Driver Alcohol Detection System for Safety (DADSS)

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NHTSA

Third International Symposium on Naturalistic Driving Research

Blacksburg, VA

August 2012

Cooperative Agreement

- **Cooperative Agreement** between Automotive Coalition for Traffic Safety and NHTSA (begun February 2008)
- **Supports a non-regulatory, market-based approach** to preventing drunk driving
- Phased approach
  - Phase I – **Proof-of-principle prototype development** (focus: speed, accuracy, precision)
  - Phase II – **Subsystem development and integration into research vehicle**

Cooperative Agreement

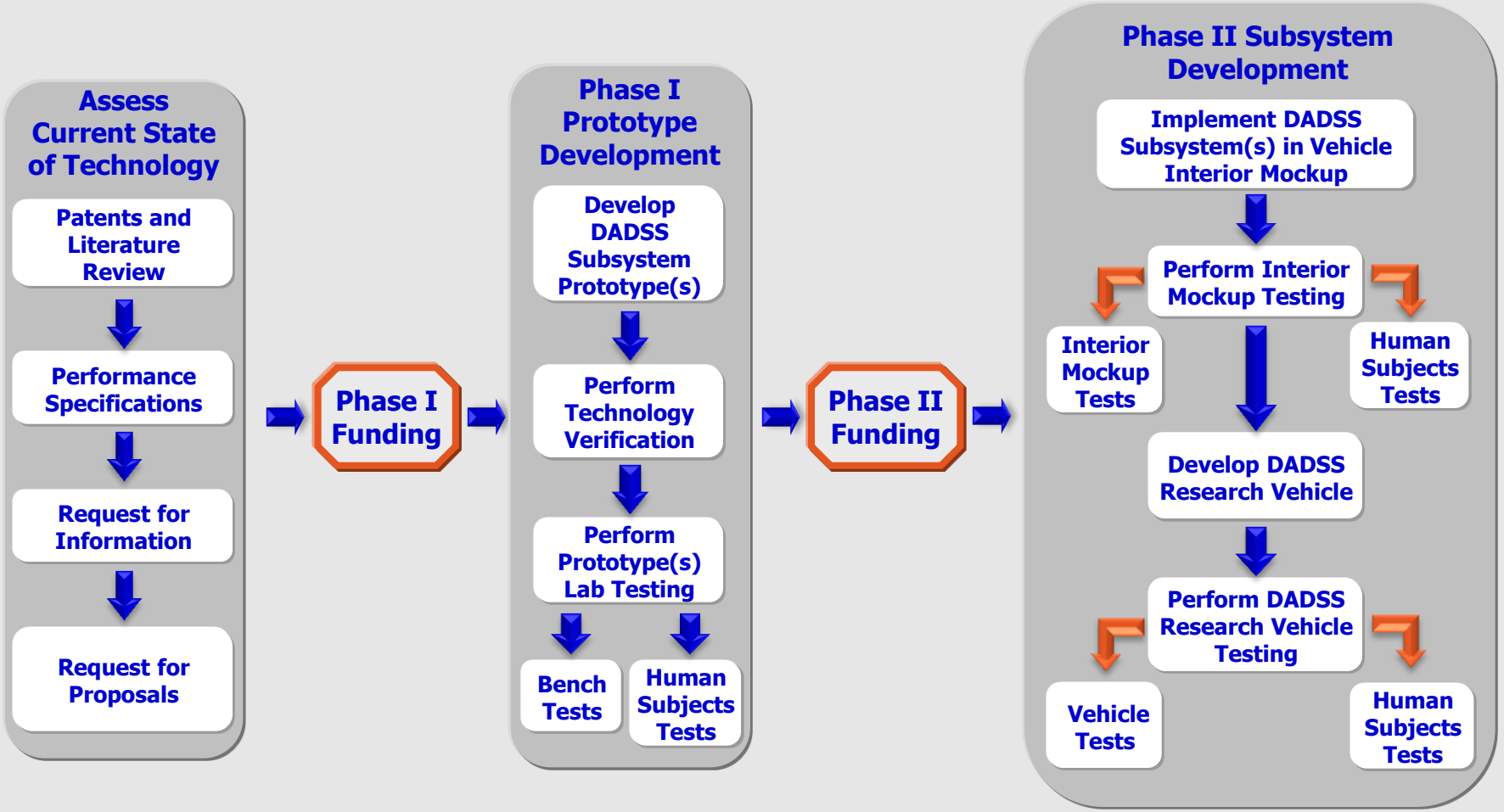
- Five-year program to develop and test prototypes that may be considered for vehicle integration
  - **Non-invasive**, seamless technologies to measure driver BAC and reduce incidence of drunk driving
  - Measure alcohol **accurately, precisely, and reliably in a very short time** so the sober driver is not inconvenienced
  - Devices intended to prevent alcohol-impaired drivers **(BAC ≥ 0.08)** from driving their vehicles

Participating Manufacturers (17)

BMW Group
CHRYSLER
Ford
GM
HONDA
HYUNDAI
JAGUAR
LAND ROVER
KIA MOTORS
mazda
Mercedes-Benz
MITSUBISHI MOTORS
NISSAN
PORSCHE
TOYOTA
VOLVO

