

Presentation Title	Place in Schedule
Total Trucker Health Revisited: Surveillance and Intervention Research	Concurrent Session 1.2 <i>Day 2 – Wednesday</i> <i>May 9th, 2018</i> <i>1:00 – 2:15pm</i>
Description of Presentation	Presenter Name(s) And Credentials
<p>SYMPOSIUM</p> <p>Total Trucker Health Revisited: Surveillance and Intervention Research</p> <p>Ryan Olson, PhD^{1,2,3} (Symposium Organizer)</p> <p>1. Oregon Institute of Occupational Health Sciences, Oregon Health & Science University (OHSU)</p> <p>2. School of Public Health, OHSU-Portland State University</p> <p>3. Occupational Health Psychology Program, Portland State University</p> <p>Commercial truck drivers are objectively safer vehicle operators than the general motoring public. However, due to the dangerous nature of transportation work, heavy and tractor-trailer truck drivers experience the most annual workplace fatalities of any single US occupation. Commercial truck drivers, especially those who handle freight, have elevated rates of musculoskeletal disorders. Furthermore, longhaul commercial truck driving exposes workers to long sedentary work hours, challenging sleeping conditions, and limited eating and exercise options. These factors contribute to an excess prevalence of obesity and associated health conditions among truck drivers. Obesity, diabetes, and the obesity-associated condition of obstructive sleep apnea, have all independently been associated with elevated crash risk in the research literature. For individual drivers, employment can become highly stressful and precarious if they develop regulated health conditions. Thus, commercial drivers' safety, health, and wellbeing are all deeply interconnected. Such interactions call for Total Worker Health® approaches to surveillance and intervention research in order to inform national policy making and best organizational/operational practices in the industry to advance drivers' safety, health, and well-being. The current symposium features new surveillance and intervention research with commercial truck</p>	Ryan Olson, PhD <i>Oregon Institute of Occupational Health Sciences/Oregon Health & Science University</i>
	Jeffrey Hickman, PhD <i>Center for Bus and Truck Safety/Virginia Tech Transportation Research Institute</i>
	Matthew S. Thiese PhD, MSPH <i>Rocky Mountain Center for Occupational and Environmental Health/University of Utah</i>
	Terri Hallquist, MS <i>Federal Motor Carrier Safety Administration</i>

drivers, and is a thematic follow-up to an event presented at the First International Symposium to Advance Total Worker Health® in 2014.

Two presentations in the new symposium (Dr. Hickman) will feature results from the historic Commercial Driver Individual Differences Study (CDIDS) funded by the Federal Motor Carrier Safety Administration.

This study involves a sample of over 21,000 drivers and is prospectively investigating individual factors (e.g., demographics, medical conditions, attitudes, behavioral history) that may be associated with crash risk. Results are not yet published and thus cannot be included in this submission, but will be presented at the symposium.

The third presentation (Dr. Thiese) features a cross-sectional surveillance study of over 800 US truck drivers. The project was designed to identify the prevalence of metabolic syndrome among truck drivers, identify targetable risk factors, and compare syndrome prevalence to the general population. A key finding indicates that metabolic syndrome is 5.8 times more prevalent among truck drivers than in the US population. This finding and other results lend further strong evidence for the need for multi-level interventions for this population.

A final presentation (Dr. Olson) will feature pilot intervention results from the Tech4Rest study with team truck drivers. Tech4Rest is a research project within the Oregon Healthy Workforce Center - a NIOSH Center of Excellence in Total Worker Health®. The study is evaluating engineering and behavioral controls to improve the sleep, fatigue, performance, and well-being among driving teams (where one worker drives while their partner sleeps). Engineering controls include enhanced cab features that may reduce/alter fatiguing or sleep disruptive vibrations (Bose Ride II active suspension seat + a therapeutic Thevorelief mattress) which will be evaluated alone and in combination with a behavioral physical activity and sleep health program.

Presentations will be discussed and related to current policies and practices in the industry by Ms. Terri Hallquist, a Research Analyst with the Federal Motor Carrier Safety Administration.

Learning Objectives

1. Be able to identify several individual differences associated with reduced or increased crash risk and discuss these factors in relation to policies, organization of work, and situational factors
2. Describe working conditions for commercial truck drivers that contribute to an elevated prevalence of obesity and associated health conditions – including metabolic syndrome
3. Identify two truck cab technologies that may reduce whole body vibration, fatigue, and sleep disturbances
4. Describe components of an evidence-informed behavioral physical activity and sleep health program for team truck drivers

Ryan Olson, PhD (Symposium Organizer and Presenter)
Associate Professor, Oregon Institute of Occupational Health Sciences, Oregon Health & Science University (OHSU)

Associate Professor, OHSU-Portland State University (PSU) School of Public Health

Affiliated Faculty, Occupational Health Psychology Program, PSU

Oregon Health & Science University

3181 SW Sam Jackson Park Rd, L606

Portland, OR 97239

(503) 494-2501

olsonry@ohsu.edu

Jeffrey Hickman, MS, PhD (Presenter)

Group Leader/Research Scientist

Virginia Tech Transportation Institute

3500 Transportation Research Plaza

Blacksburg, VA 24073

(540) 231-1542

jhickman@vtti.vt.edu

Matthew S. Thiese PhD, MSPH (Presenter)

