


Young Drivers II: Research & Solutions

**Washington Teen Driving Task Force
Olympia, WA
September 9, 2009**

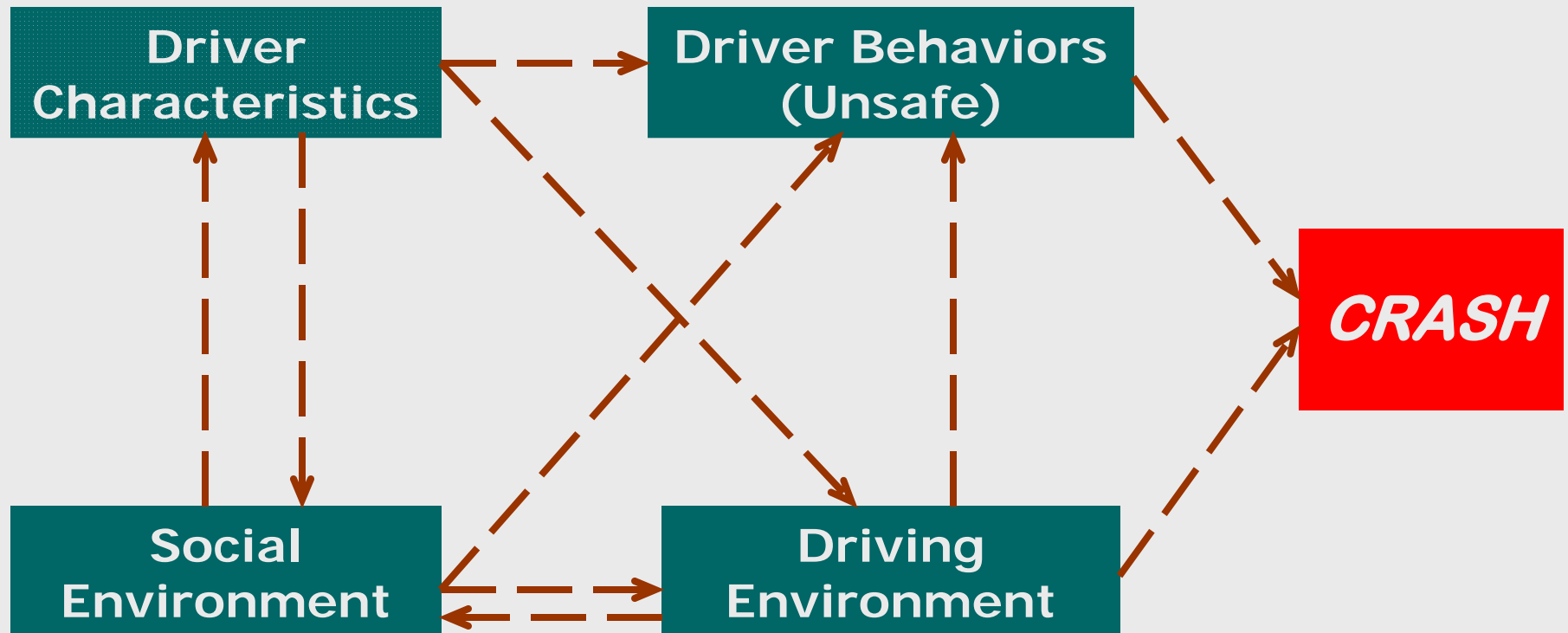


- ◆ **Why Are Teens SO Over-represented?**
 - ◆ **Behavior / Brain Development Issues**
 - ◆ **SOLUTIONS!!**
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**Why Are Teens
SO
Over-represented?**



Young Driver Crash Risk



Crash risk is determined by a variety of factors that are all interrelated. This makes it difficult to pinpoint specific, *isolated* causes of collisions.

Source: Shope & Bingham (2003)

Research shows that teens...

- ◆ Drive with smaller gaps between vehicles (thus more rear-end collisions) (Gregersen & Bjurulf; Williams, Ferguson, & Shope)
- ◆ Use seatbelts less often (Engstrom, et al.; Gregersen & Bjurulf; Masten)
- ◆ Are involved in more single-car collisions (Engstrom, et al.; Gregersen; Ulmer, Williams, & Preusser)
- ◆ Are overrepresented in nighttime and weekend collisions. (Engstrom, et al.; Gregersen; Gregersen & Berg; IIHS; Ulmer, et al.)
- ◆ Are more likely to...
 - be at fault in a collision (IIHS; Kim, Li, Richardson, & Nitz; Ulmer, et al.)
 - be speeding (Engstrom et al.; Gregersen; Gregersen & Bjurulf; IIHS; Masten; Williams, et al.)
 - accrue moving violations (Ulmer, et al.)
 - carry teenage passengers (Ulmer, et al.)
 - violate signs and signals (Masten, Williams, et al.)
 - overtake vehicles in a risky manner (Masten, Williams, et al.)
 - fail to yield to pedestrians (Masten, Williams, et al.)

But *Why?*

- ◆ Inexperience
- ◆ Immaturity (Development)

✦ *These factors interact with each other!*



Inexperience


- ◆ Not enough time behind the wheel
 - Teens *overestimate* driving skill
 - Teens *underestimate* collision risksA BAD Combination(!) that leads to:
 - Reduced hazard perception
 - Slower reaction time
 - Underdeveloped vehicle maneuvering and visual scanning skills

- ◆ These factors boost collision risk!



INEXPERIENCE

Cooper, Pinili, & Chen (1995) looked at drivers ages 16-55.