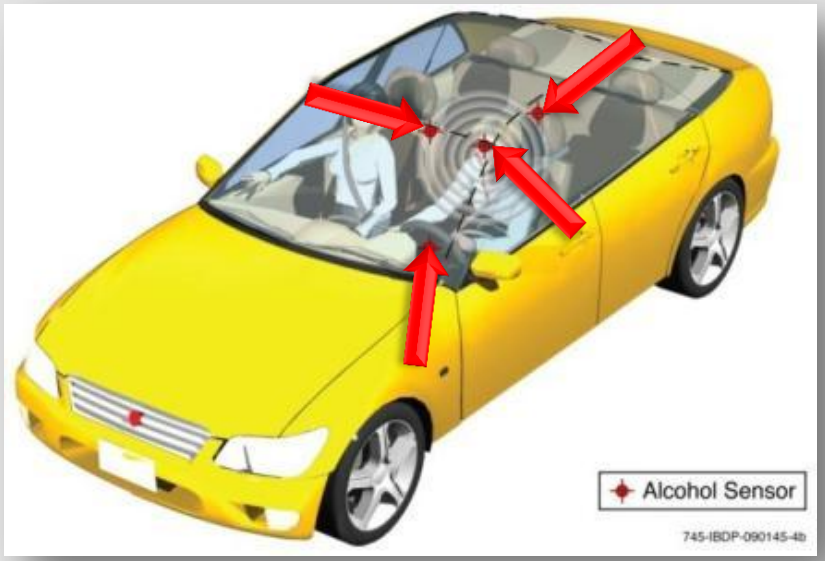
DADSS Program Process

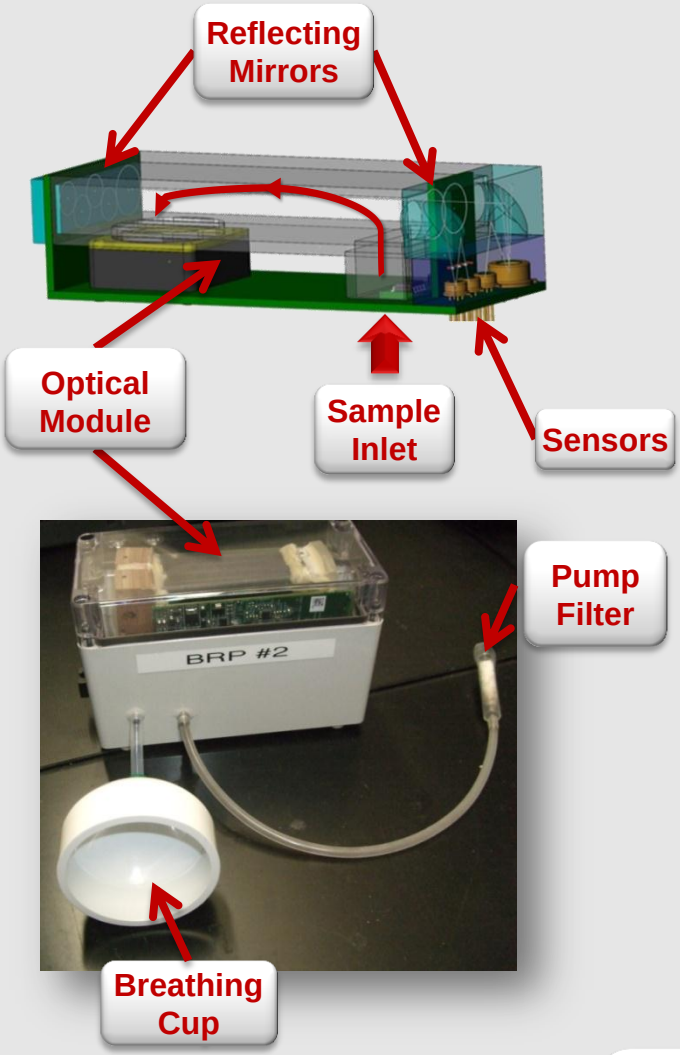
2008 | 2009 | 2010 | 2013-14



Autoliv: Breath-Based Technology

- **Breath-based** system
- Extensive real world experience with breath to measure BrAC
- **Alcohol and carbon dioxide** measured by IR sensor
- CO_2 measures **breath dilution**

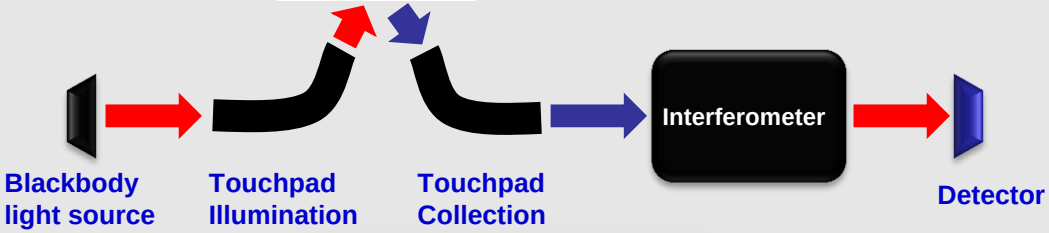


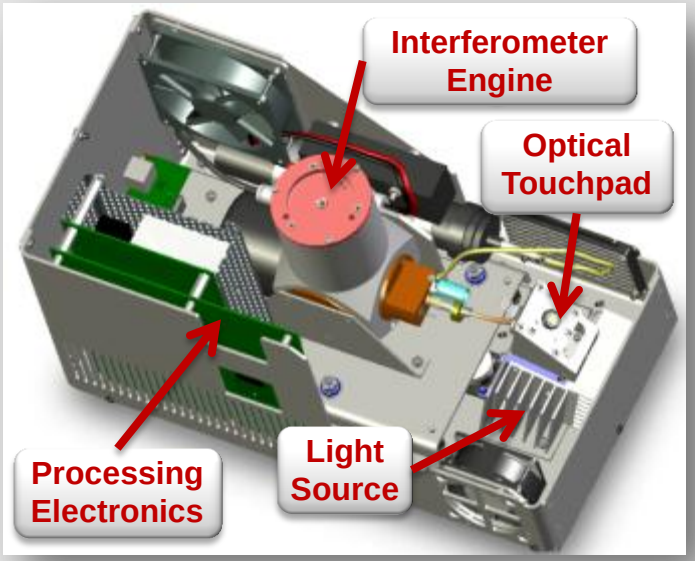


Takata-TruTouch: Touch-Based Technology

Concept of Operation:

- Finger placed on touchpad interface
- **Near-IR light** introduced into finger
- Absorbed (returned) light measured
- Interferometer measures **light intensity at each wavelength**
- **Alcohol concentration derived**





DADSS Phase I Requirements

- Phase I Prototypes evaluated against the following performance specifications:
  - Measure from **0.01% to 0.12% BAC**
  - Measurement time = **325 milliseconds**
  - Accuracy and Precision
    - **0.07%-0.09% BAC → ±0.0003% BAC**
    - Required Standard Calibration Devices (SCD)
      - Breath-based systems
      - Touch-based systems

% BAC	DADSS Accuracy	58 FR 48705 §4.1	DADSS Precision	58 FR 48705 §4.1
0.010 - 0.050	0.0010	0.0050	0.0010	0.0042
0.050 - 0.070	0.0007	0.0050	0.0007	0.0042
0.070 - 0.090	0.0003	0.0050	0.0003	0.0042
Greater than 0.090	0.0010	0.0050	0.0010	0.0042

High **accuracy** but low **precision**

High **precision** but low **accuracy**

More accurate calibration source required for DADSS program

Progress on Main Technical Challenges

Performance Metric	Perf. @ Start of Project	Progress thru Phase I	DADSS Perf. Spec.
Meas. Time	120 seconds		0.325 seconds
Accuracy	0.005% BAC		0.0003% BAC
Precision	0.0042% BAC		0.0003% BAC
Physical Packaging	500x300x150 mm		200x100x50 mm

