

TRB Synthesis Report on:
Individual Differences
and the
“High-Risk” Commercial Driver

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Transportation Research Board

**Commercial Truck & Bus Safety
Synthesis Program (CTBSSP)**

Project MC-04

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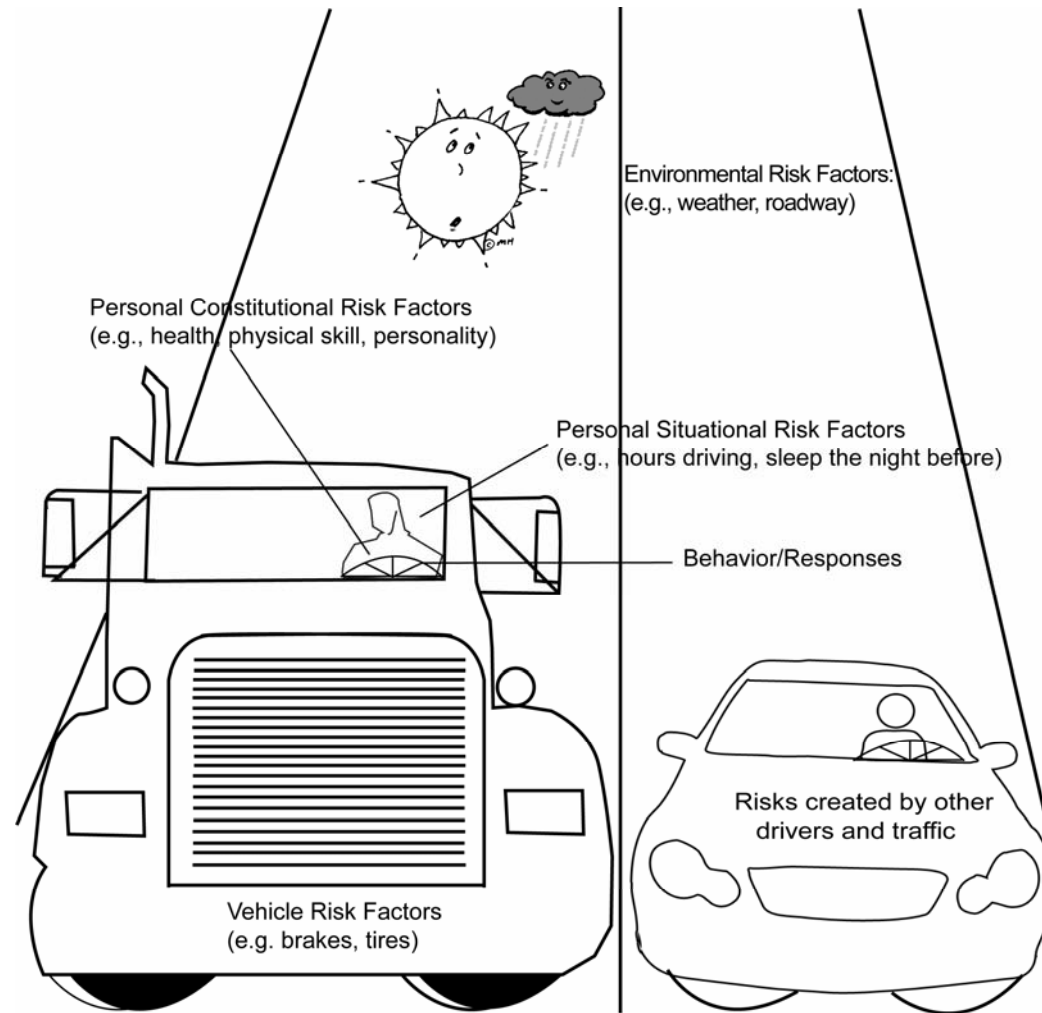
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Major Interacting Risk Factors Affecting Crash Involvement



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Illustrative Example:
FMCSA/VTTI

Local/Short Haul Driver Fatigue Study



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Study Parameters:

