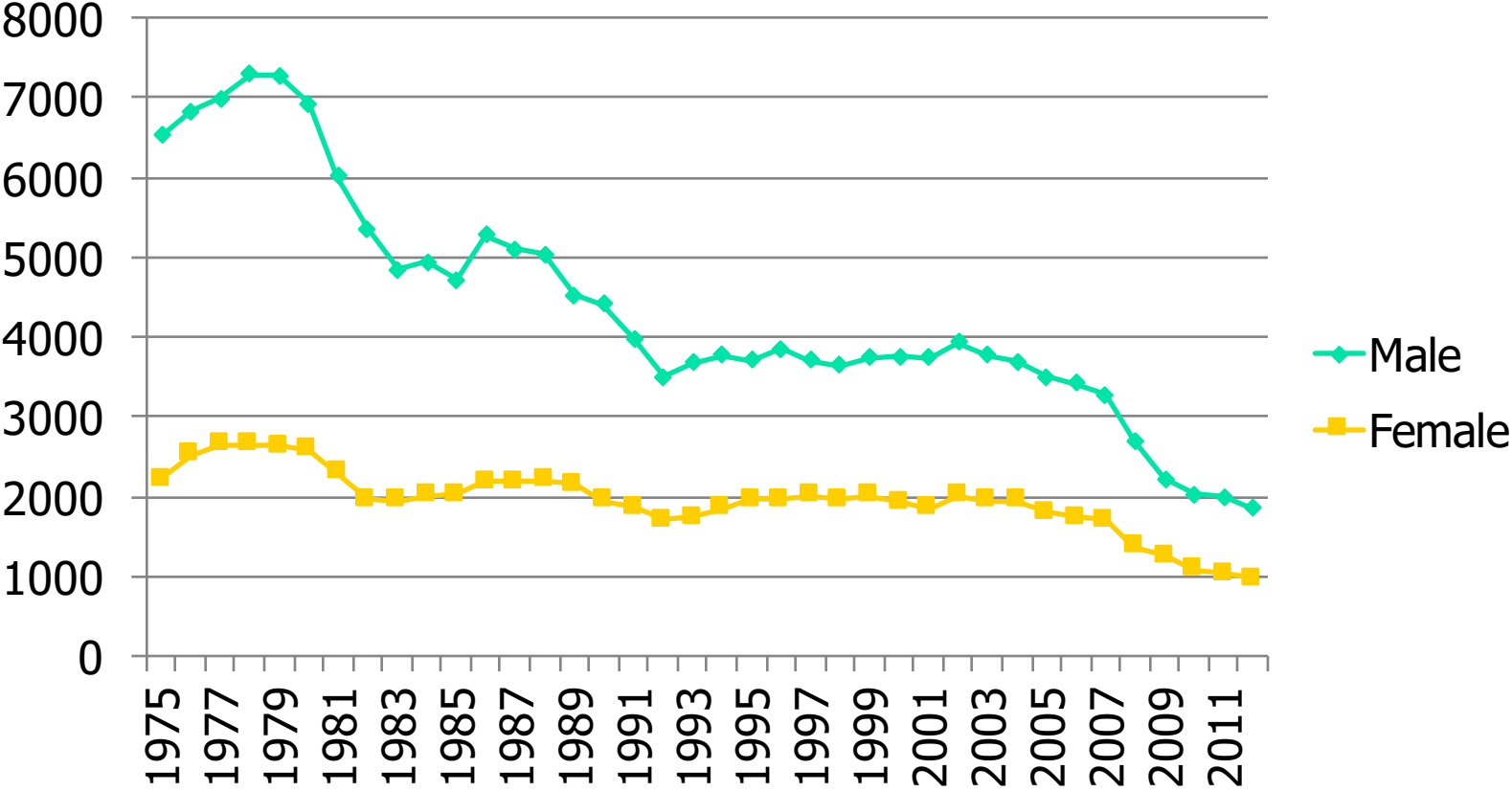
- 2/3 drivers, 1/3 passengers
- 2/3 male