Standard Calibration Devices (SCDs)

Objective:

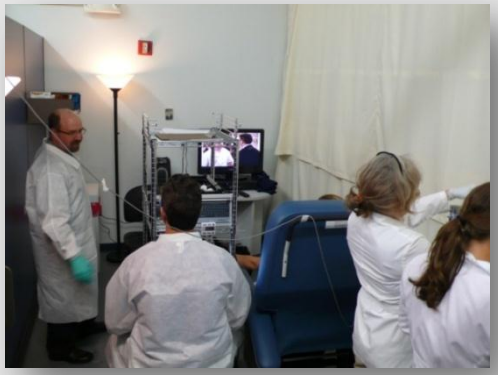
- Assess and document the accuracy and precision of the Phase I Proof-of-Principle (PoP) prototypes

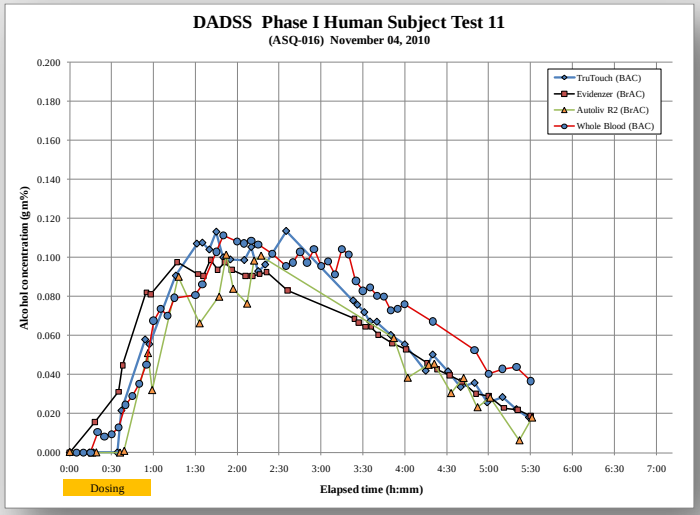
Approach:

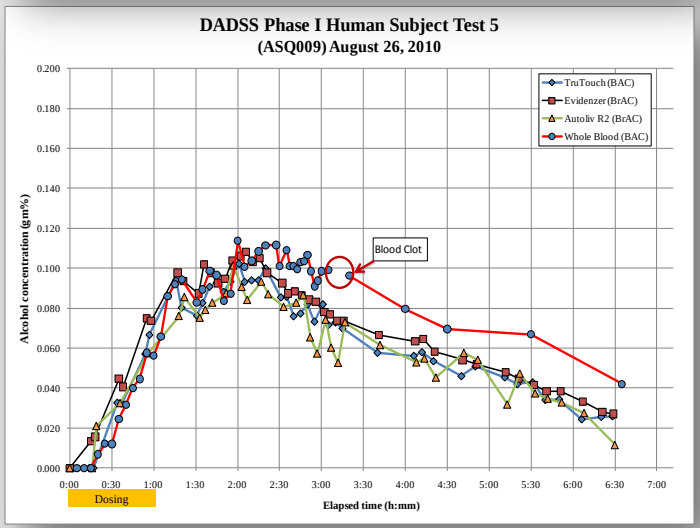
- Provide sample sources of "**breath**" or "**touch**" to PoP sensor
  - Known and consistent alcohol content

Human Subject Testing

- Subjects dosed to reach a BAC of **0.12 g/dL**
- Test procedures
  - Blood is drawn at a rate of 1 ml/min
  - Samples taken every 2.5 minutes
- Every 5 minutes subjects provide
  - Breath sample into Nanopuls Evidenzer
  - Breath sample into Autoliv prototype
  - Presses finger on touch pad of Takata-TruTouch prototype







Summary and Next Steps

- Three DADSS Phase **I** PoP prototypes have completed bench and human subjects testing
  - **Phase I results indicate there are technologies demonstrating potential to meet DADSS Performance Specifications** (meas. time, accuracy, and precision)
- Researchers have identified the research work needed to meet the DADSS requirements (gap analysis)
- **Two technology providers** have been selected for Phase II:
  - Autoliv Development AB
  - Takata-TruTouch Automotive Solutions
- **Phase II research initiated**
- **Research Vehicle with systems installed expected late 2013**

TIME 50 Best Inventions – 2011

"Nearly 9,000 deaths in the U.S. could be prevented each year if alcohol detection devices were used in all vehicles, according to the Insurance Institute for Highway Safety. Which is why QinetiQ North America, a research-and-development facility in Waltham, Mass., is working with the National Highway Traffic Safety Administration and the auto industry to develop touch- and breath-based sensors that could be strategically placed on steering wheels and ignition push buttons to instantly measure drivers' blood-alcohol concentration. The sensors would automatically analyze a driver's breath or skin to determine whether or not he or she was fit to drive. If the blood alcohol level was at or above the legal limit of 0.08%, the car would start ... but not move. The devices are in testing now and will be embedded into a research vehicle by the end of 2013. If all goes as planned, they could be on the road in eight to 10 years."

Driver Alcohol Detection System for Safety

QUESTIONS?