- ◆ Collision rates for *all* new drivers were greatest during the 1st year of licensure.
 - ◆ 16-20 year olds had the highest at-fault collision rate during the 1st year of licensure.
 - ◆ As age increased for novice drivers, initial collision risk decreased.
- 


Novice Drivers

- ◆ Novice drivers in every age group are at elevated risk for a crash in the first 6 months of licensure – **but teens even more so!**

[Mayhew, Simpson, & Pak (2003); McCartt, Shabanova, & Leaf (2003); Cooper, Pinili, & Chen (1995)].

- ◆ Thus, age (i.e., maturity) *and* experience are important factors that coincide to determine driver crash risk.

Mental Workload

- ◆ Driving is a complex, mentally demanding task, requiring higher level cognitive, perceptual, & motor skills.
 - ◆ Over time, the driving task becomes more 'automatic', decreasing the workload demands on the brain (Mourant & Rockwell; Quimby & Watts).
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- A decorative teal silhouette of a mountain range is located in the bottom right corner of the slide.

Mental Workload (cont'd)

"These results [visual scanning studies] indicate that the first few times behind the wheel almost all of the information processing capacity is absorbed in simply maintaining the car's position in the lane. As experience is gained, peripheral vision is used more to locate the vehicle in the lane, with fixations focused further down the road to allow more time to process information that becomes of increasing relevance as the vehicle's speed increases."

(L. Evans)



Visual Scanning

- ◆ Young drivers are less able to scan wider ranges on the roadway than older drivers.
 - look closer to the front of the vehicle and to the right
 - focus on keeping the vehicle in the lane
- ◆ With increased experience, drivers are better able to focus eye fixations, rely on peripheral cues, and scan wider areas.
(Masten, 2004; Evans, 1991).

Scanning (cont'd)

“The relative ineffectiveness of scanning patterns of the novice drivers probably accounts for Summala and Naatanen’s [1974] finding that, even when specifically instructed to pay attention to road signs, inexperienced drivers miss significantly more signs than experienced drivers. Brown [1982] reports that young drivers are relatively poor at identifying distant hazards, although they compare well with older drivers in identifying near hazards.”

(L. Evans)




Brain Development

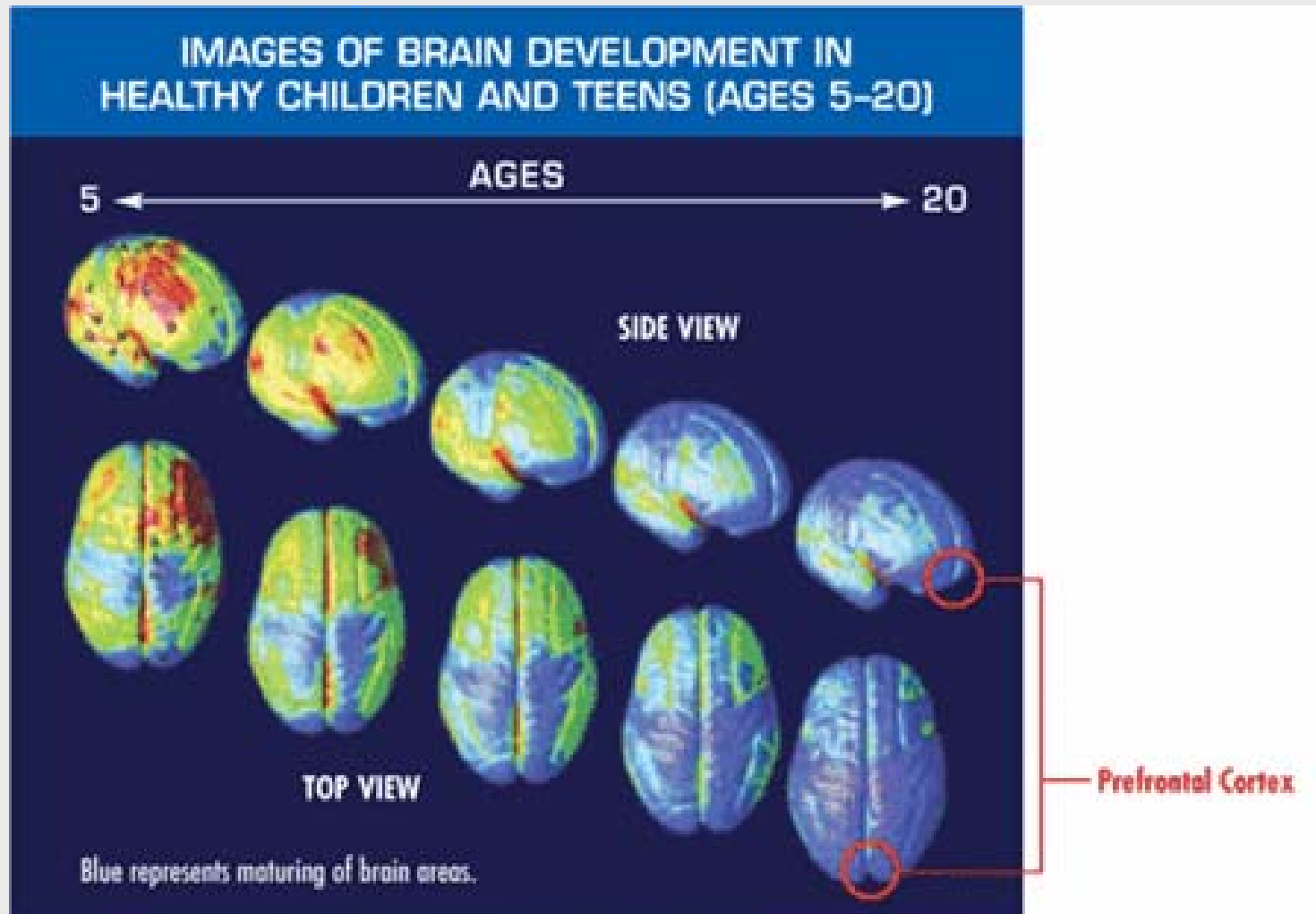
- ◆ PreFrontal cortex (PFC) development continues into our mid-20's. This lobe is responsible for (among other functions):
 - Motor control
 - Problem solving/judgment
 - Impulse control
 - Memory
 - Language

Brain Development (continued)

◆ Eby & Molnar (1998)


- Short-term memory continues to develop until age 17, responsible for “decision making, reasoning, or understanding a traffic safety message.”
 - Ability to filter attention and to concentrate for long periods of time develops further during the ages 16-20.
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Where is the PFC?