FMCSA/VTTI

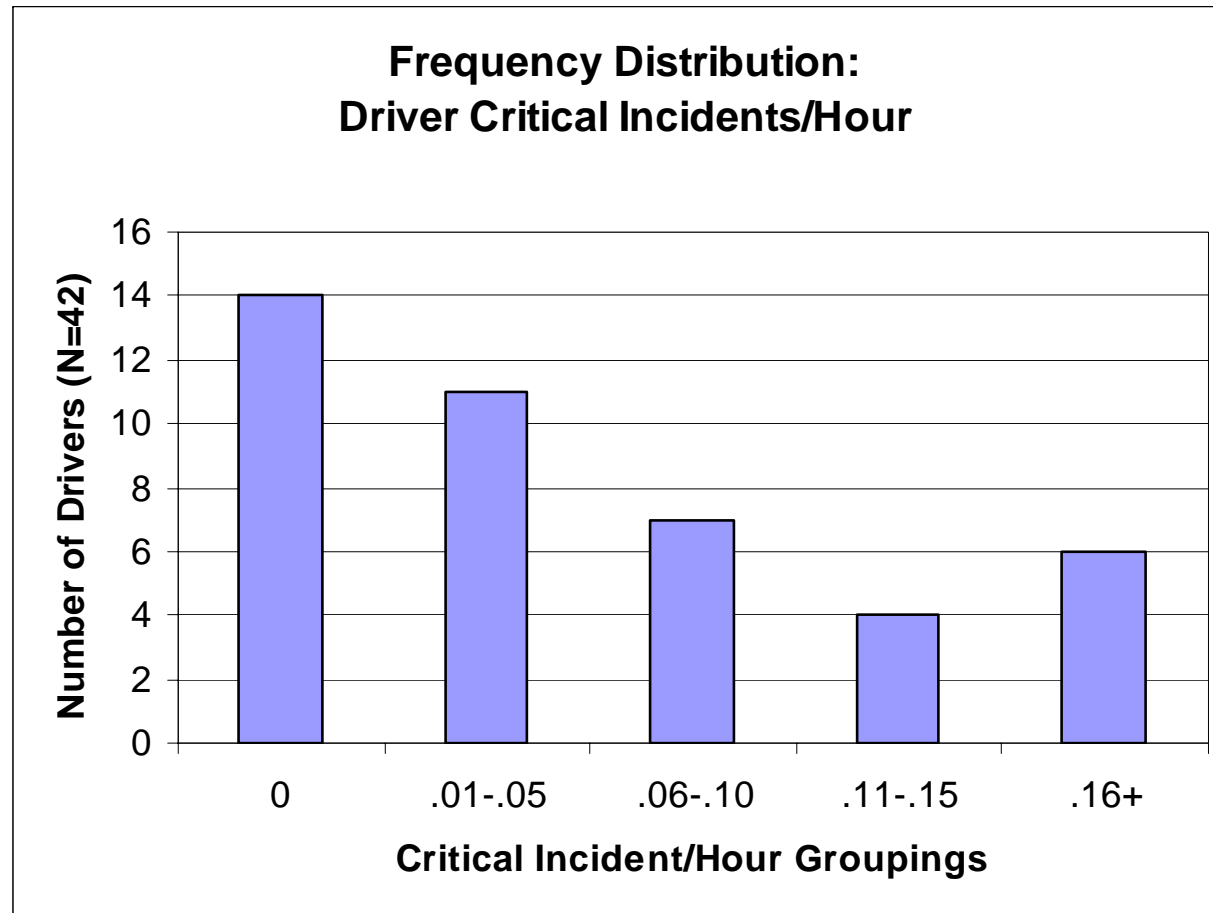
Local/Short Haul Driver Fatigue Study



- **42 drivers observed for one week each**
- **28,000 total miles**
- **249 total critical incidents**
- **77 truck driver-initiated CIs**
- **285 drowsiness episodes**