Crash risk by age



J Safety Research, 2003

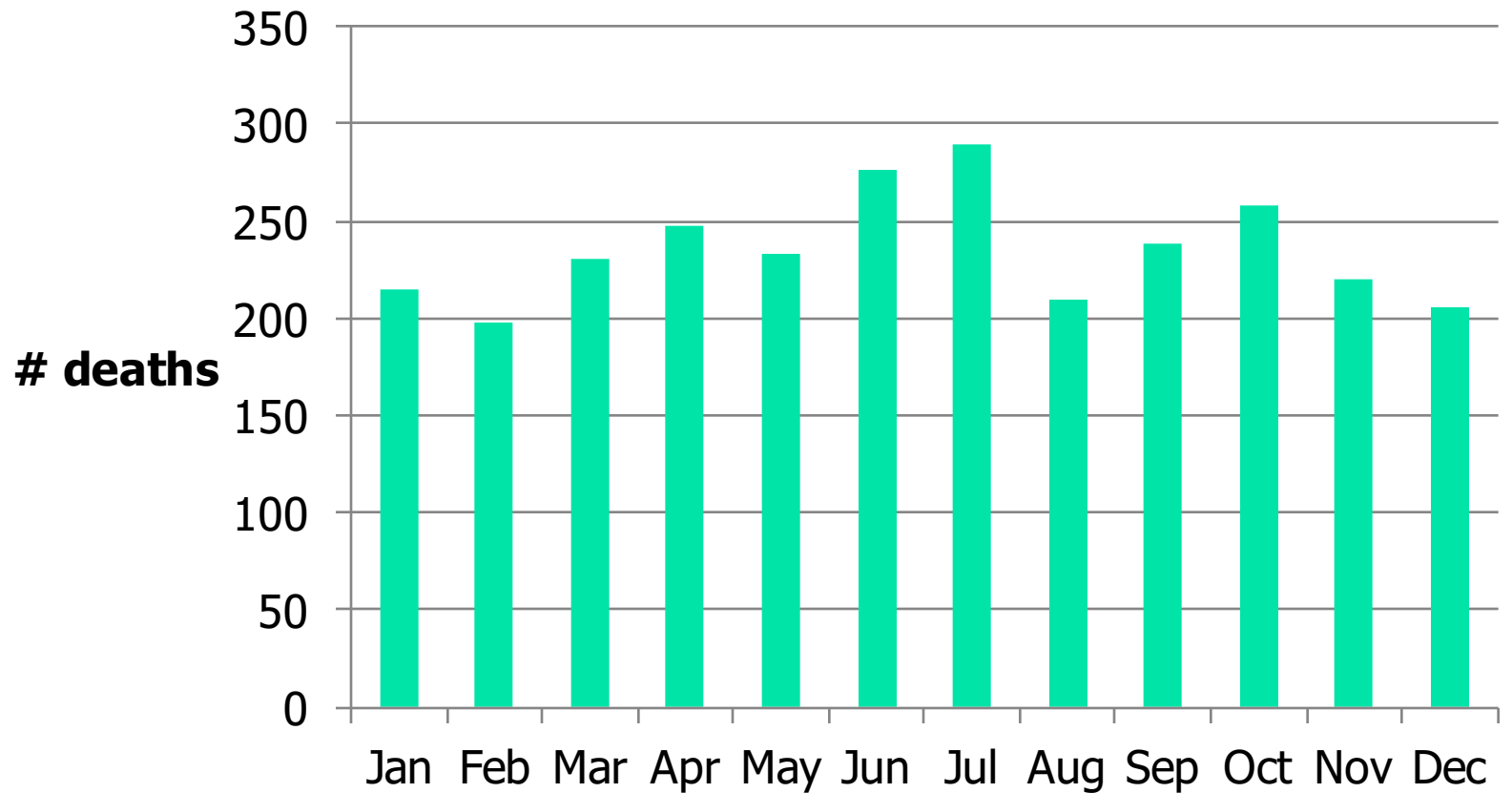
Teenage MVC deaths by gender, 1975-2012



When teenagers died

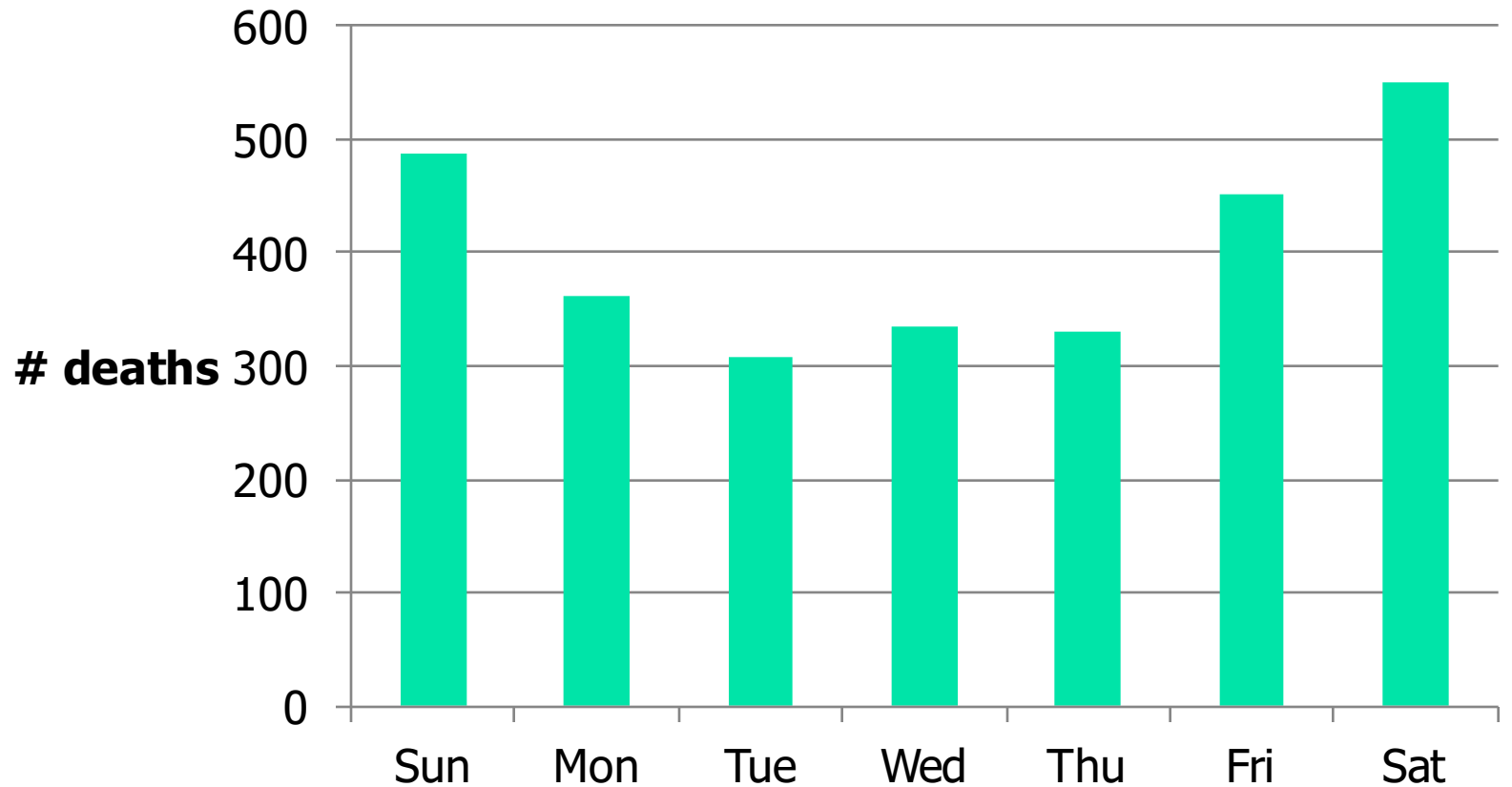


Fatal teen MVCs by month, 2012



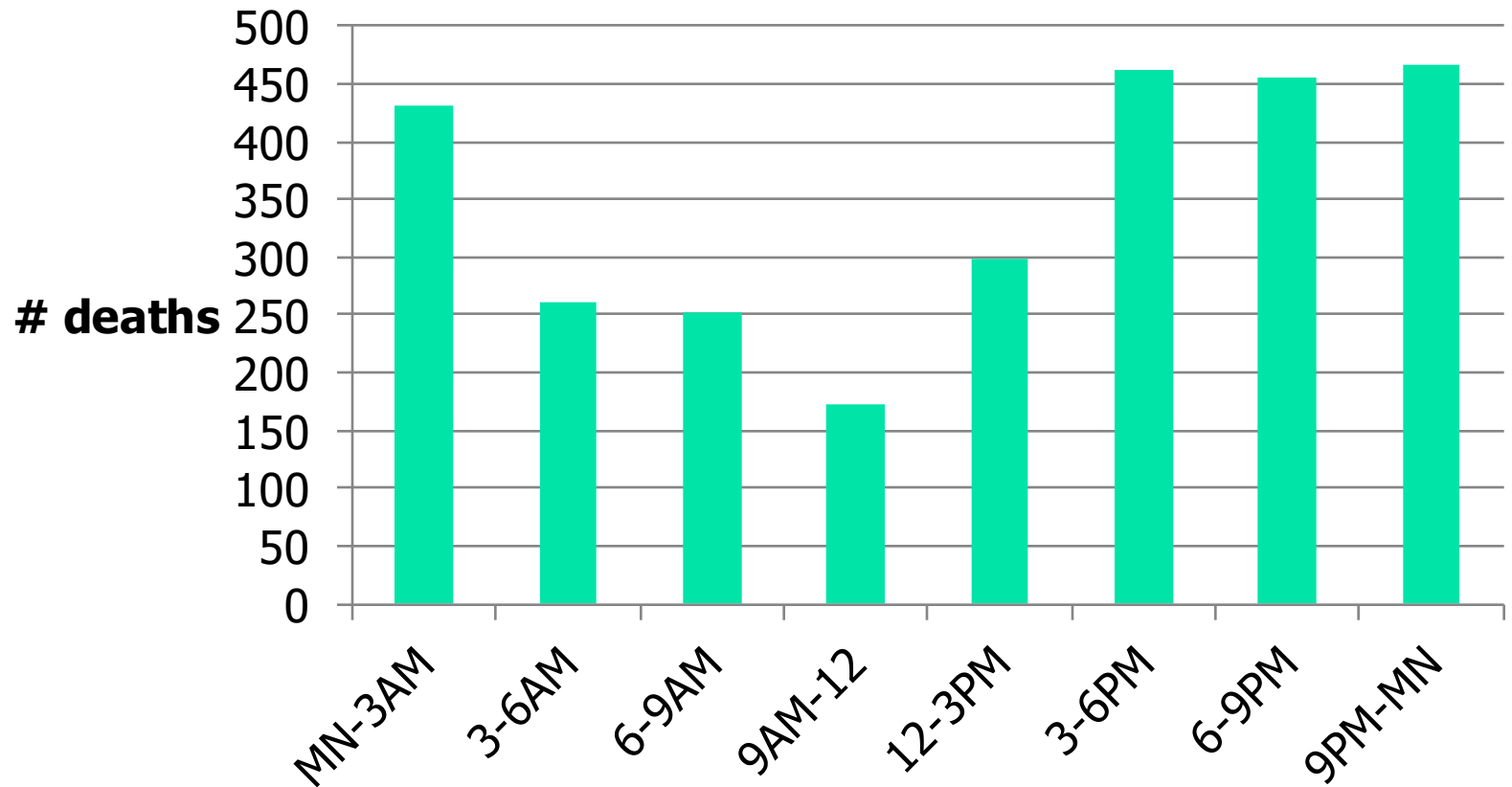
n= 2,823

Fatal teen MVCs by day, 2012



n= 2,823

Fatal teen MVC by time, 2012



Most dangerous times

- Immediately after school
- Late night
- Friday, Saturday
- Summer



Risk factors: Inexperience

- Less proficient:
 - scanning, detecting, and responding to hazards
 - controlling vehicle, especially at high speeds
- learner permit crash rate low