http://www.dadss.org

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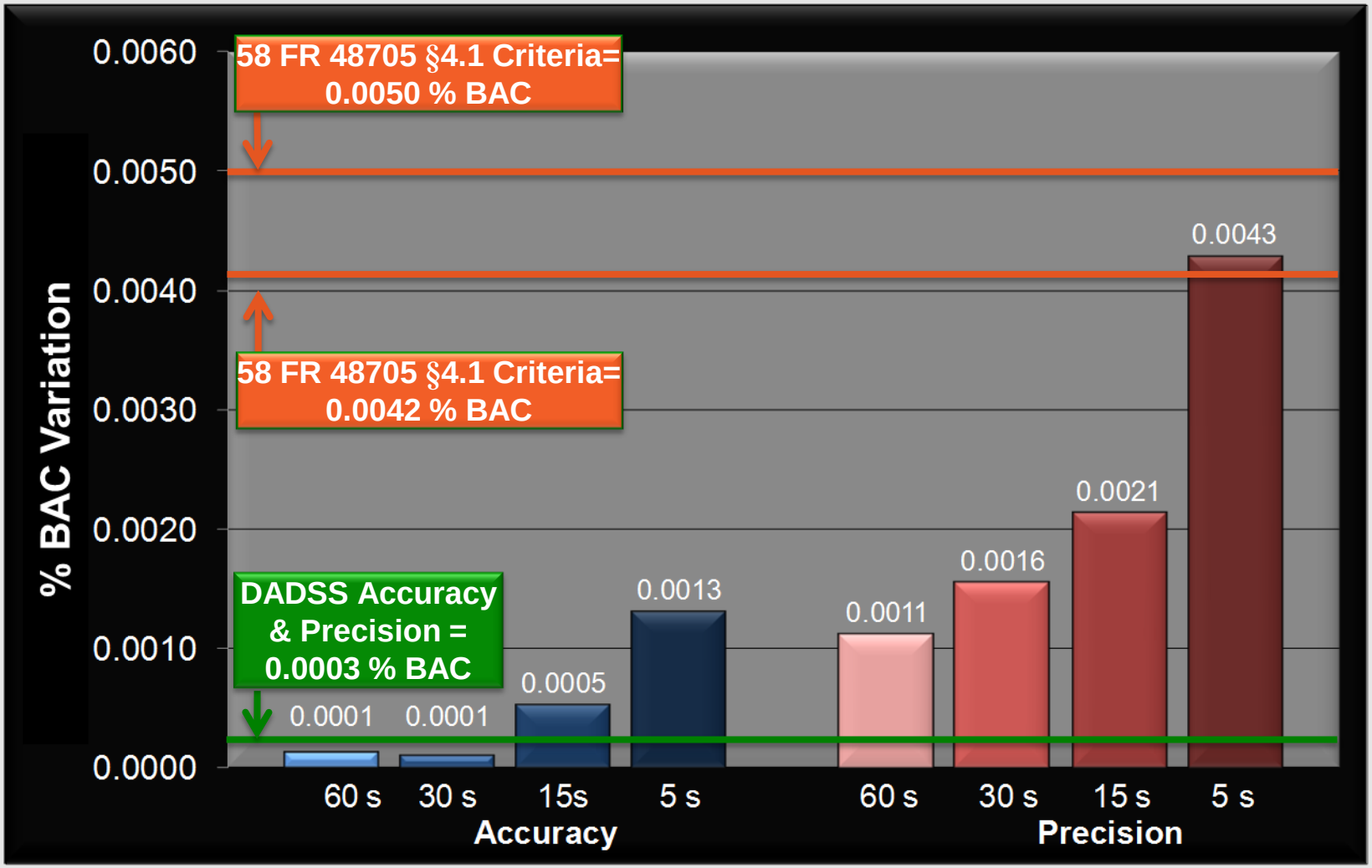
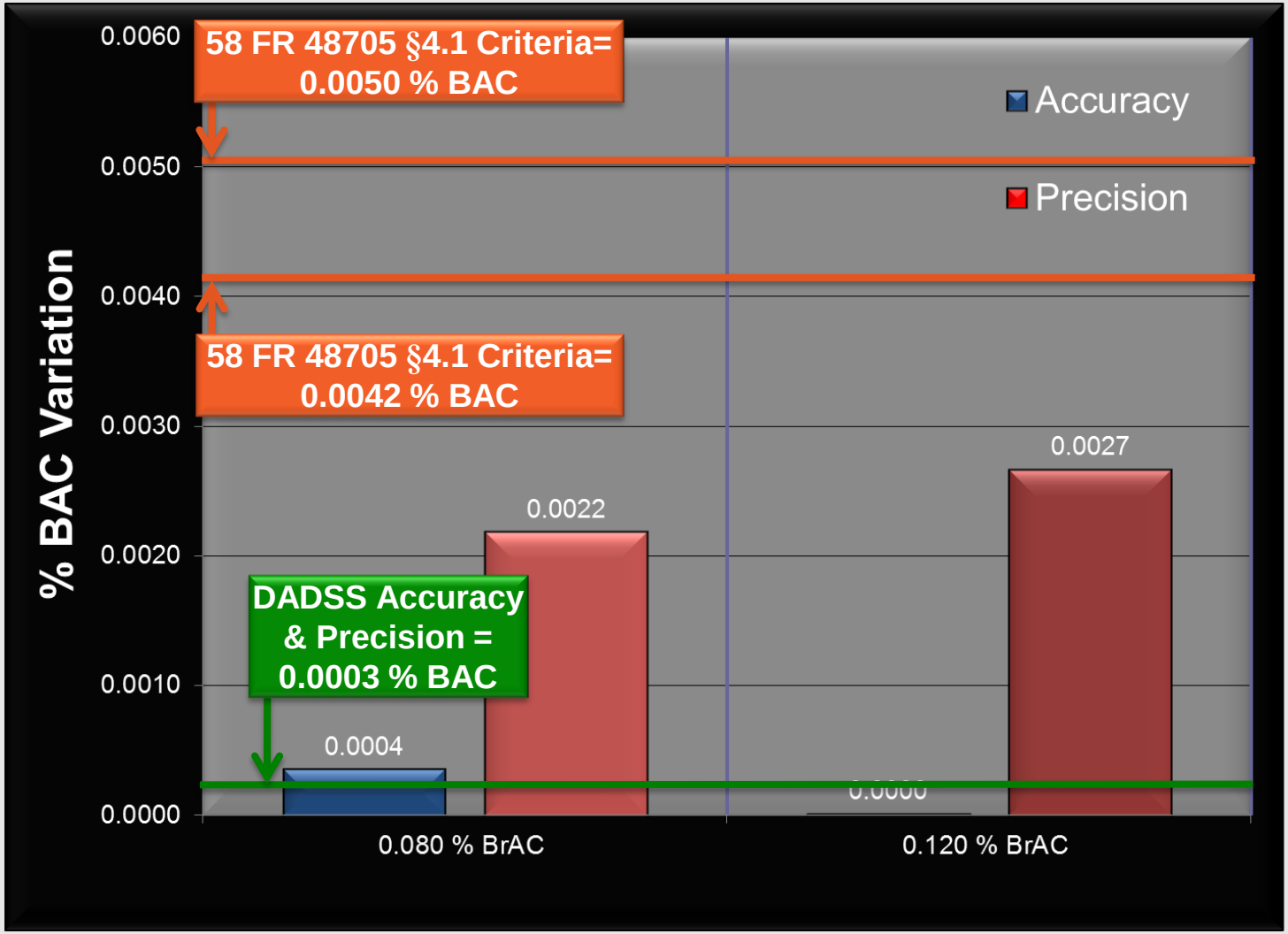
Backup Slides