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Truck Driver CIs/Hour

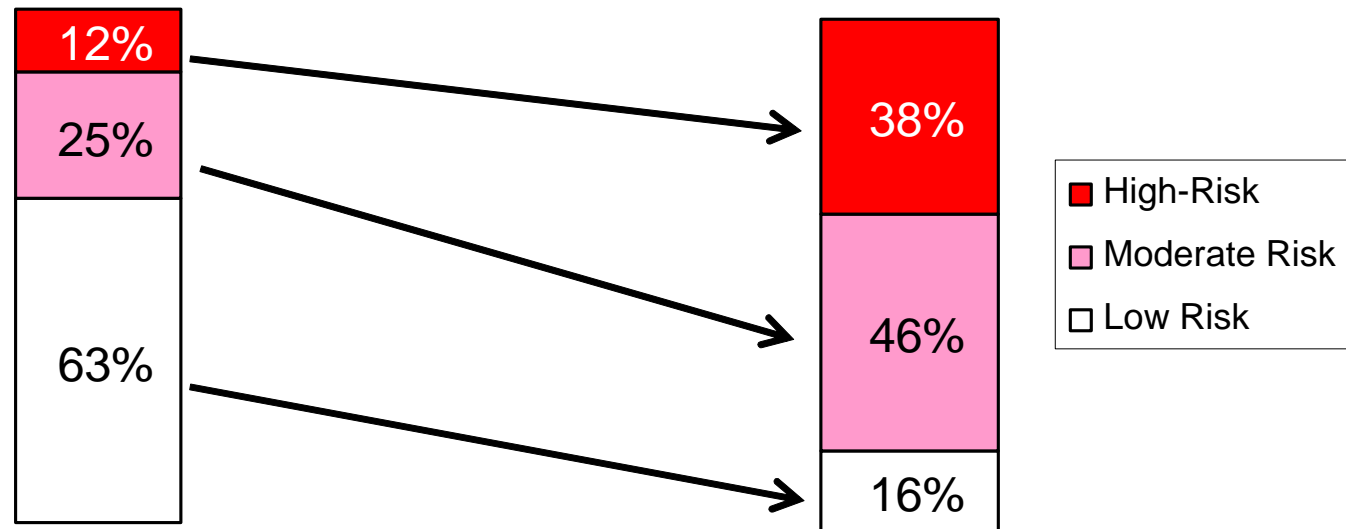


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CI Frequency/Risk

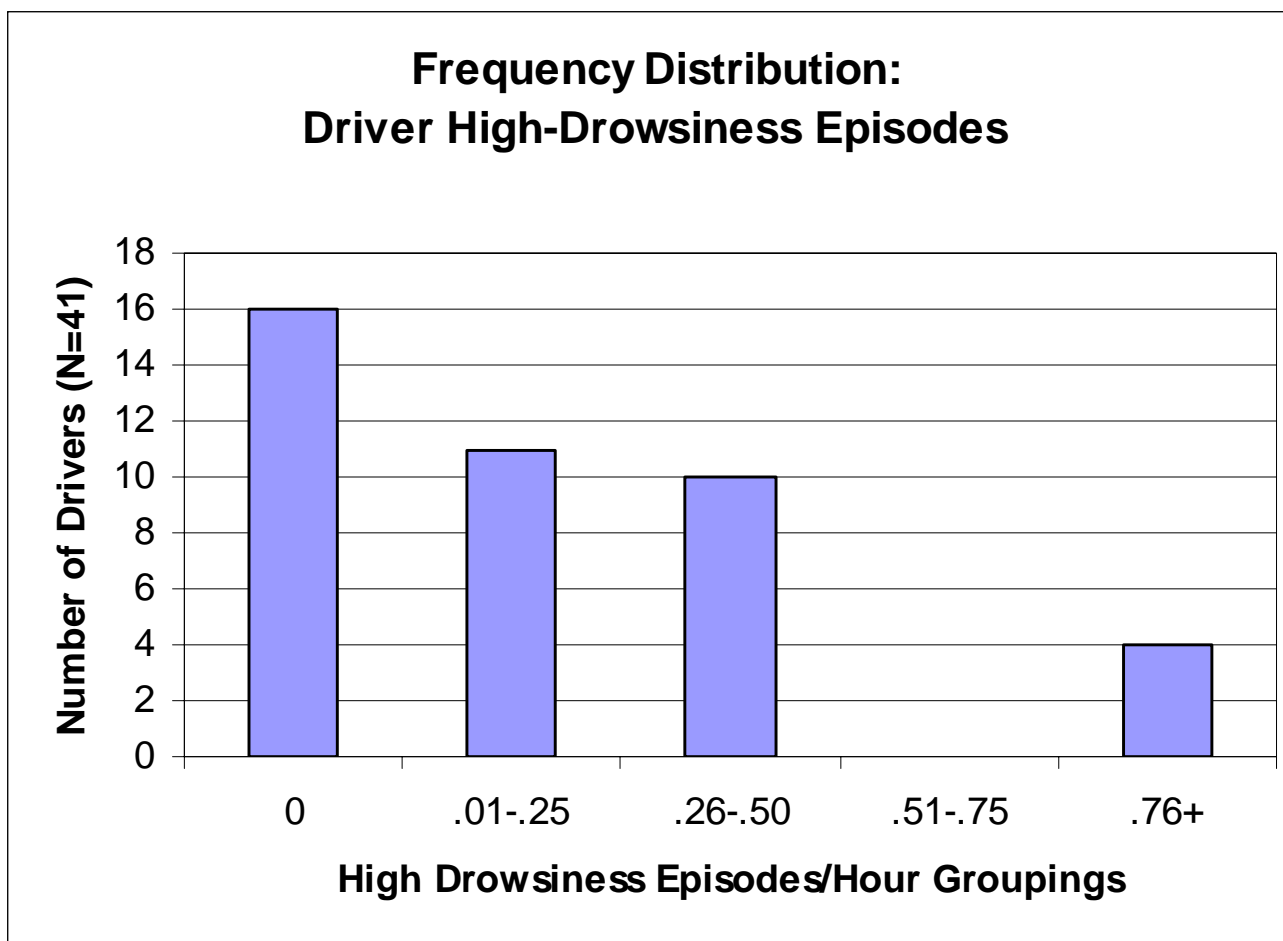
Exposure: Hours of Driving

Risk: Critical Incidents



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High-Drowsy Episodes

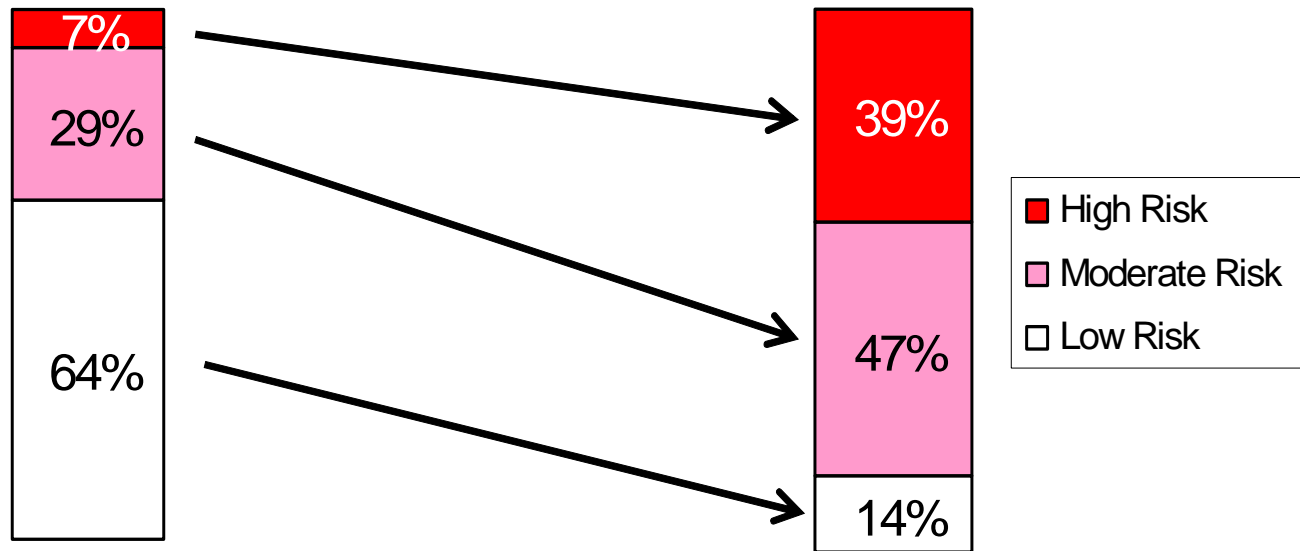


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Drowsiness Frequency/Risk

Exposure: Hours of Driving

Risk: High-Drowsiness Epochs



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L/SH Study: Additional Findings

- Risk/exposure odds ratios between best and worst drivers:
 - CIs: **12.5**
 - Drowsy episodes: **25.5**
- Correlation CIs & fatigue: **+0.15**
- Only 1 of 6 highest CI drivers was among 4 highest-fatigue drivers
- Strongest predictor of CIs: **driver age.**

Questions

- Are L/SH findings **representative**?
- How **enduring** are individual differences? (trait or state?)
- What are the principal **causes** and **correlates** of driver risk?
- What are effective **interventions**?