Source: Copyright PNAS USA, 2004 May 25;101(21):8174-9. Epub 2004 May 17.

RECENT FINDINGS

- ◆ Giedd et al (1999) and Sowell et al (1999)
 - MRI studies confirm that adolescent brain development may lie behind the behaviors widely observed regarding teen drivers, i.e., risk-taking
 - Two waves of vigorous cortical growth – early childhood (0-3 years) and pre-adolescence (10-13) years
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RECENT FINDINGS (cont'd)

- Three year-old brain has more neurons than adult brain (~100 billion), with intermittent growth of dense synaptic networks (> adults) followed by 'pruning' ("use it or lose it")
 - Pre-adolescent brains undergo renewed *synaptogenesis*, especially in the PFC, followed by pruning toward the end of puberty
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RECENT FINDINGS (cont'd)

- During the early stages of puberty, the *amygdala* (part of *limbic* system that mediates such emotions as fear) takes over executive functions normally assumed by PFC (owing to rapid pruning and *myelinization* in PFC)
- At this stage, then, adolescents are, in a real sense, 'thinking' with their emotions!!

RECENT FINDINGS (cont'd)

- Winter (2008): "During childhood, the brain grows an excessive number of connections between brain cells. At about year 11 or 12, a young person begins to lose or 'prune back' a substantial fraction of these connections. This loss is healthy in the long run and is a vital part of growing up. The pruning process clears out unneeded wiring to make way for more efficient and faster information-processing as we become adults. And it promotes building the long chains of nerve cells that are required for the more demanding problem-solving of adulthood. And the pruning process appears to follow the principle of 'use-it-or-lose-it,' according to experts. Thus, neural connections or circuitry that gets exercised as we grow up are retained, while the connections that are not activated or used, get pruned away. Dr. Giedd refers to this process in this way: 'Ineffective or weak connections are pruned in much the same way a gardener would prune a tree or bush, giving the plant the desired shape'."

Winter (cont'd)

- "This brain maturation tends to occur from the back of the brain to the front. So the front region of the brain, known as the prefrontal cortex, which is responsible for high-level reasoning and decision-making, does not become fully mature until around the early to mid 20s.
"The prefrontal cortex is the part of the brain that enables a person to think clearly, to make good decisions and to control impulses. It is primarily responsible for how much priority to give incoming messages like 'Do this now' versus 'Wait! What about the consequences?' Because the emotional, 'Do this now' regions, predominantly located behind the front of the brain, have progressed with the pruning process, it is difficult for the 'Wait' part of the brain to exert much influence. As Psychologist Laurence Steinberg sees it, a teenager's brain 'has a well-developed accelerator but only a partly developed brake'."

RECENT FINDINGS (cont'd)

- ◆ Teens may also be more drawn to stimulus-seeking and risky behaviors because of different sensory-perception and social-development needs than adults
 - Less susceptible to *awareness* of alcohol or drug effects than adults
 - More swayed by and drawn to peer interactions
 - Alcohol / drugs reduce social inhibitions more powerfully for teens than for adults



RECENT FINDINGS: SUM

- ◆ Thus, risk-taking, stimulus-seeking, and peer-centric behavior of teens is *powerfully* driven by developmental events in the PFC.