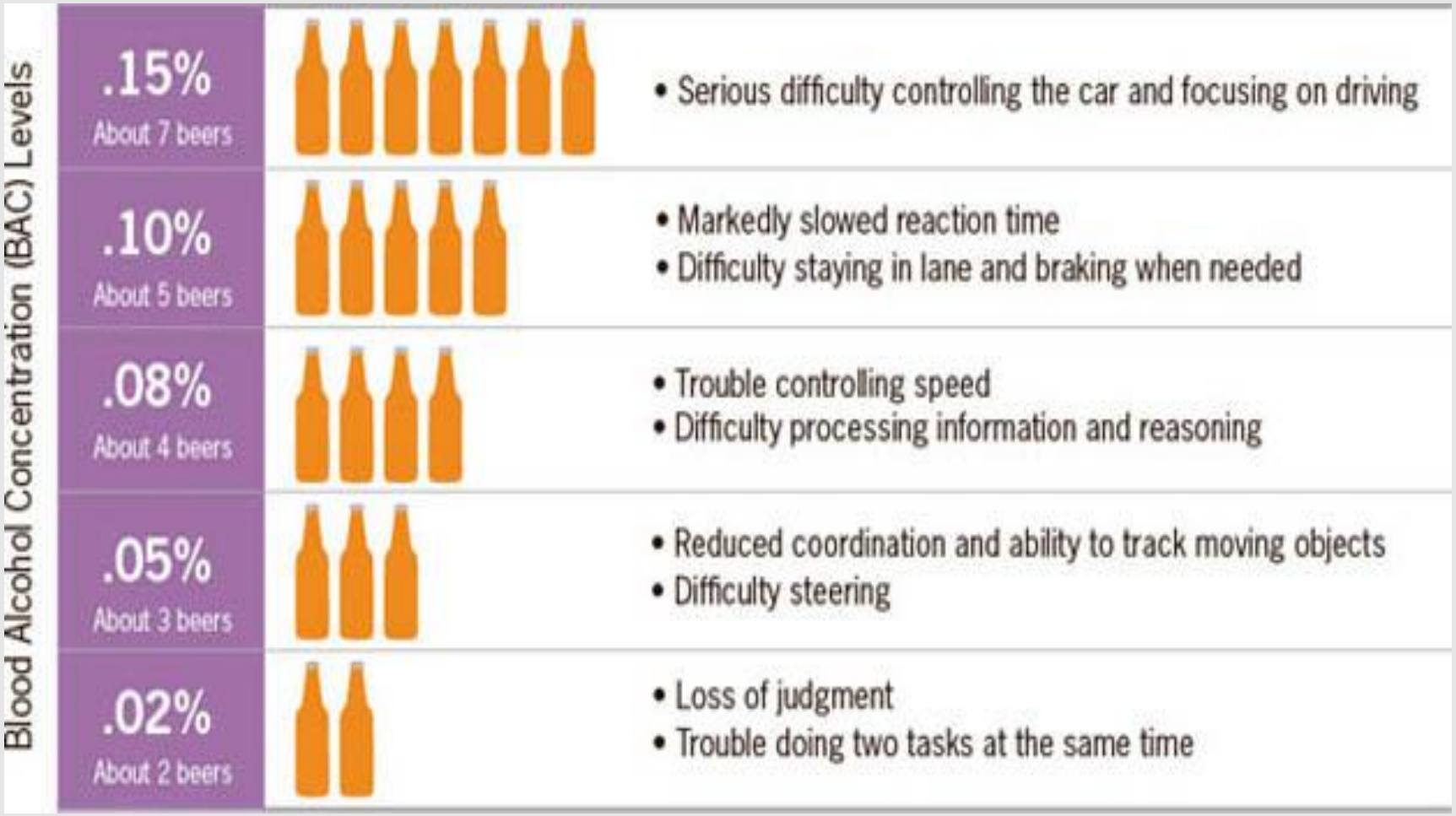
Takata-TruTouch Bench Test Evaluation @ 0.080 %