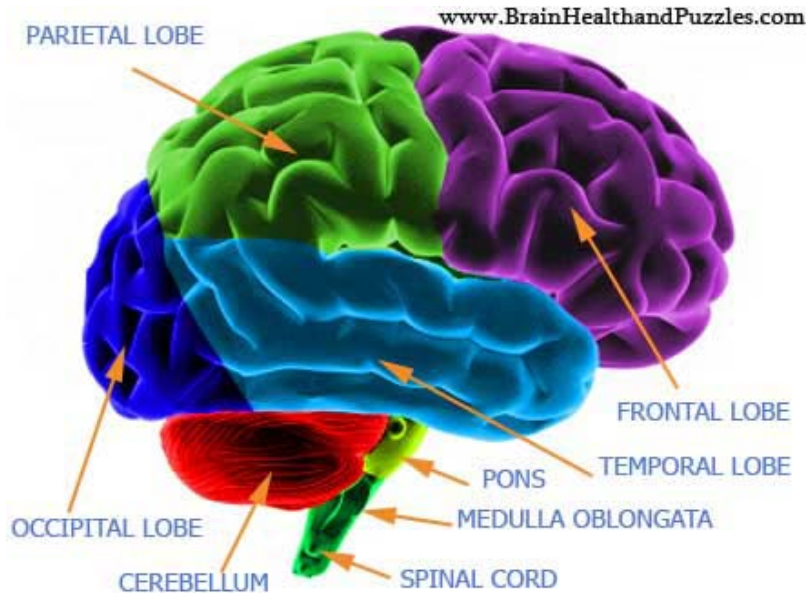
Risk factors: Risk Taking

- Normal to take chances, succumb to peer pressure, overestimate abilities
- Males at high risk
 - social norms and media images

Inj Prev, 2002

Ann NY Acad Sci, 2004

Brain Maturation



- Pre-frontal cortex not fully developed until 22- 25 yrs
 - Planning
 - Impulse control
 - Judgment
 - Decision making

NIMH, 2012

Teen brain physiology

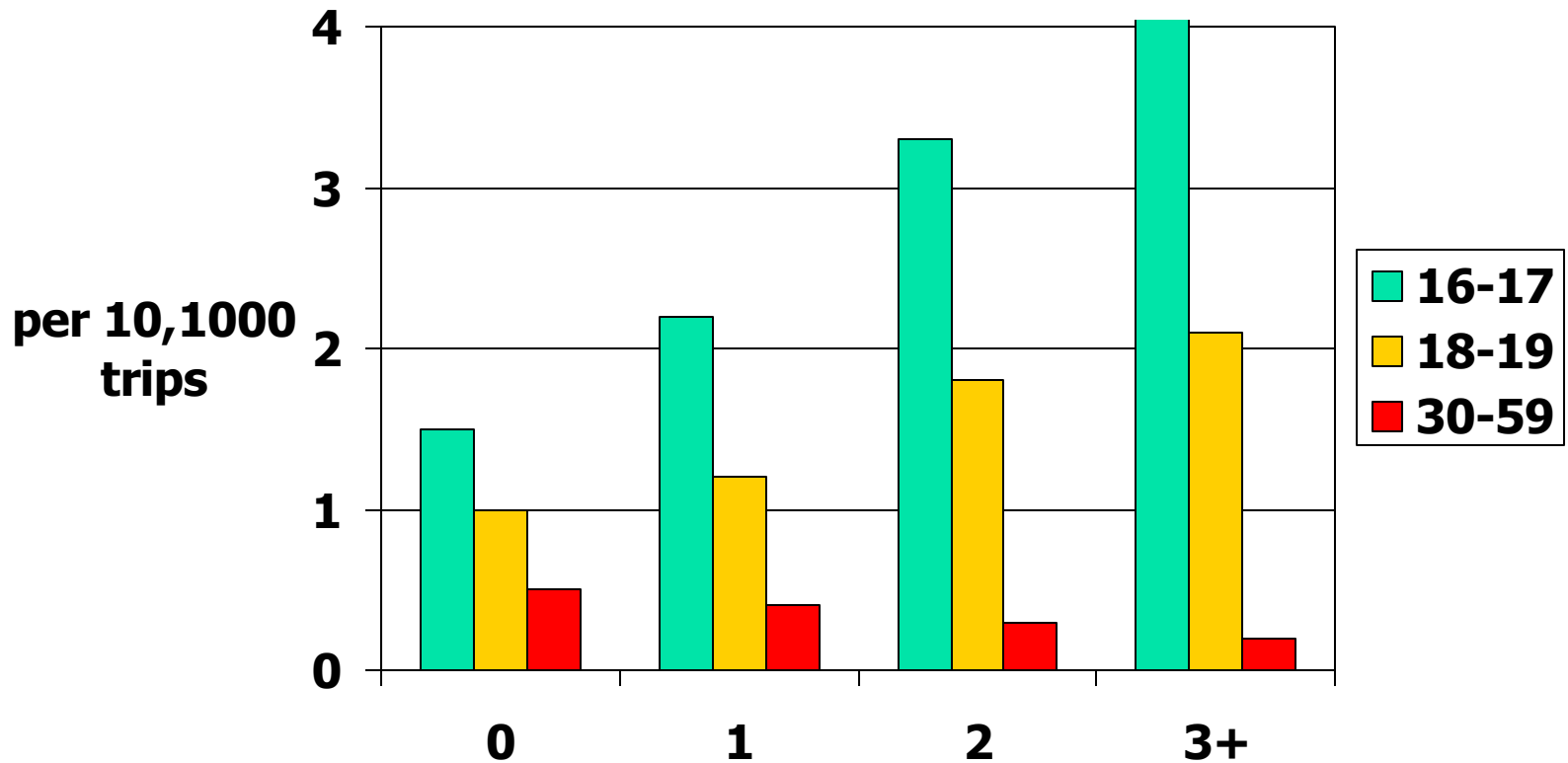
- Dopamine stimulates needs and desires for excitement (“the gas”)
- Serotonin alerts the body to risk and prompts defensive actions (“the brakes”)
- More gas than brakes in teen brain
- Judgment and restraint develop last

Risk Factors

- Passengers
- Night driving
- Safety belt use
- Impaired driving (alcohol, drugs)
- Speeding, racing, aggressive driving
- Distracted driving (electronic devices)
- Fatigue
- Any combination



Crash rates by driver age and passenger presence



Williams, J Safety Res, 2002

Teen passengers: reasons

- General distraction
- Encouragement of risky driving
- Increase risk for both male and female drivers
 - but male passengers results in more risk

Purposeful vs recreational driving

Purposeful (low risk)

- Driving with a reason and destination
- Prescribed route
 - Point A to Point B
- Consequence for not arriving on time

Recreational (high risk)