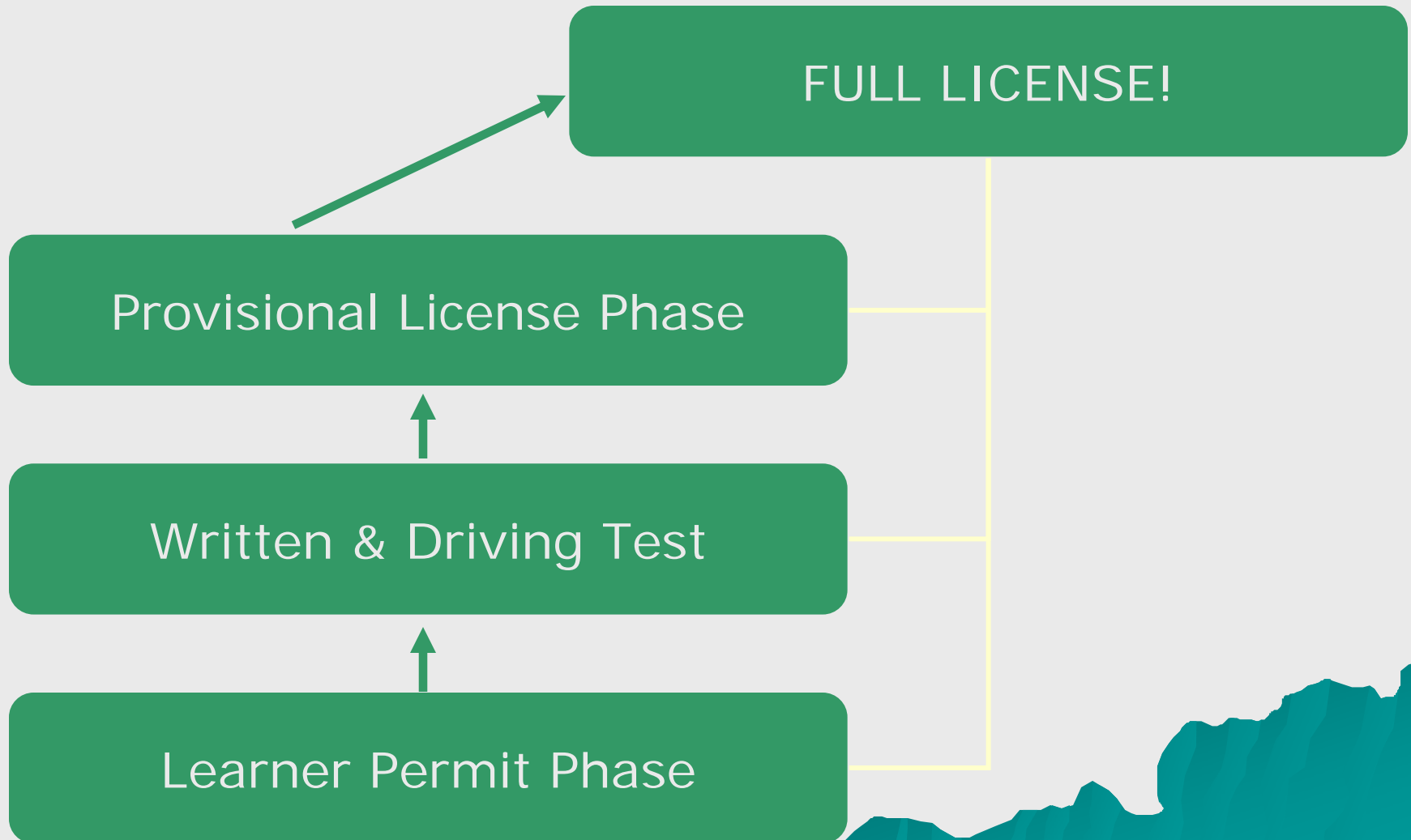


Part Two

Possible Solutions

- ◆ Intermediate Driver Licensing (IDL)
 - ◆ Traffic Safety Education
 - ◆ Parental Involvement
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Intermediate Driver Licensing (IDL)




IDL Research

- ◆ National Safety Council (2003).
 - 12 study review- reduction in teen collision rates of 33%
- ◆ Hartling, et al. (2006).
 - 13 study review- for 16 year-olds, collision rates decreased by 31%



IDL in Washington

- ◆ **Learner Phase- 6 months**
 - 50 hours of supervised practice (10 at night), pass TSE course, clean driving record
 - ◆ **Intermediate License**
 - First 6 months, no passengers under 20, next 6 months, only 3 passengers under 20
 - Cannot drive from 1:00 AM to 5:00 AM
 - ◆ **Full license** (at age 18 can get a full license without IDL)
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Has IDL Worked in Washington?

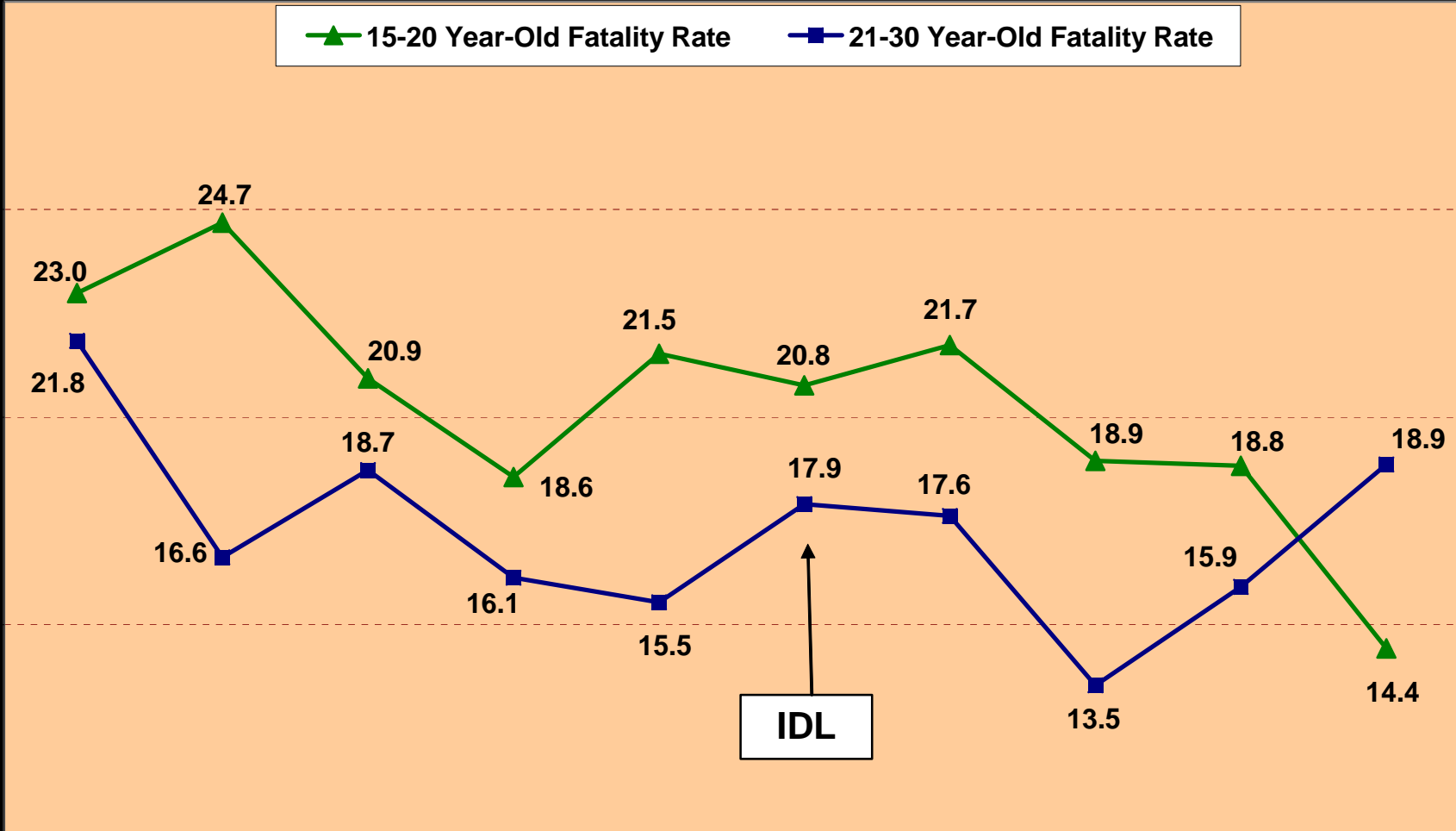
YES!

