Findings from the Commercial Driver Safety Risk Factors (CDSRF) Study

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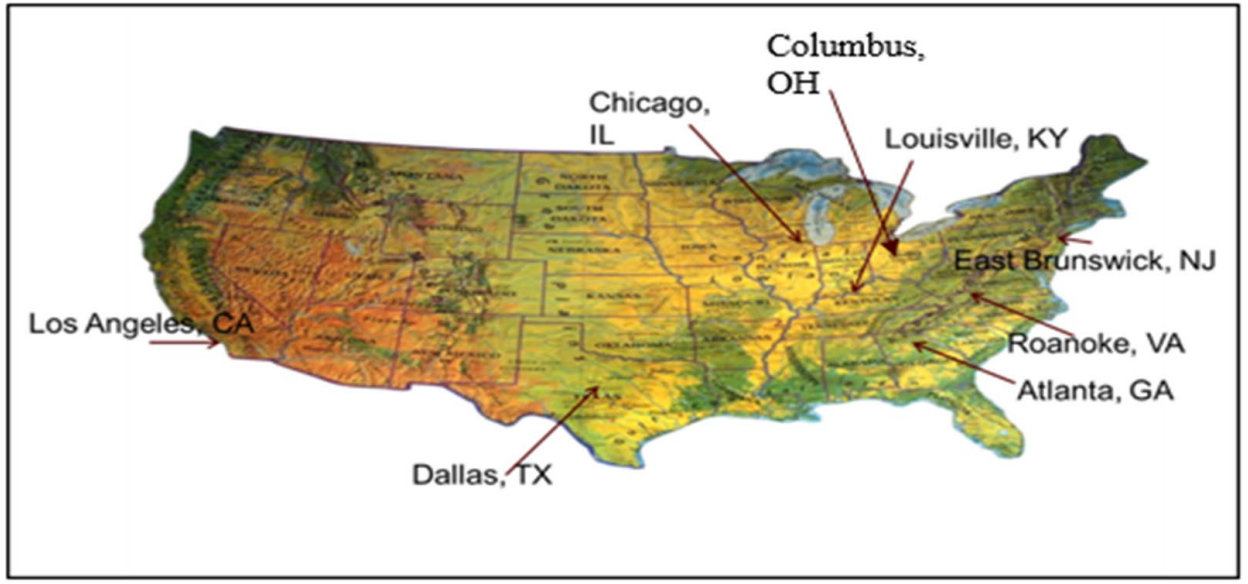
CDSRF Primary Objectives

1. Discuss the prevalence of demographic characteristics, work experience, lifestyle and behavioral habits, medical conditions, etc. for up to 21,000 CMV drivers
2. Identify personal, medical, and situational factors that increase crash or violation risk
3. Identify factors associated with presence of OSA
4. Follow CMV drivers' safety records for up to three years

Methods

- Recruited at driver orientation
- Consented drivers completed Initial Driver Survey (n=11,414)
- Driver medical exams received from carrier for all drivers
  - Complete medical examination report (n=13,724)
  - Brief medical screen (n=5,790)
- Monthly safety records from carrier
  - Self-insured; thus, filtered to on-road crashes (2,775)
  - Most minor PDO crashes excluded (e.g., driving over bush, scraping mirror, etc.)
- Monthly MCMIS data (741 FMCSA-recordable crashes)
- CDLIS moving violation convictions (n=1,614)