Autoliv Bench Test Evaluation

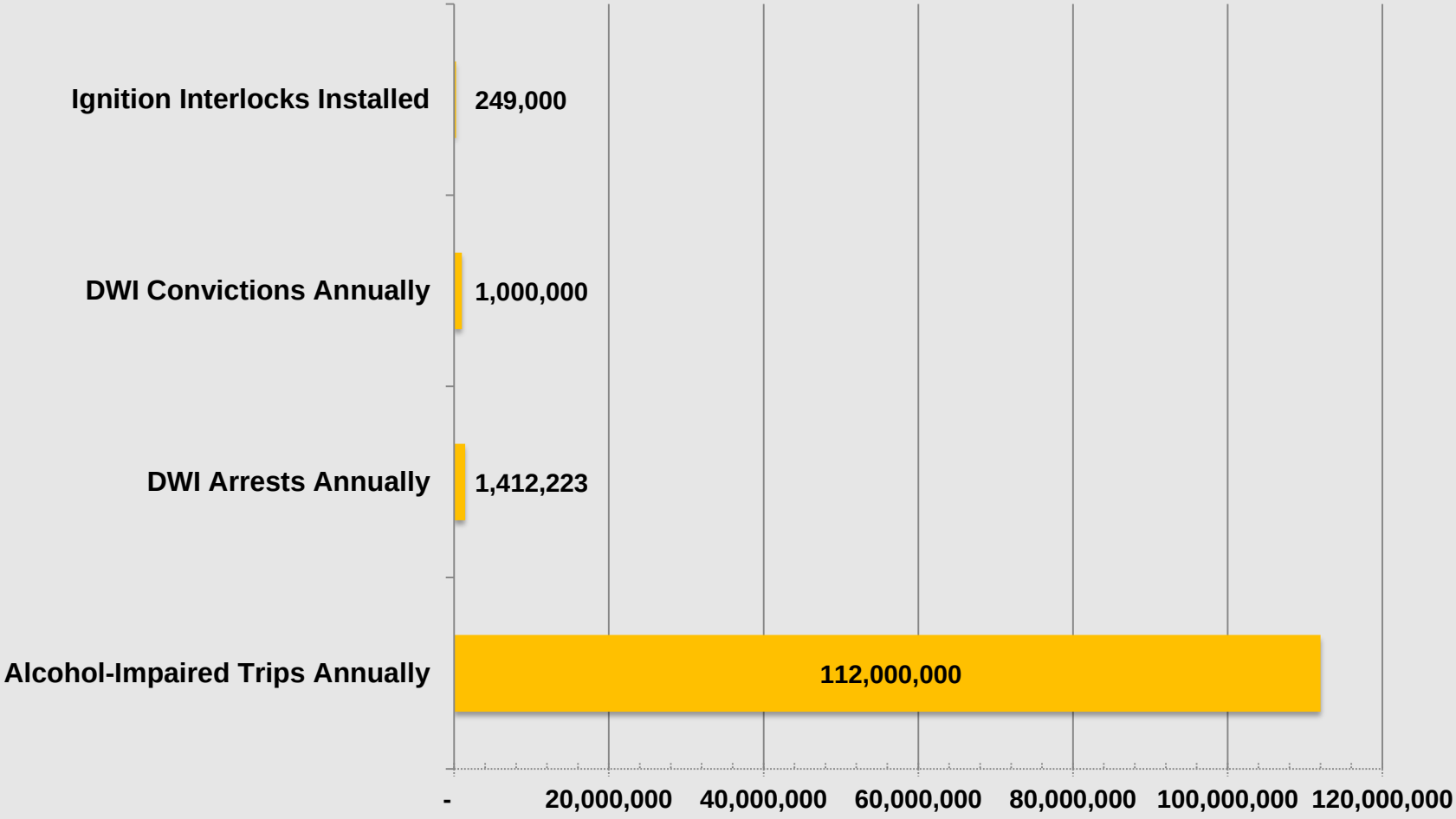


CDC: Some likely effects on driving …



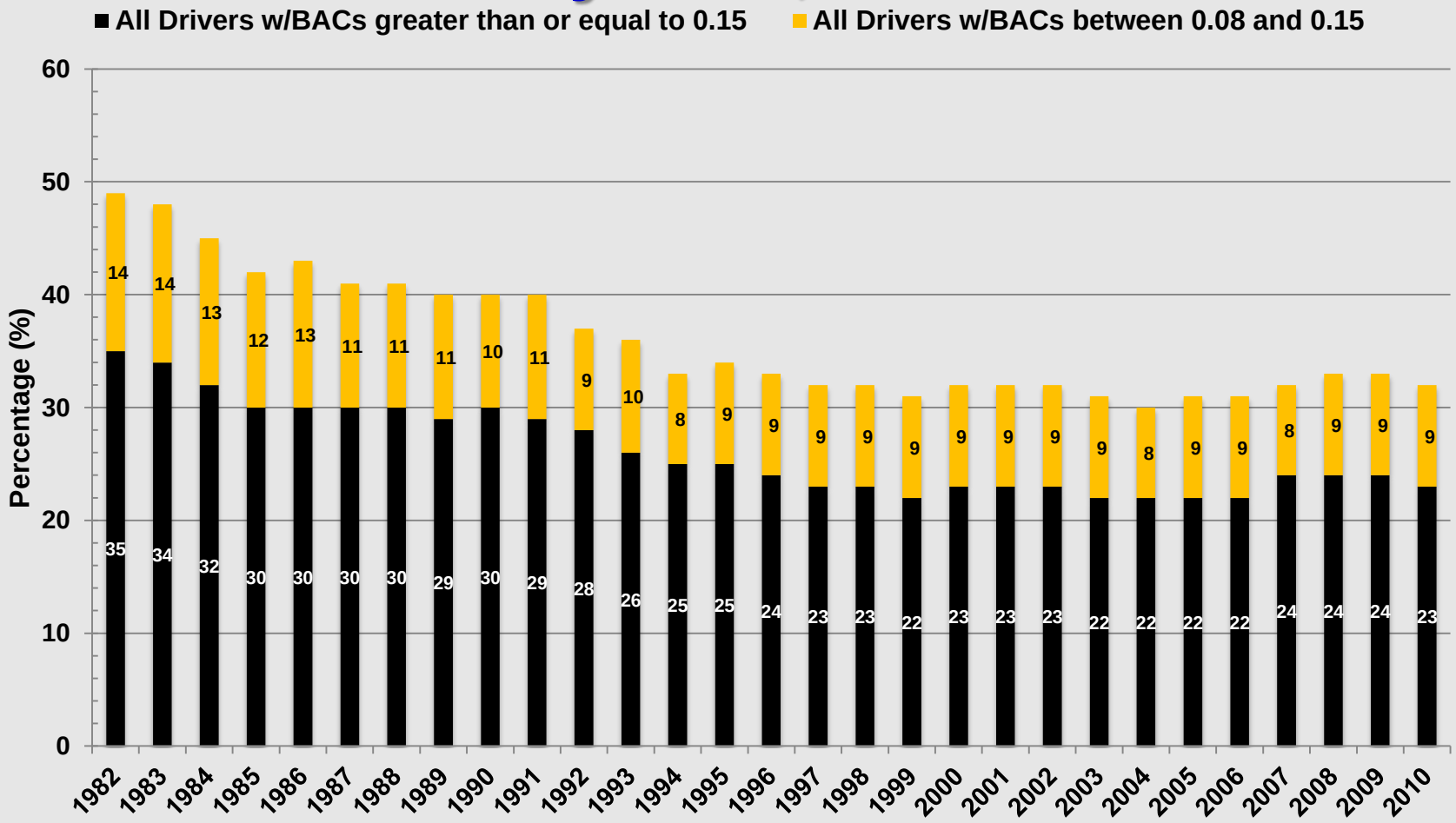
Adapted from The ABCs of BAC, National Highway Traffic Safety Administration, 2005, and How to Control Your Drinking, WR Miller and RF Munoz, University of New Mexico, 1982.