And now a look at the data...



▲ 15-20 Year-Old Fatality Rate

■ 21-30 Year-Old Fatality Rate



IDL

■ Pre-IDL

■ Post-IDL

This chart represents 16-20 year-old-driver collision involvement rates per 10,000 licensed drivers prior to the IDL laws taking effect (1999-2000) and after (2002-2005). The biggest difference can be seen in the 16-year-old group, with a 54% decrease in collision involvement rates. Although the number of 16-18 year-old licensed drivers decreased from 1999-2005, this difference has been controlled for by calculating collision involvement rates per licensed drivers for all age groups.



87 Teen Lives Saved in Washington State Since IDL

■ The number of fatalities that would have occurred had the teen fatality rate prior to IDL remained the same.

■ Actual Fatalities

Prior to IDL, from 1996-2000, the 15-20-year-old fatality rate per 100,000 population was 21.68. Following IDL, from 2002-2006, the 15-20-year-old fatality rate was 18.58.

If we had continued at the 1996-2000 fatality rate, another 87 15-20-year-olds would have lost their lives in collisions in Washington State from 2002-2006. An average of 17 lives saved per year.

Lives Saved

Actual Fatalities



The Future

- ◆ Need to change the IDL restrictions
 - Nighttime restrictions starting at 9:00 or 10:00 PM
 - Allow only one passenger under 20
 - Extend the provisional phase until age 18


Source: IIHS (2005)- guidelines for an optimal GDL system

- ◆ Overall, IDL has made a difference and needs to be maintained in WA to address the teen driver problem!

Traffic Safety Education

- ◆ Lack of evidence showing positive effects of traditional traffic safety education curricula.
- ◆ New Curricula Show Promise!
 - Europe- Project GADGET
 - Oregon State

Europe- Project GADGET


- ◆ Project in the 1990's.
 - ◆ Siegrist (1999). A new curriculum should expand from knowledge and skills of vehicle maneuvering and mastery of traffic situations, to include information about driving goals and context, as well as goals for life, risk awareness, and self-evaluation.
 - ◆ Focus on higher order cognitive skills!
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- A decorative teal silhouette of a mountain range is located in the bottom right corner of the slide.

GADGET Project Results

◆ Finland

- Collision rates decreased for 18-19 year olds.
- Males 18-20 had 25% fewer collisions per licensed drivers, females 18% fewer.

◆ Denmark

- Overall reduction of 7%, equating to 50-150 lives saved per year.
 - Majority of reductions during first year of licensure!
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Oregon State

- ◆ Sponsored by ODOT
- ◆ 10 Modules, consisting of one classroom lesson, a 30 min driving lesson, and required home practice
 - Uniting Driver & Vehicle
 - Knowing Where You Are
 - You Are In Control
 - Searching for LOS-POT's
 - You Control the Intersection
 - Space Management, The Deadly D's
 - Interacting with Others
 - Practicing Your Skills
 - Managing Driver, Vehicle & Environmental Risks
 - Putting it All Together (more info: <http://www.otsea.org>)
- ◆ First Lesson is Parents' Night- Mandatory!!
Review course outline, OR state laws, etc.

OR State Results

- ◆ 42.6% reduction in fatal collisions involving 16 year old drivers (1998 vs. 2004)
- ◆ 16-19 year olds who completed the **COURSE** (with 50 hours behind the wheel):
 - 11-21% lower collision rate
 - 39-57% lower traffic conviction rate
 - 51-53% lower license suspension rate
(all compared to those who had 100 hours of training just with their parents)

Parents and Teens


Beck *et al* (2001): "More frequent parental supervision and restricted teen access to a car were associated with less likelihood of teens speeding and more likelihood of using seat belts."

- *A majority* of parents of teens who drink and drive, who ride with other teen drinking-drivers, who drive aggressively or distractedly, or who run stop signs/signals are unaware that their children engage in these driving behaviors.

Parents' Influence

- ◆ Survey by SADD & Liberty Mutual Group (2004)
 - 59% of high school aged drivers indicated their parents had the greatest influence on their driving.
 - 67% of respondents reported speeding, 62% reported cell phone use while driving, and 33% reported seat belt non-use.
 - 48% indicated their parents sped, 62% indicated their parents used cell phones while driving, and 31% indicated their parents did not use a seat belt.