- Joyriding
- Get away from parents
- Spend time in car with friends



Night driving



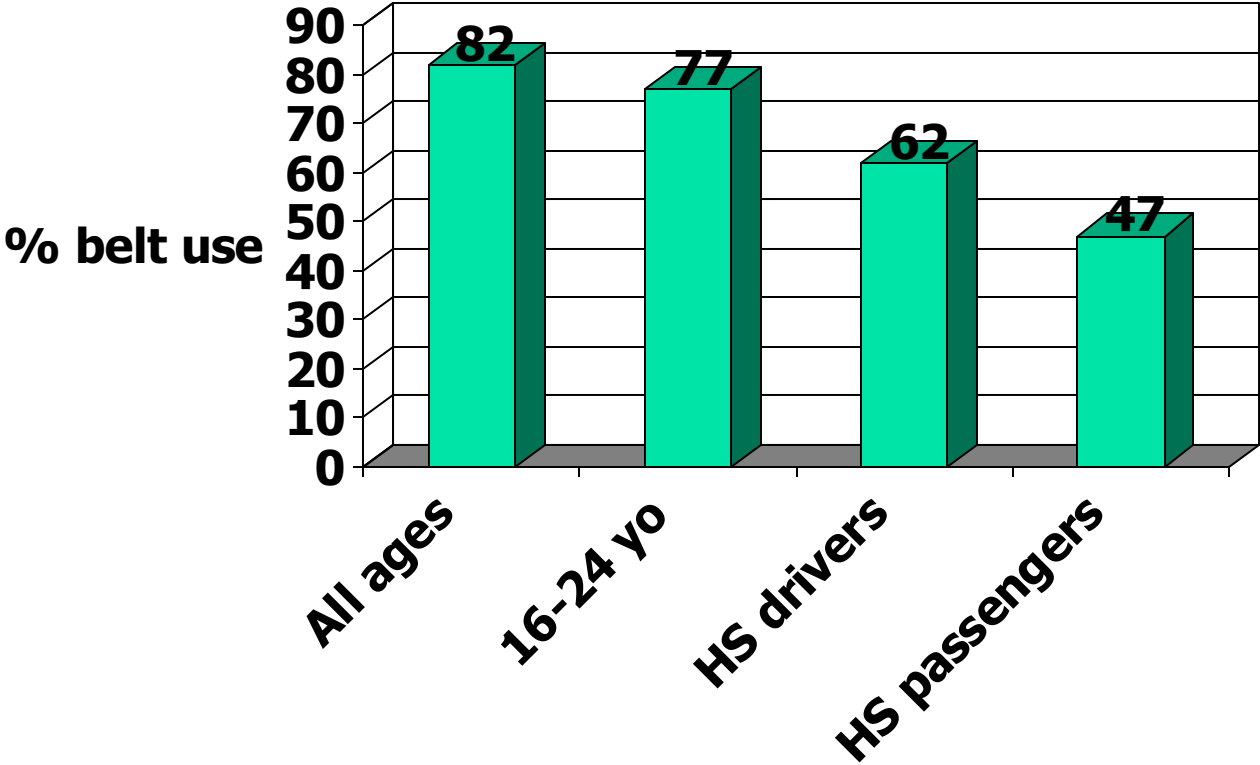
Risk factor: Night driving

- Teens have higher crash rate than other drivers
- Only 14% of miles driven between 9P-6A yet,
 - 32% of fatal crashes occur during this time
- 58% of fatal crashes occur from 9P-12MN

Night driving: reasons

- Fatal night crashes more likely to involve multiple teen passengers, speeding, and alcohol
- More difficult to drive at night for all drivers
 - fatigue and lack of practice play greater role for teens

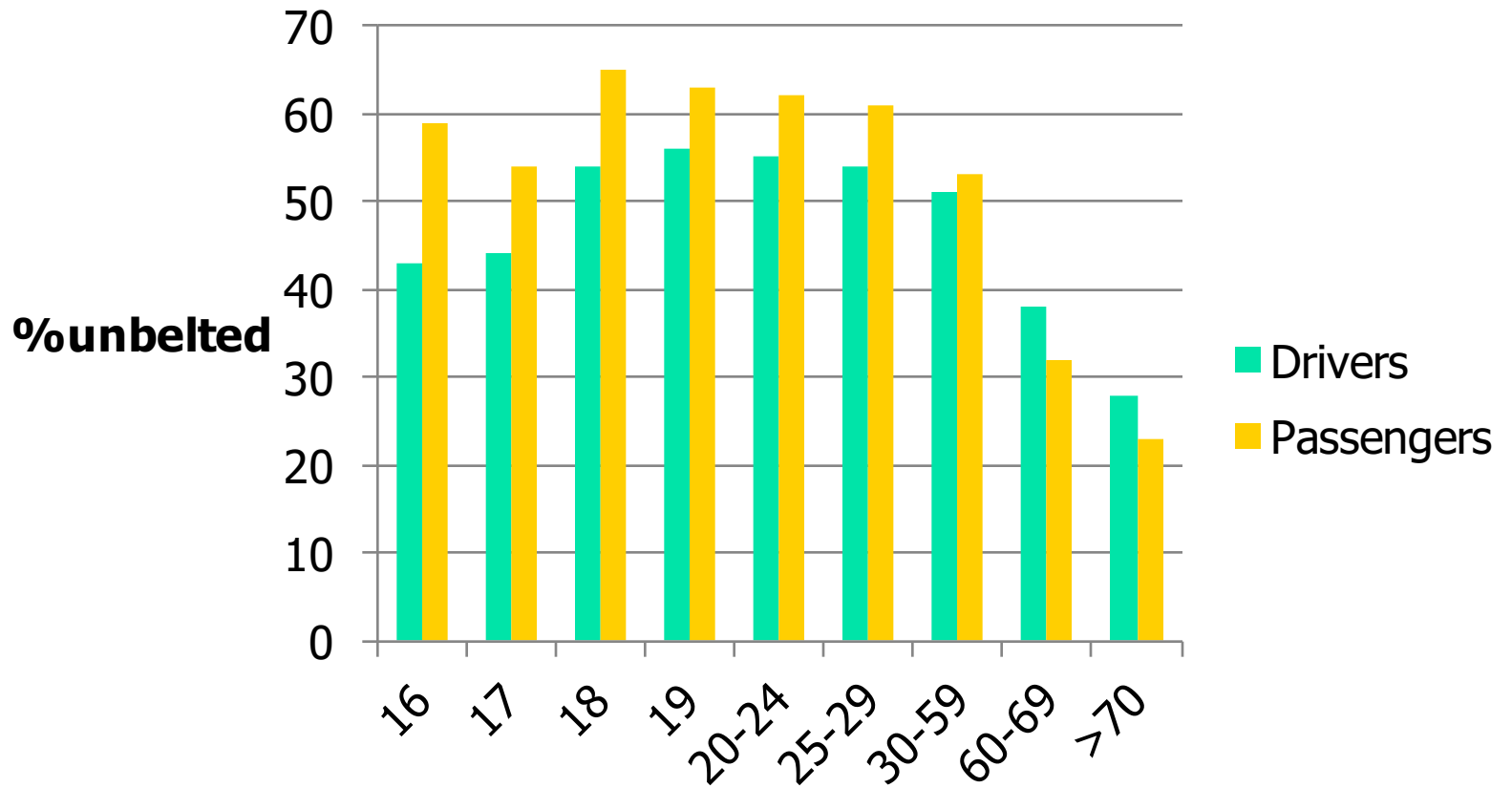
Safety belt use



Reasons for lower safety belt use

- Not cool
- Peer pressure
- Wrinkle clothes
- Travel short distance
- Nothing will happen to me
- As likely to cause harm then help
- Worry about being in an accident