Drunk Driving in the United States



Sources: CDC, FBI, BJS, FHWA, NHTSA, Roth

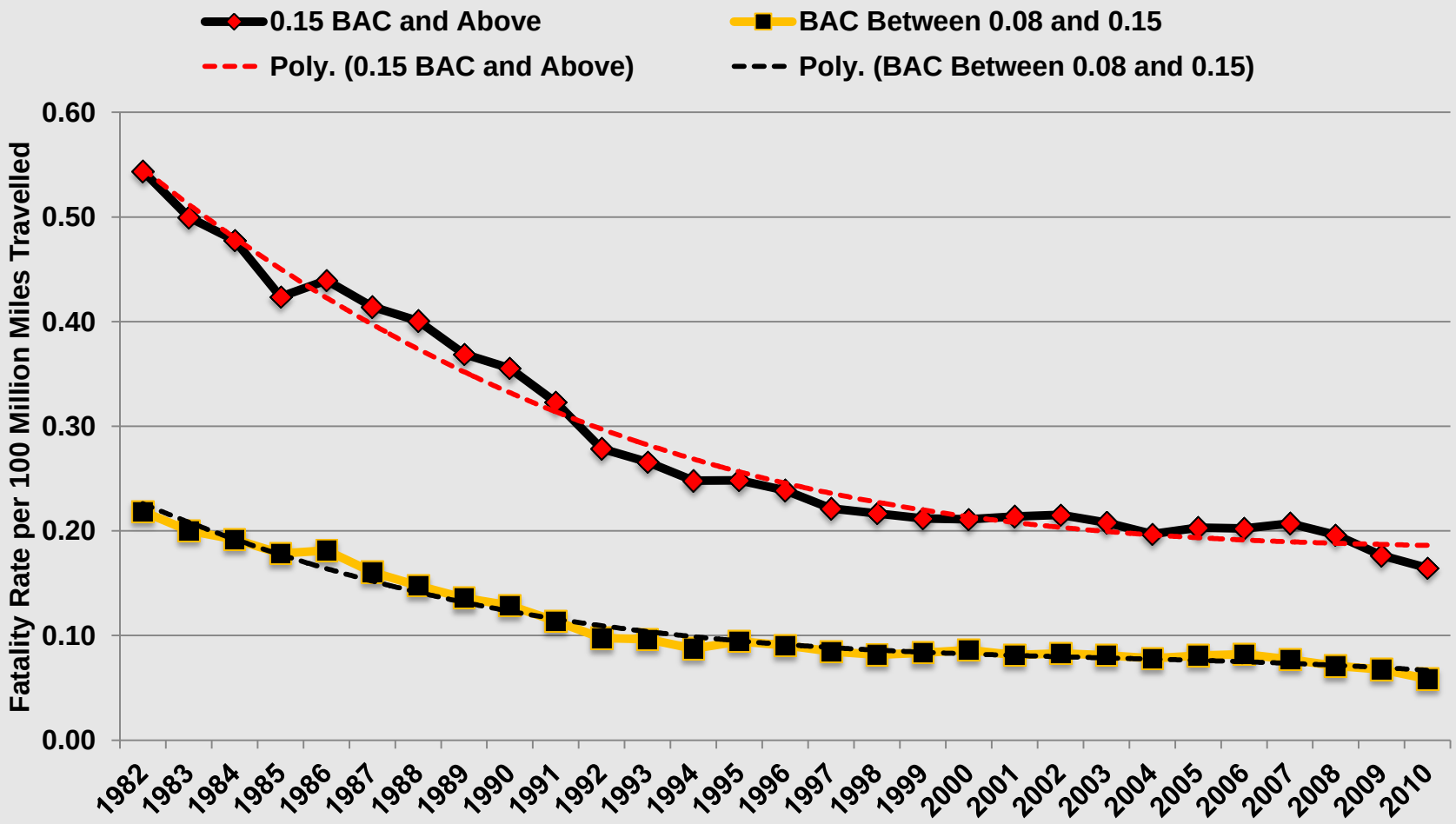
Estimated Percent of Fatally Injured Drivers by BAC, 1982–2010



Source: IIHS

Alcohol–Impaired Fatality Rate

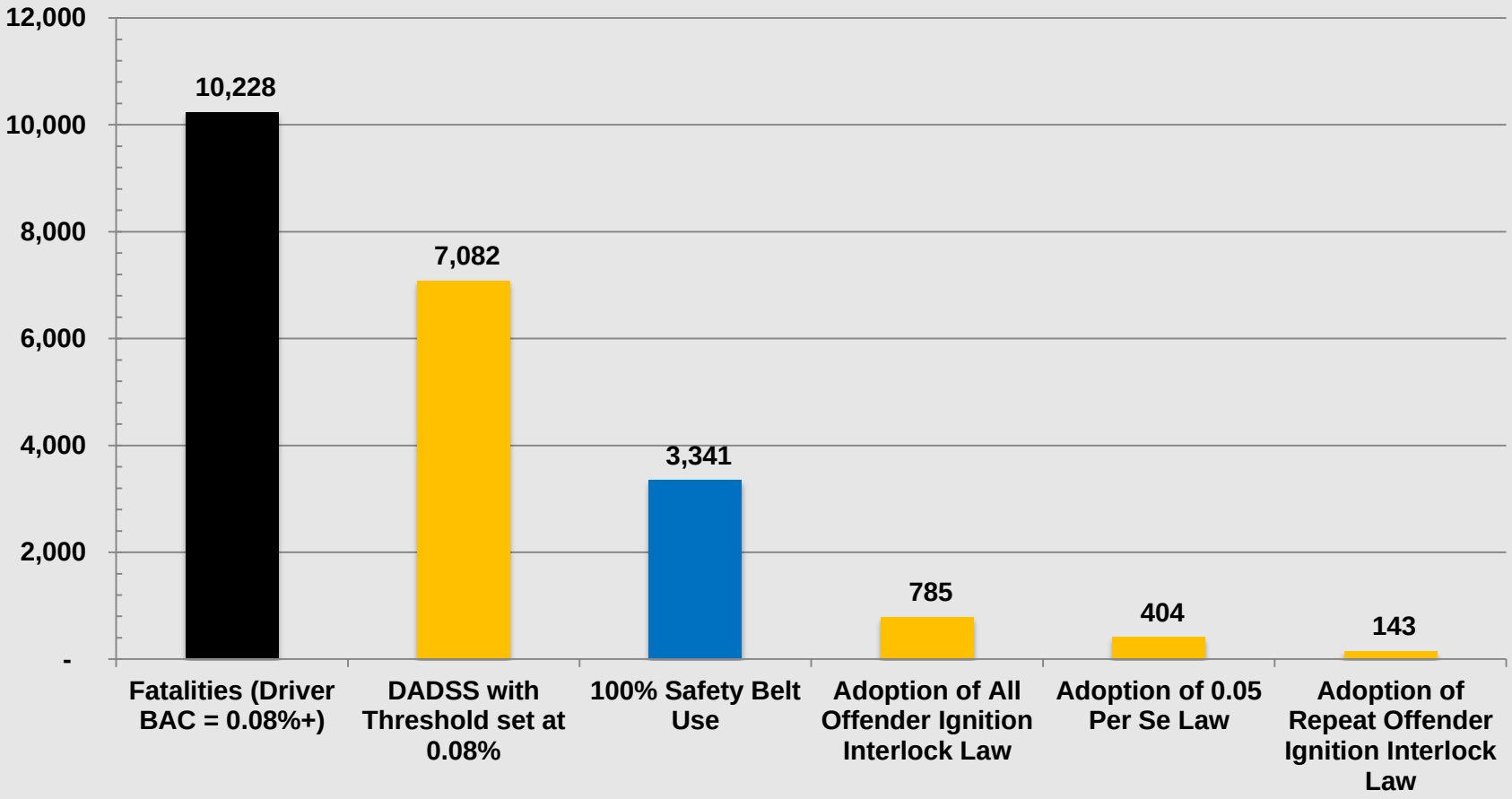
All Drivers



Source: FHWA, IIHS

Potential Lives Saved in the U.S. in 2010 by Countermeasure

(Specific Deterrence Only; General Deterrence not Estimated)