Medical Exam and Initial Driver Survey

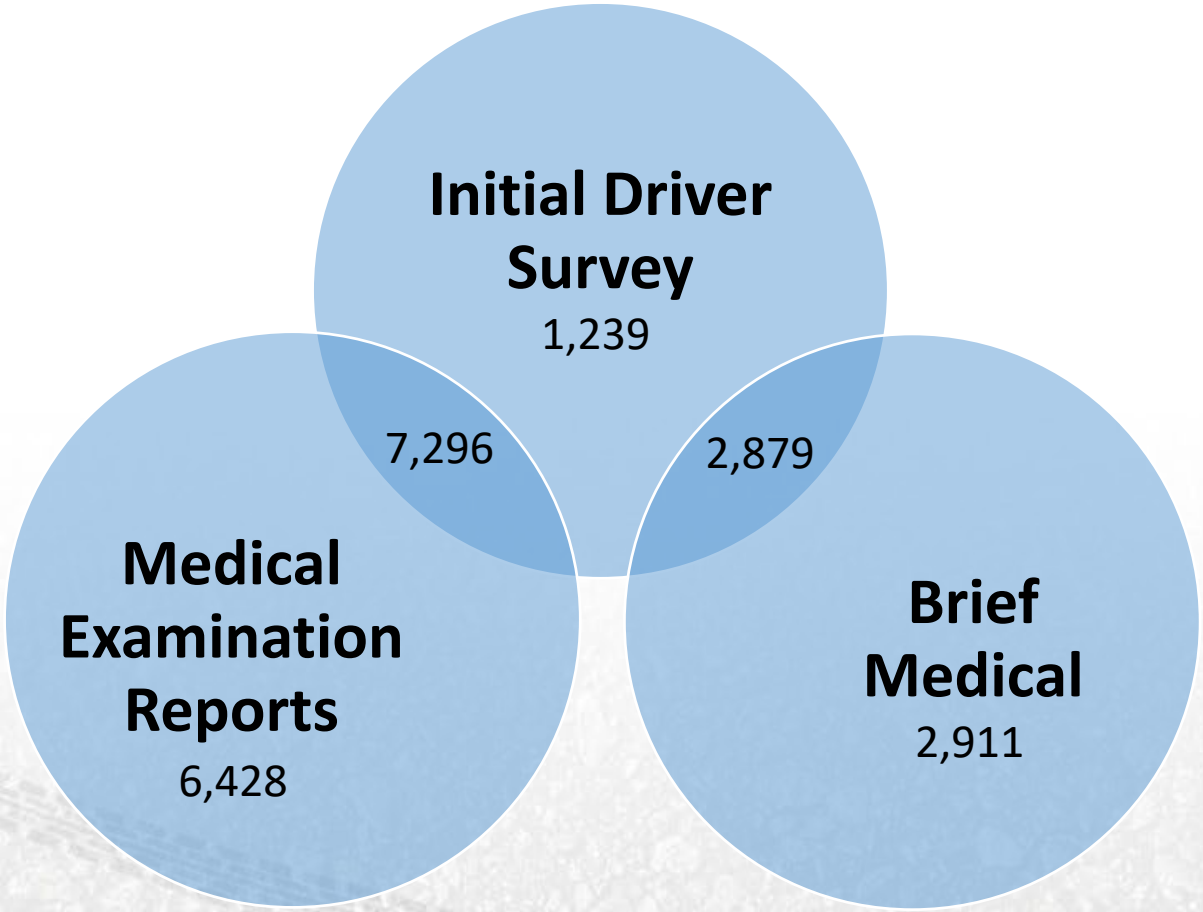
Questionnaire	Description
Medical Examination Report for Commercial Driver Fitness Determination	Required of all drivers with a commercial driver's license (CDL). The examination form consists of biographical information, such as name, date of birth, weight, height and gender, as well as 64 items related to medical health.
Brief Medical Exam	Collected demographic information (driver's license number, gender, and date of birth) as well as two pieces of objective medical information (blood pressure and heart rate). Only collected for those drivers without a Medical Examination Report.
Initial Driver Survey: Demographic Questionnaire	Basic demographic information that was not covered in the Medical Examination Report (e.g., sleep, lifestyle, training, driving experience, etc.).
Initial Driver Survey: Epworth Sleepiness Scale (ESS)	A self-report screening tool for daytime sleepiness.
Initial Driver Survey: Berlin Questionnaire (BQ)	A self-report screening tool for OSA.
Initial Driver Survey: Survey of Recent Life Experiences (SRLE)	A survey reporting the frequency of recent life experiences that contribute to stress or "daily hassles."
Initial Driver Survey: Dula Dangerous Driving Index (DDDI)	A survey assessing various aspects of driving behavior, including hostility felt and expressed while driving.
Initial Driver Survey: Social Desirability Scale (SDS)	A survey which helps determine if a respondent is attempting to appear in a favorable light or is otherwise not responding truthfully.