Safety belt use among fatally injured drivers & passengers, 2011



FARS, 2012

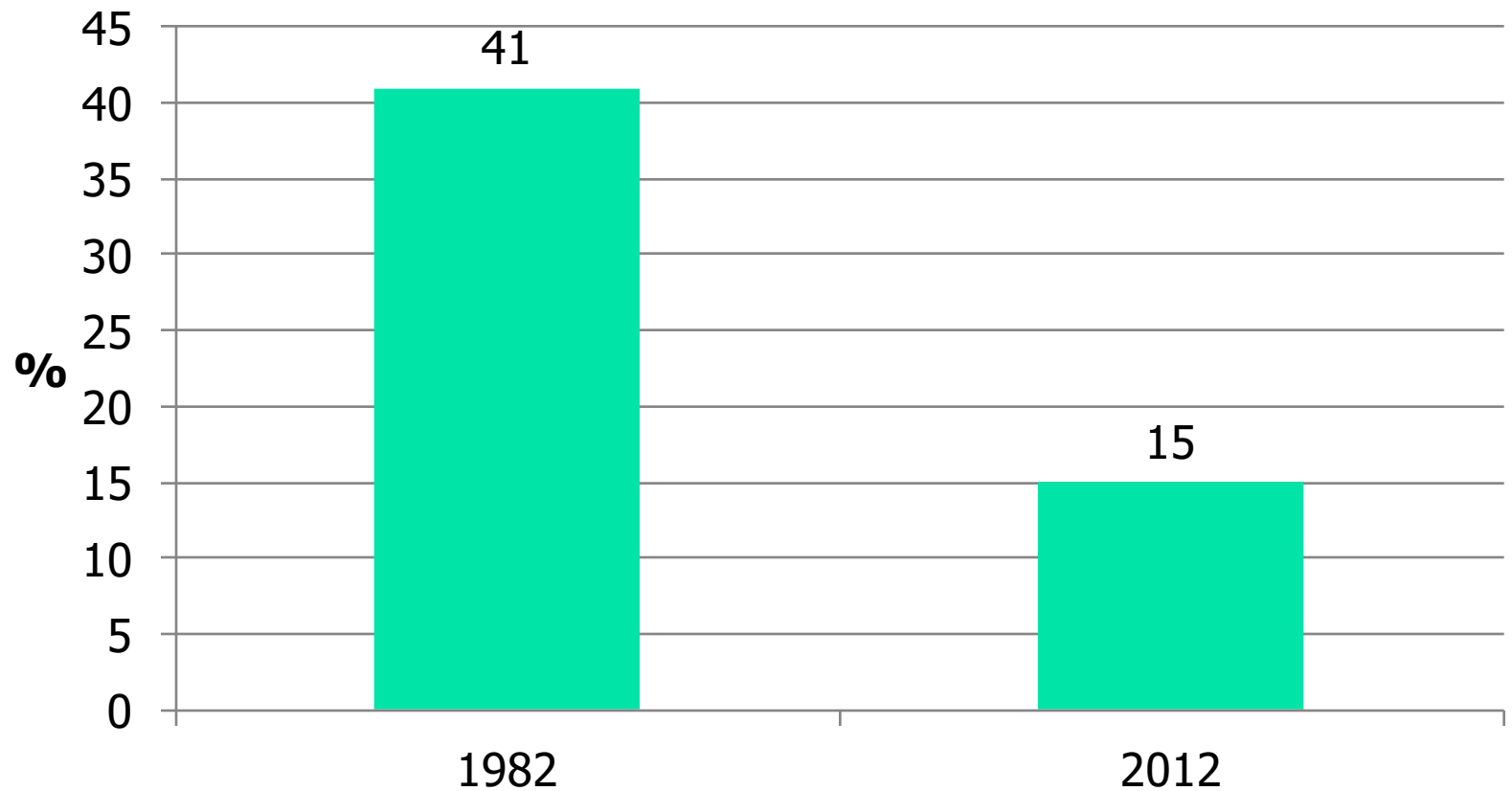
Risk factors: alcohol, marijuana, meds



Alcohol involvement

- Young drivers are less likely than adults to drive after drinking alcohol, but their crash risk is substantially higher when they do. This is especially true at low and moderate blood alcohol concentrations (BACs).

Percent of fatally injured 16-17 yo drivers with BAC >.08



FARS, 1982, 2012

Driving and drug use among undergraduate college students

- 18% reported marijuana does not impair driving
- 52% reported marijuana use as a driver or passenger immediately following drug use

Rx and non-Rx meds

- Sedatives, analgesics, sedating antihistamines, stimulants, anti-hypertensives
- Meds and alcohol problematic
- Benadryl

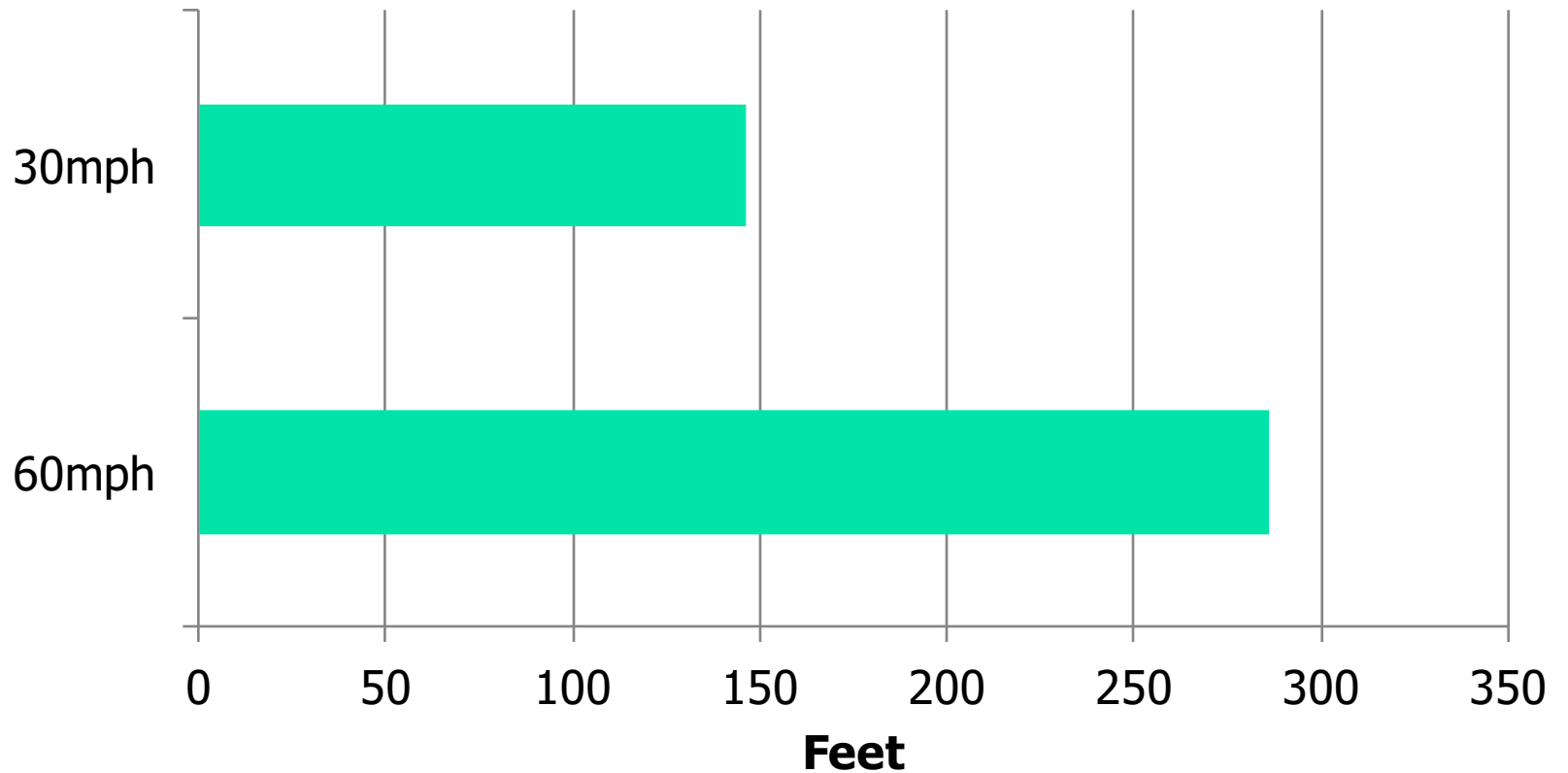
Distractions including cell phones

- Eating, drinking, adjusting radio/climate controls
- Cell phone use (increase crash risk 4X)
 - Hands-free (same risk)
 - Text messaging