Sources: IIHS, NHTSA, Wagenaar

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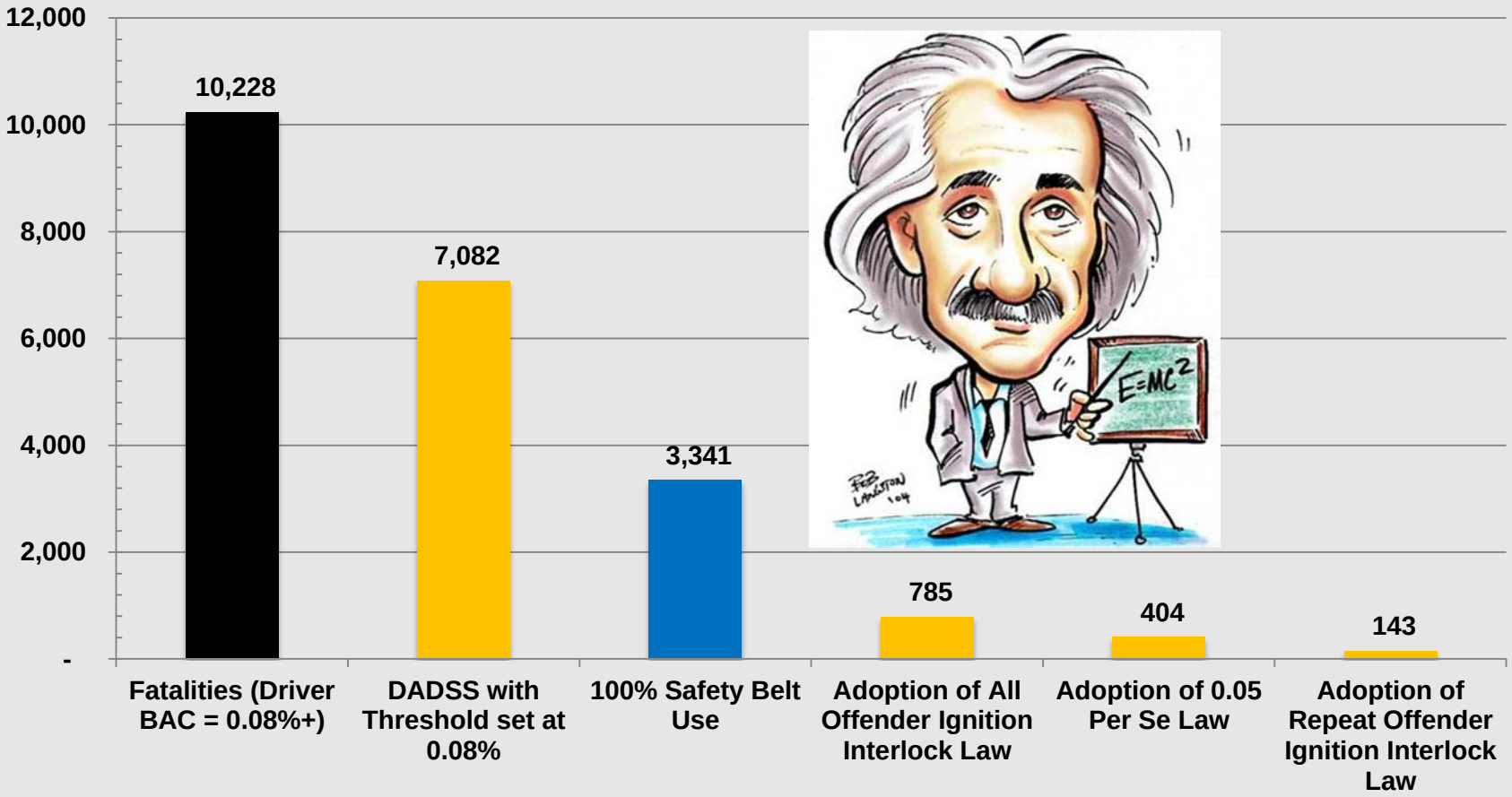
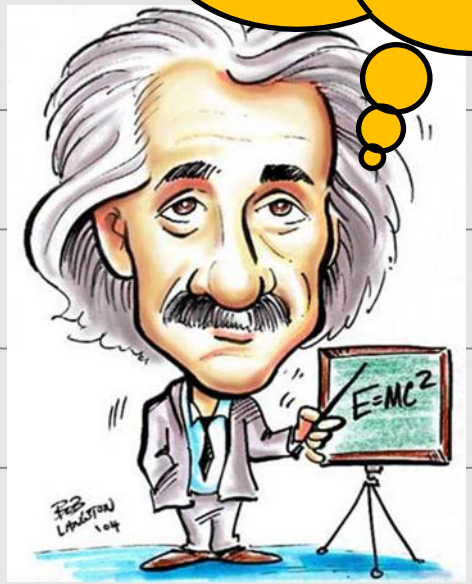


Sources: IIHS, NHTSA, Wagenaar

Potential Lives Saved in
by Counterm

(Specific Deterrence Only; General De

Without DADSS, only lowering the *per se* BAC limit and alcohol control policy options remain.



Sources: IIHS, NHTSA, Wagenaar

DADSS Drivers & Trends

- Sensor research and development for homeland security uses
- Adoption of “driver assist” systems by automakers
  - Blind Spot Warning, Lane Departure Warning, etc.
- In-car driver health monitoring
  - BMW/Technische Universitaet Muenchen driver health monitoring system
  - Ford WellDoc® Health and Wellness Solutions
  - Toyota steering wheel cardio-vascular monitoring system

DADSS Drivers & Trends

- Median age of new car purchaser in the U.S. is 56 years old (mid-point of Baby Boomer generation)
- Median age of population in the U.S. is 37 years old (mid-point of Generation X)
- Gen Xers first to grow up with computers; technology interwoven into their lives