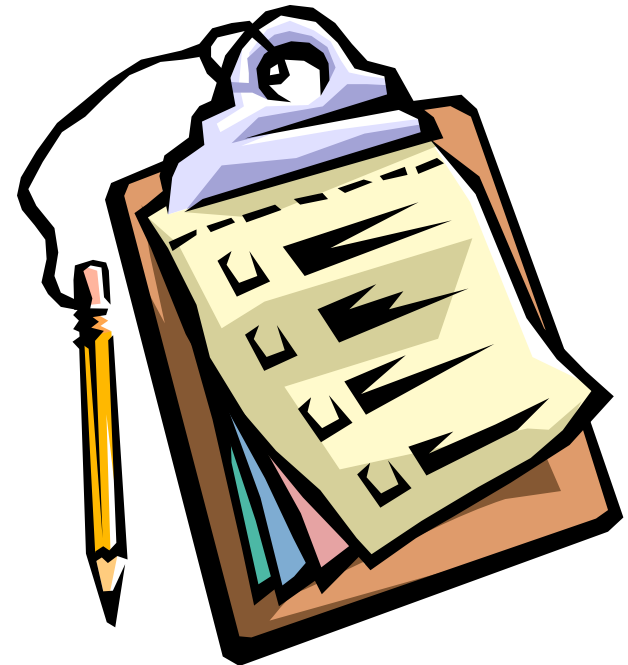


Study Methods & Topics

- Survey of carrier safety managers & other experts
- Review of:
 - Risk concepts
 - Risk factors (correlates)
 - Management methods
- Identification of research needs.

Project Survey

- One page (front & back)
- Seven parts:
 - Problem importance
 - Driver factors
 - Hiring practices
 - Driver evaluation
 - Driver management
 - Comments
 - Respondent Info
- Parallel forms for safety managers (N=178) & other experts (N=67).
- Convenience sample
- Average respondent experience:
~20 years



Survey Results:

Disproportion of Risk

	Safety Managers	Other Experts
Worst 10% → 10% of problems	6%	0%
Worst 10% → 20% of problems	6%	6%
Worst 10% → 30% of problems	14%	19%
Worst 10% → 40% of problems	15%	21%
Worst 10% → 50% of problems	59%	54%

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Survey Results:
Consistency
of Individual Differences

	Safety Managers	Other Experts
Risk can change dramatically	10%	0%
“Some tendency” to stay the same, but can change	25%	35%
Risk stays about the same	65%	65%

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Safety Manager Survey Results: Top 6 of 16 Driver Risk Factors

1. Aggressive/angry
2. Impatient/impulsive
3. Inattentive
4. Inexperienced (new CMV driver)
5. Unhappy with job/company
6. Young driver (< 25)

Individual Differences in Fatigue Susceptibility

- Several studies reviewed; similar findings
- High, moderate, and low risk groups apparent
- Up to 25-fold difference in fatigue risk
- Cannot be explained solely by sleep disorders
- When people are repeatedly sleep deprived:
 - Large differences between different people
 - Individual responses stable and consistent.
- Level of susceptibility to fatigue appears to be an enduring personal trait.