Two steps to avoid crash

1. Recognize hazard
2. Execute maneuver to avoid hazard
 - slow
 - stop
 - redirect

Distance traveled in 3 seconds



Texting, electronic distraction

- Driving blindfolded
- Eliminates reaction time
- Zero tolerance



Social norms and media images



If 12 fully loaded jumbo jets
crashed every year,
something would be done about it.



EVERY YEAR, NEARLY 6,000 TEENS DIE IN CAR CRASHES.



Injury Prevention

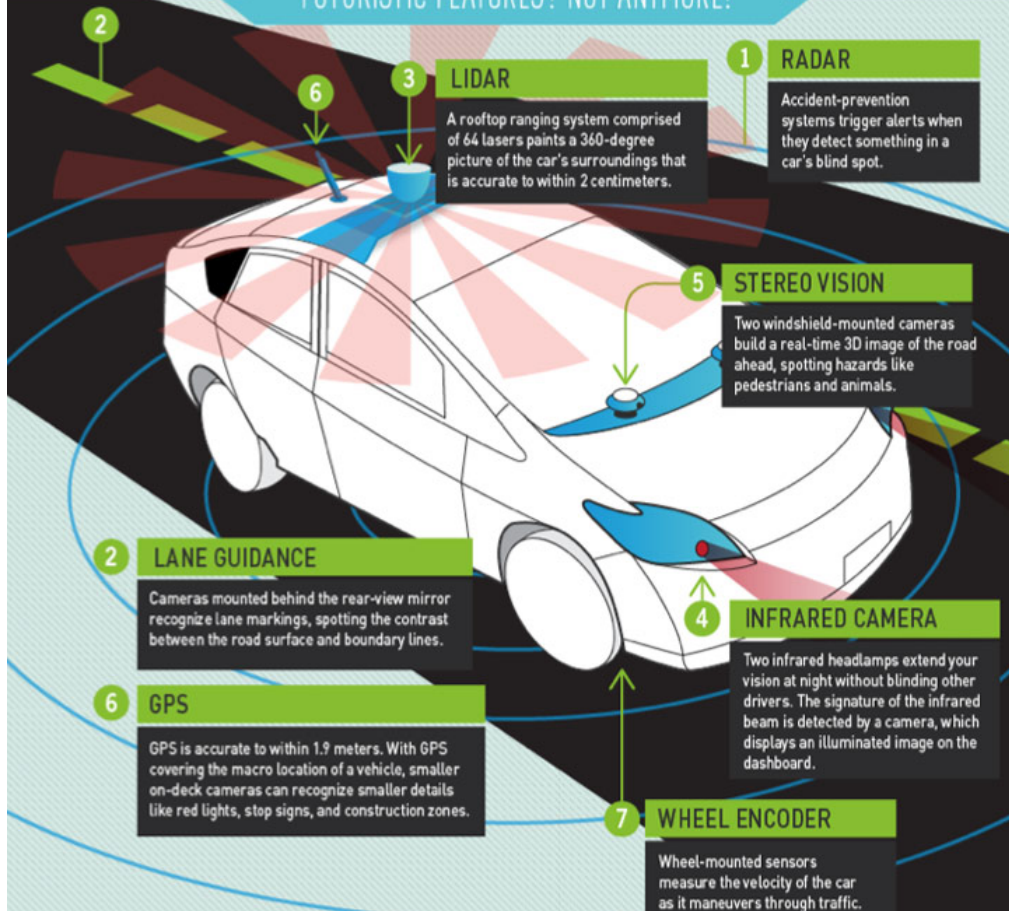
- **Pre-event** –Avoid the crash (Intelligent cars, GDL's, contracts)
- **Event** –Crash interventions (seatbelts, airbags, breakaway signs, crash cushions)
- **Post-event** – Treat injury, reduce morbidity/mortality (EMS, Trauma systems, Rehab)

Collision avoidance systems

- Back-up cameras
- Multidirectional WiFi to detect potential collisions and warn drivers
- Adaptive headlights move in the direction in which the car steers
- Adaptive cruise control to maintain a certain distance between vehicle



FUTURISTIC FEATURES? NOT ANYMORE!





Google™

self-driving car

Google car

VIDEO CAMERA

Mounted near the rear-view mirror, the camera detects traffic lights and any moving objects.

LIDAR

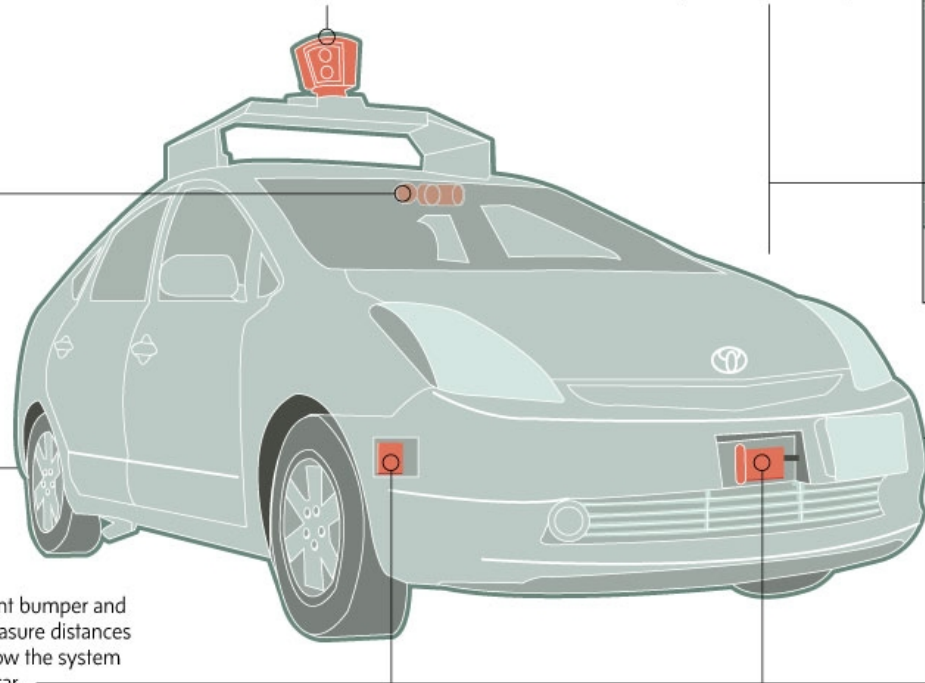
A rotating sensor on the roof scans the area in a radius of 60 metres for creation of a dynamic, three-dimensional map of the environment.

POSITION ESTIMATOR

A sensor mounted on the left rear wheel measures lateral movements and determines the car's position on the map.

DISTANCE SENSORS

Four radars, three in the front bumper and one in the rear bumper, measure distances to various obstacles and allow the system to reduce the speed of the car.