Parents and Teens (cont'd)


- ◆ Hortos *et al* (2002): Higher-risk teen drivers are *three times* more likely to report low parental monitoring and *twice* as likely to report minimal parental restriction.
 - ◆ **Bottom Line:** Parents are a critical link in promoting safe driving among teens, but many are barely engaged in monitoring or restricting the driving behaviors of their children.
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Parents and Teens (cont'd)

- ◆ Simons-Morton et al (2006 review)
 - Parent-supervised practice was *not* shown to be effective in early studies
 - More recently, studies on the early phase of 'independent' teen driving (i.e., post-IDL) have demonstrated that parental monitoring significantly reduces crash risks for teen drivers.


“Checkpoints” (CT)

Behavioral Contract

- ◆ Parent-Teen “Driving Agreement” for communicating parental concerns and offering effective oversight/limits.
 - ◆ Study authors:
 - Mailed (I) parents ‘persuasive communications’ on risks of teen driving (vs. (C) general driving & vehicle maintenance info)
 - Compared family-imposed driving limits at 3 months, 6 months, and 12 months
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Checkpoints (cont'd)

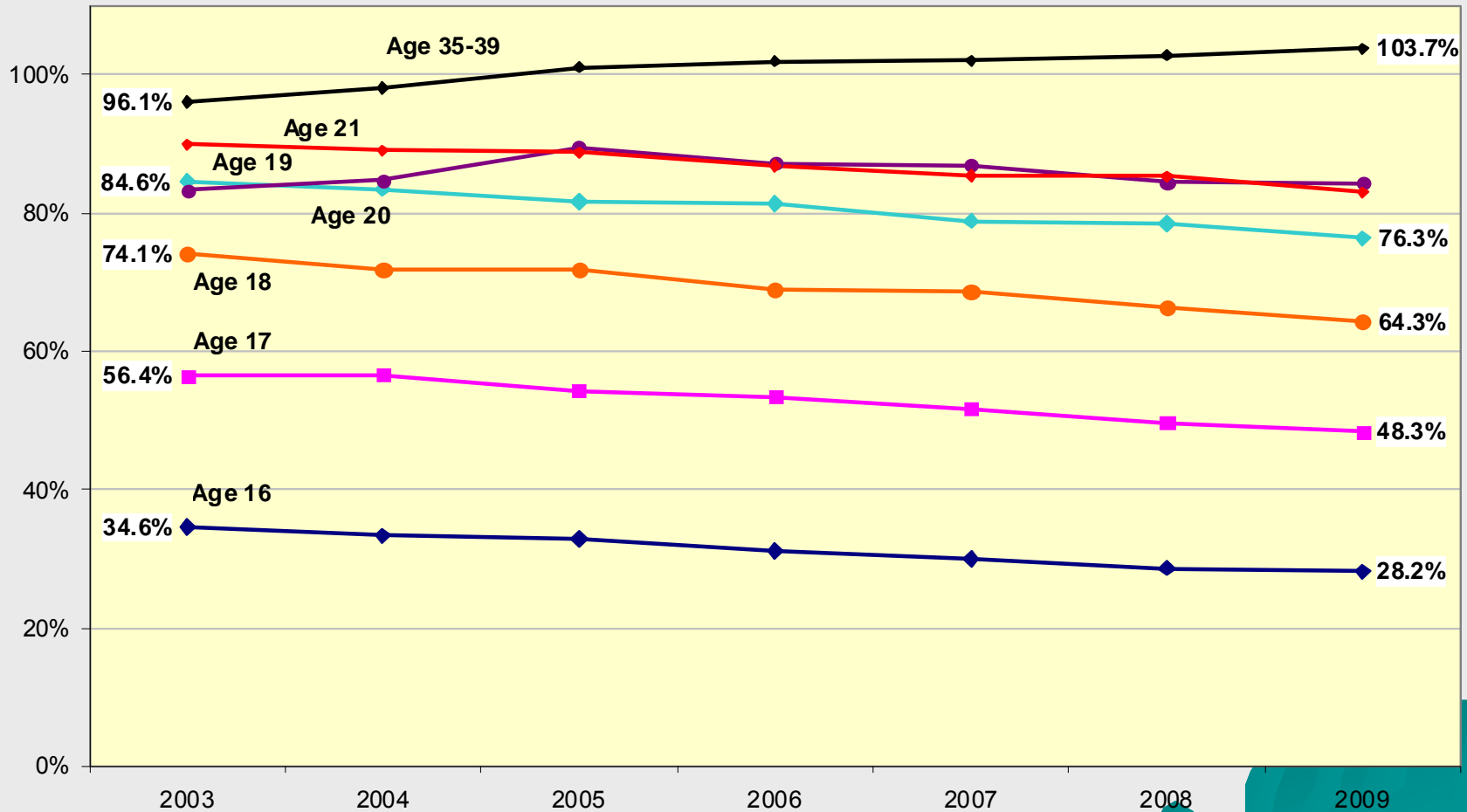
Results

- ◆ Families in (I) group showed “significantly greater limits on high-risk teen driving conditions” than (C) group
 - ◆ (I) Teens had significantly fewer traffic violations
 - ◆ However, no difference in crash frequency
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NEW DATA

