MANAGING FATIGUE CONFERENCE PRESENTATION

General Motors

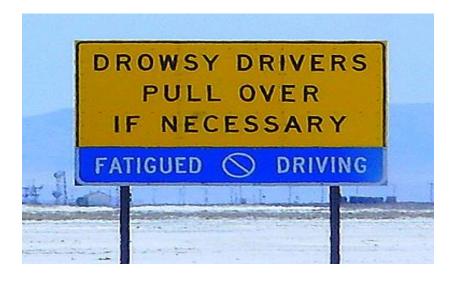Maureen Short

Well Known Drowsiness Disasters?

DROWSY DRIVING

- NHTSA estimates 100,000 vehicle crashes per year due to drowsiness (Rau, 2005)

- Some automotive manufacturers have used indirect measures
  - Lane position deviation
  - Steering wheel movement
  - Pressure on accelerator
  - Length of drive

- These features alert the driver

- Large-scale NHTSA-UMTRI-GM OnStar data collection study with ~2000 vehicles over ~1-year period indicates many drivers are turning off Lane Departure Warning system (DOT HS 812 247, 2016)
  - Percent time ON time was 36% with "beeps" versus 68% with Safety Alert Seat (directional seat vibrations)

GM

THE REAL ISSUE

Investigating officers only use testimony or circumstantial evidence, so crashes due to drowsiness may be underreported (National Sleep Foundation, 2016)

- No simple test to objectively assess sleepiness (NHTSA Drowsy Driving Research and Program Plan, 2016)

- New Jersey and Arkansas have laws making it punishable if driver is without sleep for 24 consecutive hours (National Conference of State Legislatures, 2016)

- No consistent law enforcement reporting protocol (NHTSA Drowsy Driving Research and Program Plan, 2016)
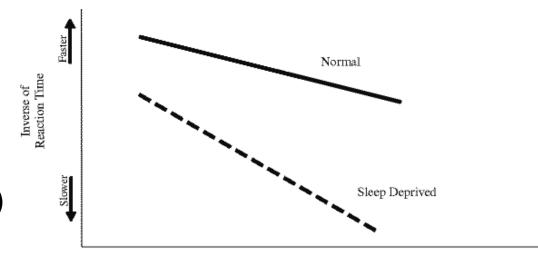
DROWSY DRIVING CRASHES AND RISKS

Majority of Drowsiness Crashes…

- On highways (Knipling, Wang, 1994; Wang, Knipling, Goodman, 1996)
- At high speeds 55-65 mph (Knipling, Wang, 1994; Wang, Knipling, Goodman, 1996)
- Single Occupant (McCartt et al., 1996)

Excessive Drowsiness (Kribbs, Dinges, 1994)

- Increases human error
- Increases lapses in performance, slows reaction time
- Can lead to unpredictable microsleeps

Reaction time slows with less sleep
(Kribbs, Dinges, 1994)

KEY FACTORS CONTRIBUTING TO DROWSINESS

- Trip Duration

- Time of Day

- Quality of Sleep

- Quantity of Sleep

SLEEP AND SOCIETY

- Sleep-wake cycle is a pattern that cannot be ignored (Kolling et al., 2016)

- Masking of sleepiness with caffeine (Daniello, Fievisohn, Gregory, 2012)

- People overestimate the amount of sleep they get (Mukherjee et al., 2015)

Drivers are unaware of the negative effects of sleep loss

DROWSY DRIVING CAUSES

- Age and Gender

- Circadian Effects / Time of Day

- Acute sleep deprivation

- Chronic sleep deprivation

Source: American Society of Safety Engineers, 2017

ALERTING DRIVER

- Most drowsiness detection systems for automobiles are based on algorithms related primarily to vehicle control behavior

- Central monitoring has reported to work well in mining (Eiter, Steiner and Kelhart, 2014)

- Mandatory wearable biometric-type devices could be challenging for marketing

- People may not be accurate when asked to report hours of sleep (Sahayadhas , Sundaraj and Murugappan, 2012)
  - BUT in bed does not equal sleep quality
  - Actigraphs may capture some useful sleep data

POTENTIAL TECHNIQUES USED TO COMBAT DROWSINESS DURING A DRIVE

- Breaks

- Coffee

- Exercise

- Active Safety Features On

Can we help driver BEFORE the trip starts with respect to drowsiness and fitness to drive?

OPPORTUNITIES

- Can we help a driver better plan a trip?

- Can we provide more detailed feedback on their drowsiness level?

- Can we find ways to provide more practical support to drivers experiencing drowsiness?

- Can we increase acceptance of widely emerging active safety features; which may provide indirect indications of drowsiness via alert feedback?

100%   50%   0%