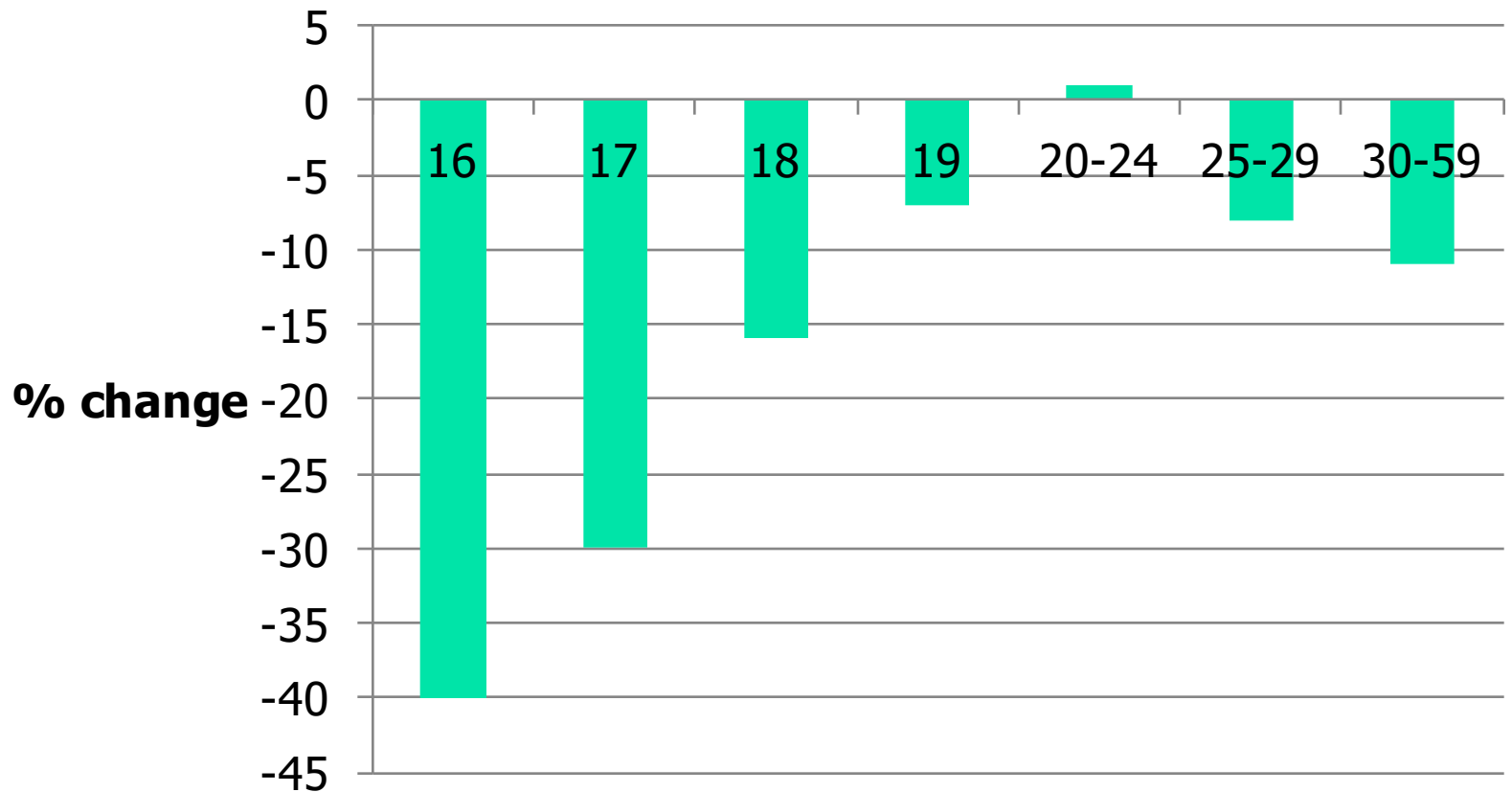
Graduated Driver Licensing

- **Learner's permit** – allows driving only while supervised by an experienced driver
- **Intermediate License** – allows unsupervised driving under certain restrictions
- **Full license** – no restrictions.

Graduated Driver Licensing

- Research in the US & Canada has conclusively shown that GDL has reduced teenage driver crashes & fatalities 20-40%
- Crash reductions greater for stronger GDL systems

Percent change in MVC rate, 1999 vs. 2008



Rogers, J Trauma, 2011

Fatal MVC, 2008-2012

- Half of fatal MVC involved a GDL violation

Accelerating adoption of GDL

- GDL = vaccine

Learning to drive

- Train teens on local roads in compact cars
 - Allow them to drive SUV and light trucks on crowded Interstate highways
- Learning to drive and navigate at same time

Driver Education



- Provides basic instruction on how to operate a vehicle
- No safety benefit

Mayhew, 1998
Vernick, 1999

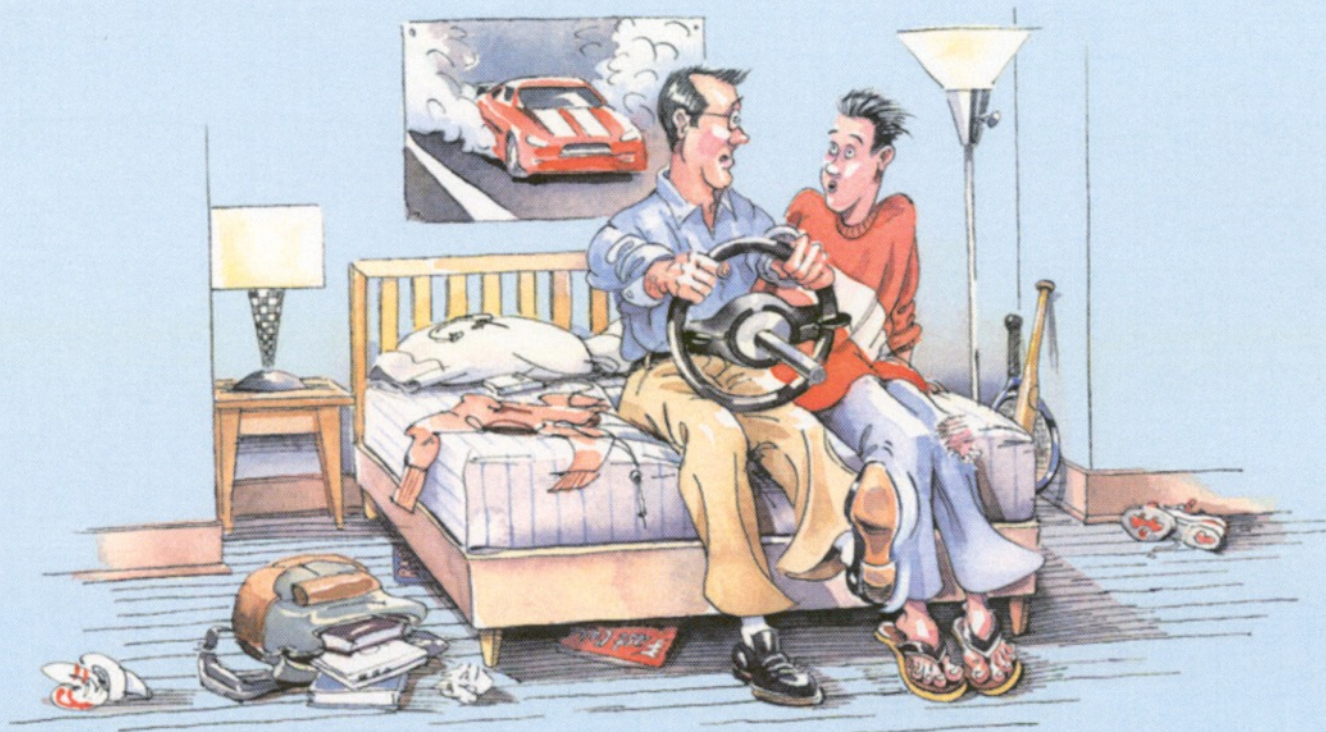
Teen driver training

- Good driving judgment requires 3 -5 years of driving experience
 - Most states require 30-50 hours of practice driving
- Teens look at perimeter of car, not road ahead

By 16, teens have had
the “*Birds and Bees*” talk and
the “*Say No to Drugs*” talk.