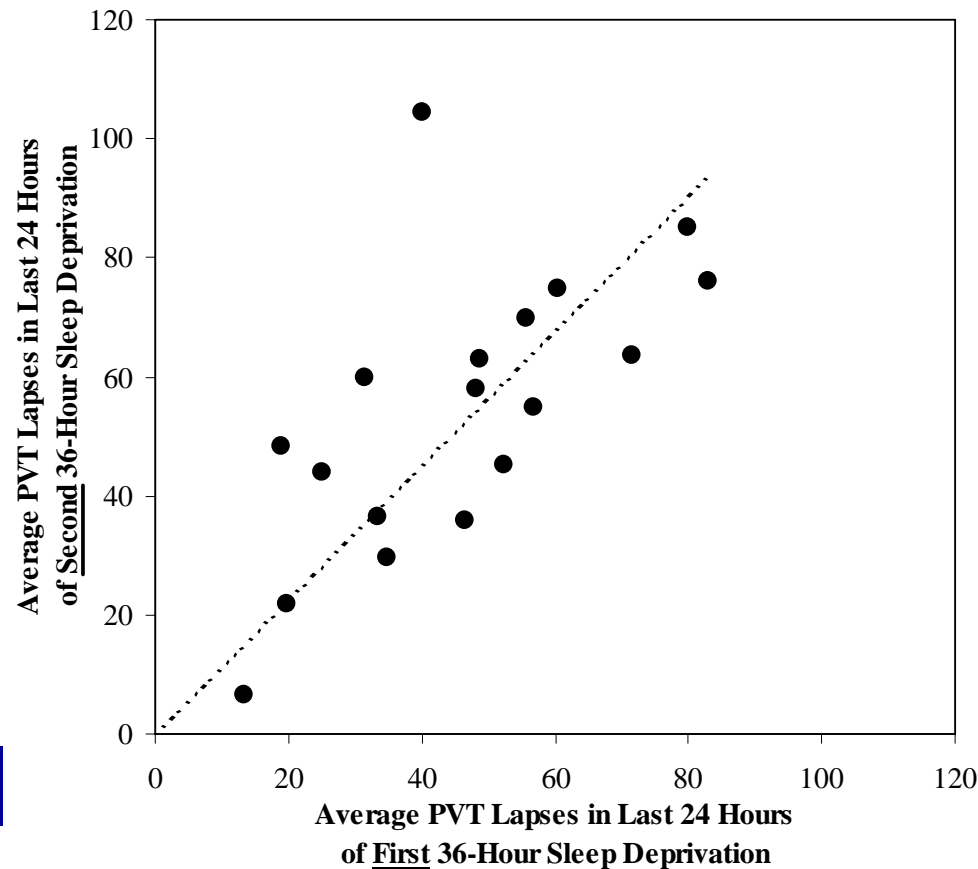
Van Dongen et al. (2004): “Trait-Like” Individual Differences

- 21 subjects sleep-deprived for 36 hours three separate times.
- 13 different “neurobehavioral” tests, including PVT
- Pronounced differences observed *between* individuals.
- Striking similarities observed *within* individuals.
- Across 13 tests, 68% to 92% of variance related to individual differences
- On specific tests, many subjects performed almost identically during 3 sessions
- Controlling for pre-deprivation sleep duration did not reduce individual differences
- Conclusion: “. . . *Interindividual differences in neurobehavioral deficits from sleep loss constitute a differential vulnerability trait.*”

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Van Dongen et al. (2004): Comparison of PVT Lapses for 18 Subjects in 1st & 2nd Deprivation Sessions

Systematic Inter-Individual Differences in
Psychomotor Vigilance Task (PVT) Performance
during 36 Hours of Sleep Deprivation ($n=18$)



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Other Topics in Report

- **Concepts of crash risk & “accident proneness”**
- **Factors; e.g.,:**
 - Age & gender
 - Driving history
 - Medical conditions & health
 - Personality traits
 - Sensory-motor performance
- **Other transport modes**
- **Selection tests**
- **Management job aids**
 - Recruiting/selection/hiring
 - Performance evaluation & coaching.



Some R&D Needs

- Verify & extend findings: delineate driver traits and states
- Implications of above:
 - Traits → improve driver selection
 - States → improve situational management
- Determine quantitative relations between specific driver personal factors and crash risk *for the same group of drivers.*
- Validate selection tests & other tools
- “Soup-to-nuts” R&D on On-Board Safety Monitoring
- Pilot tests of Behavior-Based Safety and other safety management interventions.

Thanks for your attention!

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Report pdf available at:

http://trb.org/news/blurb_browse.asp?id=11



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