Data Entry/Formatting

- Questionnaire data double entered
- Medical Examination Report comments
  1. Current condition is:
     - Diagnosed
     - Potential
       - ME left a comment suggesting a possible condition
     - Unsure/unclear
  2. Condition is:
     - Being treated
     - Not being treated
     - Unsure/unclear
     - Treatment prescribed but not compliant

Completion Counts

- 1st completed measure
- 20,753 unique drivers
  - No duplicates



Descriptive Results

Demographics

- 96% of study drivers Male
- Age
  - 21-33 yrs: 25%
  - 34-42 yrs: 24%
  - 43-51 yrs: 27%
  - ≥52 yrs: 24%
- 29% Overweight
- 58% Obese (BMI≥30 kg/m^2)
  - Class I (30≤BMI<35): 28%
  - Class II (35≤BMI<40): 16%
  - Class III (BMI>40): 15%
- 48% Married
- 37% Single
- 12% Divorced

Lifestyle

- 63% used tobacco
- Caffeine
  - 22%: 1 drink/day
  - 33%: 2 drinks/day
  - 17%: 3 drinks/day
  - 12%: 6+ drinks/day
- Alcohol
  - 70%: 0 drinks/week
  - 30%: 1 drink/week
- 73% napped during day
- 34% not on a regular sleep schedule
- 54% sometimes on a regular sleep schedule
- Nightly sleep
  - 73%: 7 or more hrs/night
  - 26%: 5-6 hrs/night
  - <1% 4 or fewer hrs/night

Data Analysis Approach: Prospective Cohort

- Poisson regression model to link crash risk with survey/medical factors
- Individual regression
  - Stratified by age quartiles (20-33; 34-42; 43-51; 52+)
  - Adjusted for age and BMI
- Stepwise regression (effect of multiple variables)
  - Adjusted for age and BMI
  - Not stratified
  - No interaction
  - Missing value problem

Data Analysis Approach: Prospective Cohort

- Four outputs
  - National crash database (MCMIS)
  - National moving violation conviction database (CDLIS)
  - Carrier crash files
    - Total on-road crashes
    - Preventable crashes

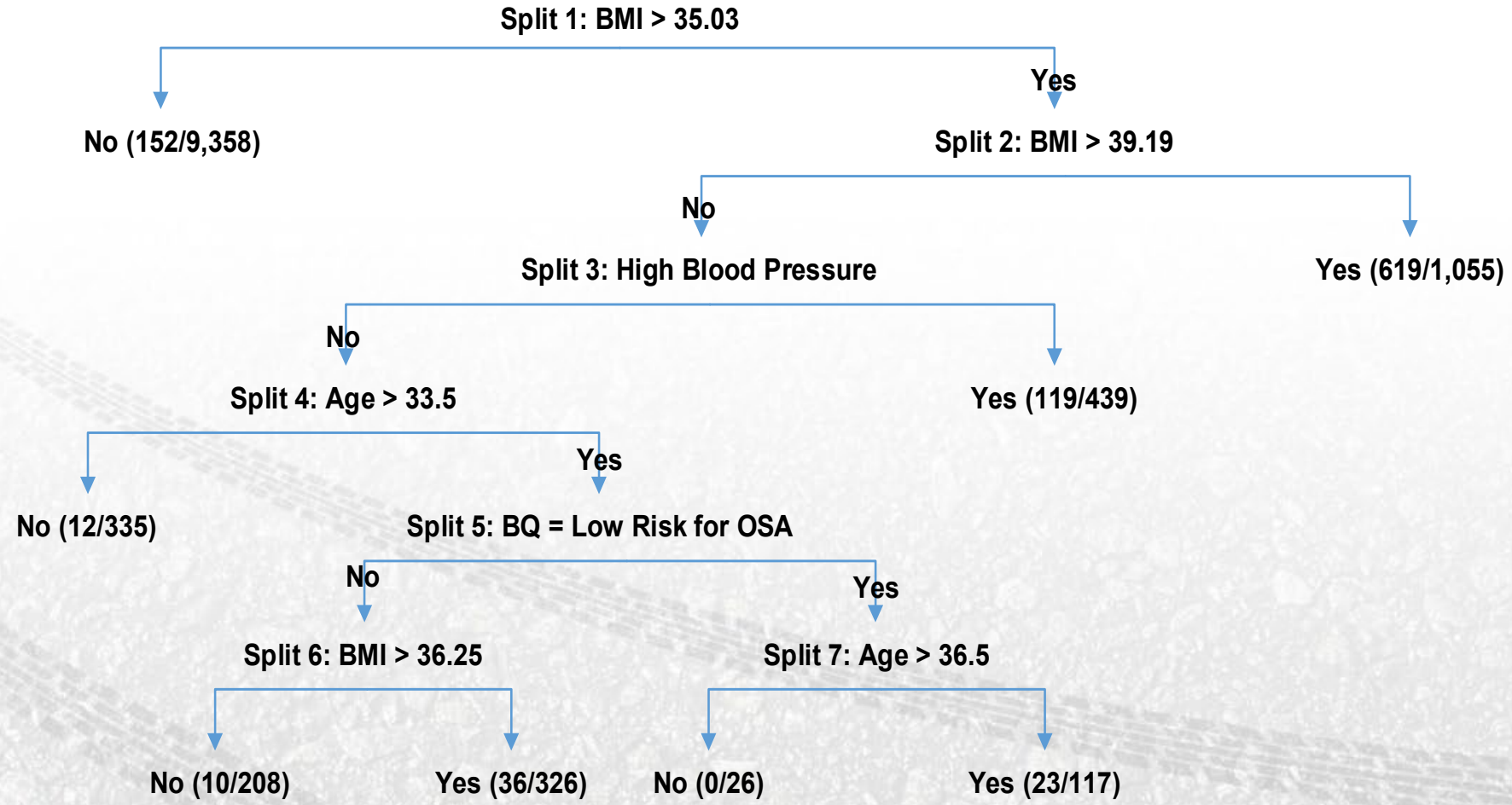
Data Analysis Approach: Prospective Cohort