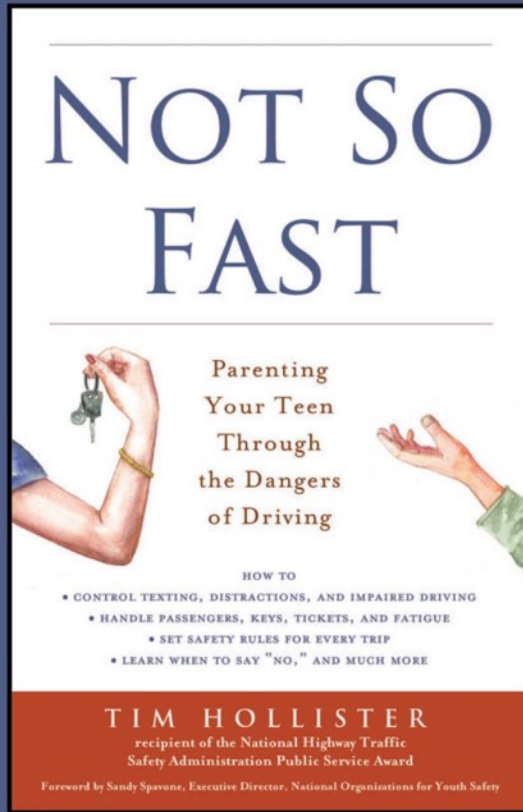


UNFORTUNATELY, NEARLY 6,000 TEENS DIE EACH YEAR
BECAUSE THEY DIDN'T HAVE THE “DRIVING TALK.”



Parent role: monitor driving

- Ride along often
- Require permission for trips
- Limit teen passengers
- Enforce curfew
- Write contract



“A concise, practical and potentially life-saving book that should be required reading for every parent before their teen gets behind the wheel.”

PublishersWeekly, 7/15/13

Tim Hollister
Hartford, CT

Blog: www.fromreidsdad.org
Website: www.nsfteendriving.com
E-mail: tim@fromreidsdad.org

Act like a air traffic controller

- Destination?
- Route?
- Timetable?
- Equipment check?
- Communications plan?
- Passengers?
- Rested and alert?
- Contingency plan?



Parent/Teen Safety Agreement

Rev. 01/12

Model Teen Driving Agreement

source: "From Reid's Dad" blog, www.fromreidsdad.org

Teen driving agreements are a proven way to raise awareness of the dangers of teen driving and reduce crash risk. This Agreement spells out safety risks and what happens if the teen driver violates his/her obligations. This is a national model that needs to be consistent with, or stricter than, your state's law. Complete and sign this Agreement when your teen obtains a learner's permit, and review it again when your teen obtains a license.

CAUTIONS FOR SUPERVISING ADULTS

- State laws allow teens to obtain a learner's permit, but parents and guardians may prohibit those under 18 from starting to drive. *Review the safety risks stated below and use your judgment.*
- Teen drivers *should not use any electronic device*, at any time that the vehicle is not in Park, *to text, type, read, watch video, or communicate with someone outside the vehicle.*
- You are a *role model for your teen driver*, and need to teach safe driving habits by being a safe, responsible, defensive driver at all times.

SAFETY RISKS OF TEEN DRIVING (teen and supervising adult(s) to initial each)

INITIALS

- _____ Driving is especially dangerous for teens because *the human brain does not fully develop* its ability to assess risk and danger or control impulse *until the mid-20s. No amount of teen driver training can overcome this limitation.*
- _____ Passing a driver training course and obtaining a driver's license only means that a teen is a beginner; *it does not mean that your teen is a safe driver.*
- _____ A teen driver violating state laws can cause *injury or death to people and damage to property, which can result in criminal and civil penalties and financial liability for parents or guardians.*
- _____ Speeding, reckless driving, alcohol or drug use, not using seat belts, illegal or distracting electronic devices, illegal passengers, or driving while fatigued *risk the life of the driver, passengers, other drivers, and pedestrians.*

TEEN DRIVER AGREEMENTS

1. **Time Period:** This Agreement will remain in effect until (*recommended: one year or 18th birthday, whichever is later*) _____.
2. **Supervising Adult:** My driving will be supervised by one or more adults who will decide, day-by-day, whether it is safe for me to drive.
3. **Driving Plan:** I will get permission from one of my supervising adults every time I drive, and we will agree on my route, destination, time of return, and passengers. Joyriding (driving with no destination or purpose) is not allowed.
4. **Seatbelts:** I will wear my seatbelt and I will make sure that every passenger in my car, of any age, wears one.

Model Teen Driving Agreement

5. **Electronic Devices:** Unless my vehicle is in Park, I will not use any electronic device, even in hands-free mode, to text, type, read, watch video, or communicate with a person outside the vehicle.
6. **Curfews:** I understand that I may not drive between the hours of (*fill in state curfew, or stricter hours*) _____, except for (*fill in state law exceptions*) _____. If I need to rely on an exception for an extended time (such as a job or school activity), I will get written permission and carry it in my vehicle.
7. **Passengers** (*must be consistent with state law; may be stricter; recommend three stages*): For my first _____ months with a license, I will carry only an adult who is supervising my driving. In the next _____ months, I will carry only a supervising driver and immediate family. I will not transport anyone else until I have had my license for (*recommend one year*) _____.
8. **Alcohol or Drug Use, Fatigue:** I will never drive under the influence of alcohol or drugs, or when I have not had sufficient rest.
9. **Speeding:** I will obey speed limits, stop signs, traffic signals, and the rules of the road. I will drive at a reasonable speed and will adjust my speed based on road conditions (*i.e.*, weather, turns, hills, visibility, unfamiliar roads).
10. **Suspension of Driving Privileges:** Violations of this Agreement or state laws may be reported to one of my supervising adults by law enforcement, neighbors, school personnel, or friends. ***IF I VIOLATE ANY OF THESE OBLIGATIONS, MY DRIVING PRIVILEGES WILL BE SUSPENDED FOR _____ DAYS.*** This suspension will be in addition to state law requirements. If I drive while my privileges are suspended, they will be suspended indefinitely.
11. **Call for Safe Ride:** At any time and for any reason, I may call for a safe ride to avoid a dangerous situation. My reasons for requesting the ride will not be a violation of this Agreement.
12. **Finances:** During this Agreement, costs of insurance, gas, and maintenance will be divided: _____.
13. **Technology:** (*Specify any device that will be installed or used to track information about the teen's operation of the vehicle.*) _____.
14. **Mediator** (*optional*): We appoint _____ to serve as mediator. If a dispute arises about this Agreement, we will ask our mediator for advice. (Contact number: _____).

BY SIGNING BELOW, WE COMMIT OURSELVES TO THE SAFE DRIVING REQUIREMENTS AND UNDERSTANDINGS STATED IN THIS AGREEMENT.

Teen Driver _____ Date _____

Supervising Adult _____ Date _____

Supervising Adult _____ Date _____

Model Teen Driving Agreement

2



- Teen/Parent agreements are emphasized as a proven way to reduce driving risk.

Conclusions

- Teens at risk for mv crashes due to inexperience and risk taking
- GDL systems effective in reducing crashes but greater adoption needed
- Anticipatory guidance provides valuable strategies to teenagers and their parents that can reduce the risk of crash-related injuries.