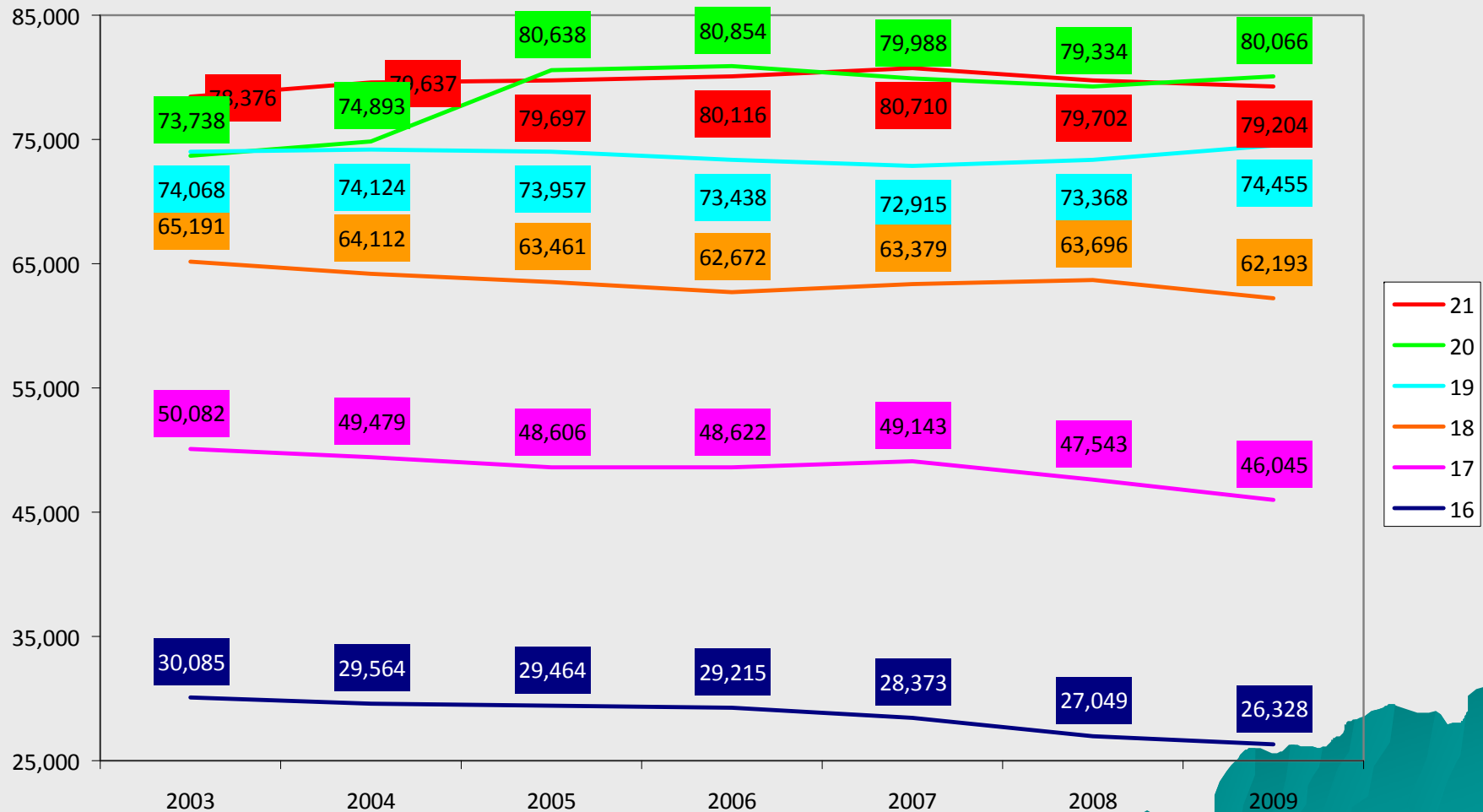
Percentage of Population Licensed Drivers by Age and Year

Data Source: DOL and OFM



NEW DATA (Cont'd)

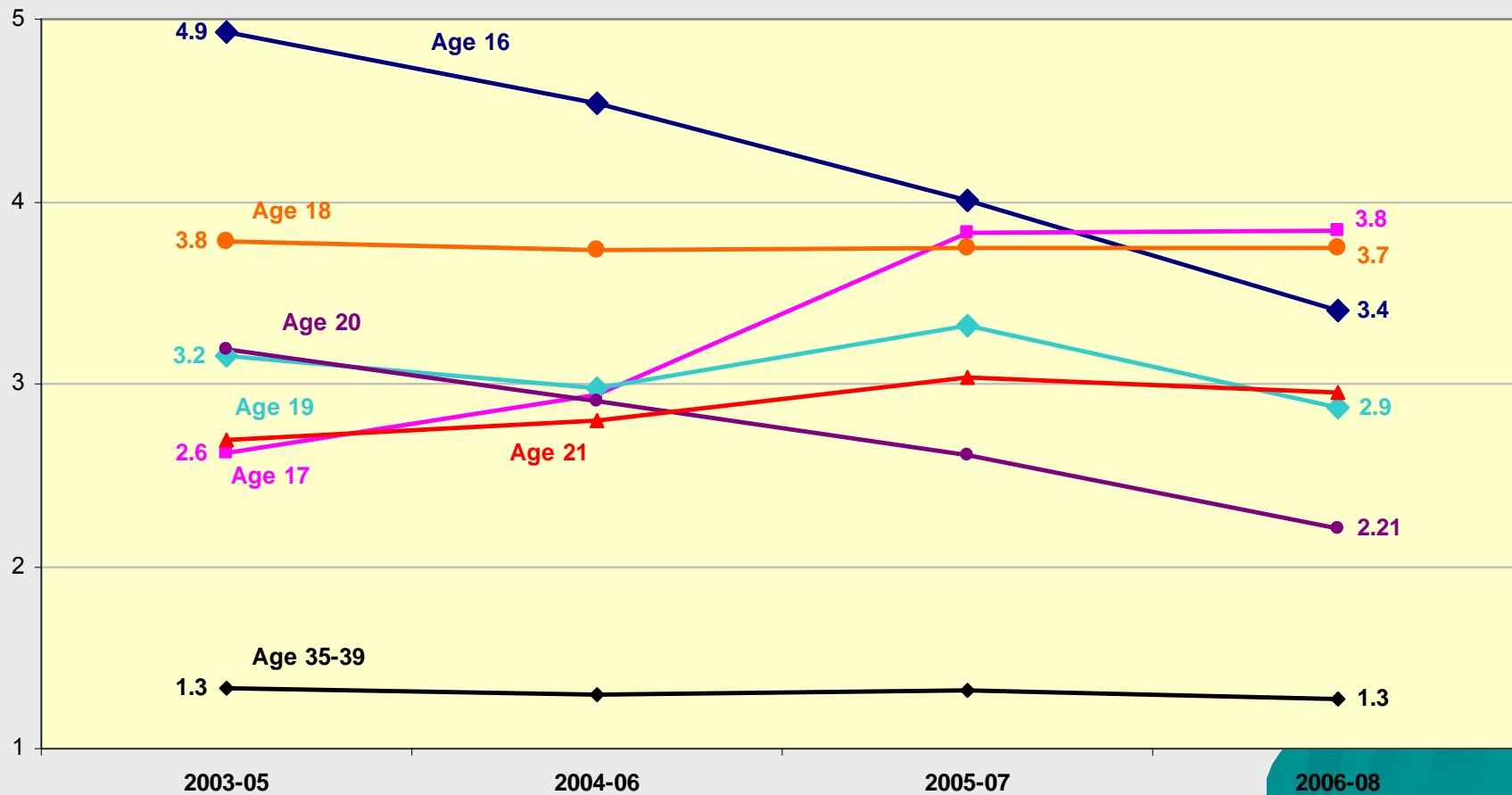
Washington Licensed Drivers by Age and Year