- Time A + C = Carrier crashes and Violations / Tenure
- Time B = National Crashes / Exposure

Key Findings

OSA Prediction

- Which predictors were associated with a diagnosis of OSA?
  - Classification tree shows the relative importance of the predictive variables in identifying diagnosed OSA drivers



Crash Risk for Medical Conditions

- Which medical conditions and treatments had an impact on future crash and/or moving violation risk?
  - Drivers being treated for medical conditions, such as diabetes/elevated blood sugar, high blood pressure, and OSA, were no riskier than drivers without the same medical conditions. In some age groups, treated drivers were less risky than those who did not have the medical condition
  - OSA treatment reduced crash risk ~40%; non-treatment increased risk by ~200%
  - Hypertension treatment reduced risk ~5% to ~40%; non-treatment increased risk by ~30% to ~200%

Crash Risk by Prior Moving Violation

- Did prior moving violations have an impact on future crash and/or moving violation risk?
  - Drivers with a self-reported moving violation in the last 3 years were 40-58% more likely to be involved in a crash than drivers of similar age without prior moving violations

Crash Risk by Age and Driving Experience

- Did driver age and driving experience have an impact on future crash and/or moving violation risk?
  - Each yearly increase in age reduced the likelihood of a *moving violation conviction* by 6.0 percent.
  - Each yearly increase in age reduced the likelihood of involvement in a *national crash* by 4.0 percent.
  - Each yearly increase in age reduced the likelihood of involvement in a *carrier preventable crash* by 5.6 percent.

Other Takeaways

- Obesity was highly prevalent among study sample (58.4%); however, obesity itself does not increase crash or violation risk
  - Untreated comorbid conditions increase crash risk
- Most common diagnosed medical groupings in study population
  1. High blood pressure (24.39%)
  2. Diabetes/elevated blood sugar (9.38%)
  3. OSA (7.15%)
- Effect of age on safety events and relationship of age to BMI and medical conditions
  - Older drivers → more driving experience → fewer safety events
  - Older drivers → higher BMI and more medical conditions

Conclusions

- Relationship of age, BMI, medical conditions, and safety
  - Informs future longitudinal study in planning (NIOSH)
- High prevalence of obesity and obesity-related comorbid conditions
- Questionnaires used with light vehicle drivers may not be appropriate
  - Need to assess with truck drivers or develop new questionnaires with truck drivers
- Requirements for medical certification working
  - Risk present in non-treatment/potential
  - Treatment typically safer/no difference

Conclusions, cont

- OSA predictors similar to STOP-BANG
  - Snoring
  - Tired
  - Observed apnea
  - Blood Pressure
  - BMI
  - Age
  - Neck circumference
  - Gender

- Fleets
  - High rates of characteristics/behaviors associated with comorbid health conditions
    - Target smoking and weight loss
  - Pre-employment screening can be effective (moving violations)
  - Treating health conditions results in healthier AND safer drivers

Limitations

- Limited sample size of many medical conditions-not enough power to see differences
- Exposure measured in calendar days, not vehicle miles traveled or hours driving
- Initial Driver Survey respondents are convenience sample, not random
- Treatment for medical conditions did not consider type or efficacy
- Once drivers left participating carrier, unable to know if they continued driving. MCMIS and CDLIS data impacted
  - Drivers with poor safety records who are unable to find employment would have zero crash risk

Questions?

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