NEW DATA (Cont'd)

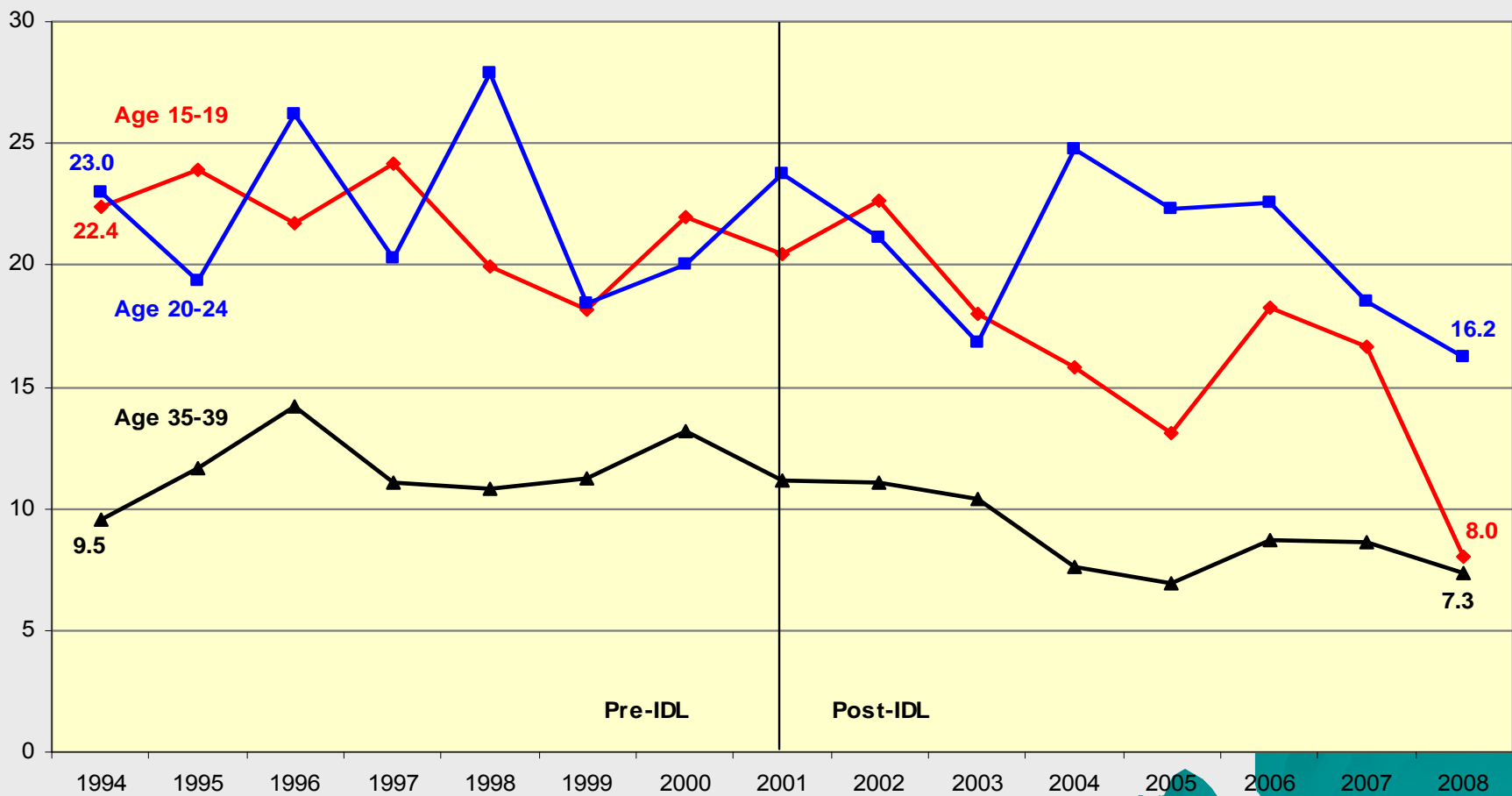
Fatal Crash Involvement Rate per 10,000 Licensed Drivers
3 Year Moving Averages

Data Source: DOL and FARS



NEW DATA (Cont'd)

Traffic Fatality Rate per 100,000 Population
Washington, 1994-2008



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