Associate Professor

Rocky Mountain Center for Occupational and

Environmental Health, Department of Family &

Preventive

Medicine, University of Utah School of Medicine

391 Chipeta Way, Suite C

SLC, UT 84108

(801) 581-4800

Matt.Thiese@hsc.utah.edu

Terri Hallquist, MS (Discussant)

Research Analyst

Federal Motor Carrier Safety Administration

1200 New Jersey Avenue SE, Mailstop: W68-320

Washington, DC 20590

(202) 366-1064

theresa.hallquist@dot.gov

Description of Presentation

PRESENTATION 1

The Commercial Driver Individual Differences Study

Jeffrey Hickman¹, Erin Mabry¹, Laurel Marburg¹, Feng

Guo^{1,2}, Huiying, Mao¹, Richard

Hanowski¹, Theresa Hallquist³, and Martin Walker³

1. Virginia Tech Transportation Institute

2. Virginia Polytechnic Institute and State University

3. Federal Motor Carrier Safety Administration (FMCSA)

Many different factors interact to impact crash risk, including driver factors, vehicle or environmental factors, and situational factors. Research indicates a strong relationship between driver factors and an increase in crash risk. Individual factors, including age, gender, personality traits, including risk-taking and sensation-seeking, and driving behaviors, such as seat belt use, distraction, speeding, and moving violations have all been associated with an increase in crash risk. Health and medical conditions, including obesity, cardiovascular disease, diabetes, obstructive sleep apnea (OSA), and musculoskeletal injuries have also been demonstrated to increase crash risk.

While these investigated various specific factors, most did not consider the multitude of interactions and how these interactions affect crash risk. Additionally, most of the studies use a retrospective approach, which may be biased, as the crash may alter the driver's perception or condition. Lastly, many of the studies reported above used self-reports of crash history and did not include a measure of exposure (e.g., miles traveled). Further, crashes independent of exposure are misleading (e.g., one crash after 1 month of driving compared to one crash after 3 years of driving).

The Commercial Driver Individual Differences Study (CDIDS), reported herein, addressed many of these issues. The objective of the CDIDS was to examine a wide array of driver and situational factors and determine the prevalence of these factors as well as their relationship to being involved in a crash or moving violation in a diverse sample of more than 21,000 commercial motor vehicle (CMV) drivers. The CDIDS sought to identify and prioritize CMV driver individual differences with respect to risk factors. Primarily, these risk factors consisted of personal factors, such as demographic characteristics, medical conditions, personal attitudes, and behavioral history. The CDIDS identified risk factors by linking the characteristics of individual drivers with their driving records over the course of the study, especially the occurrence or absence of crashes. The prospective study design afforded the opportunity to observe these drivers for up to 3 years using a combined dataset from carrier and Federal sources. The presentation will discuss the CDIDS methodology as well as the descriptive results from 21,000 CMV drivers.

Jeffrey Hickman, MS, PhD (Presenter)

Group Leader/Research Scientist

Virginia Tech Transportation Institute

3500 Transportation Research Plaza

Blacksburg, VA 24073

(540) 231-1542

jhickman@vtti.vt.edu

Erin Mabry, Ph.D.

Senior Research Associate

Center for Truck and Bus Safety

Virginia Tech Transportation Institute

3500 Transportation Research Plaza

Blacksburg, VA 24061

540-231-1055

emabry@vtti.vt.edu

Laurel Glenn, M.A.

Research Associate,

Virginia Tech Transportation Institute

3500 Transportation Research Plaza

Blacksburg, VA 24061

(540) 231-1543

lglen@vtti.vt.edu

Feng, Guo, Ph.D.

Associate Professor, Department of Statistics, Virginia

Polytechnic & State University/Research Scientist

Virginia Tech Transportation Institute

3500 Transportation Research Plaza

Blacksburg, VA 24061

(540) 231-1038

fguo@vtti.vt.edu

Huiying Mao

Research Assistant/ Graduate Student, Department of
Statistics

Virginia Tech Transportation Institute

3500 Transportation Research Plaza

Blacksburg, VA 24061

(540) 231-1542 (via Dr. Hickman)

mhuiying@vt.edu

Richard J. Hanowski, Ph.D.

Director, Center for Truck & Bus Safety

Virginia Tech Transportation Institute

3500 Transportation Research Plaza

Blacksburg, VA 24061

(540) 231-1513

hanowski@vtti.vt.edu

Terri Hallquist

1200 New Jersey Ave, SE

W66-410

Washington, DC 20590

(202) 366-1064

theresa.hallquist@dot.gov

Martin Walker, Ph.D.

Chief of Research, FMCSA

FMCSA Office of Research and Analysis

1200 New Jersey Avenue, S.E., Room W68-302

Washington, DC 20590

(202) 385-2364

martin.r.walker@dot.gov

PRESENTATION 2

The Commercial Driver Individual Differences Study:

Crash and Violation Risk Of Medical Conditions

Jeffrey Hickman¹, Erin Mabry¹, Laurel Marburg¹, Feng

Guo^{1,2}, Huiying, Mao¹, Richard

Hanowski¹, Theresa Hallquist³, and Martin Walker³

1. Virginia Tech Transportation Institute

2. Virginia Polytechnic Institute and State University
3. Federal Motor Carrier Safety Administration (FMCSA)

A qualifying Medical Examination Report is 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. In addition to the 64 mandatory items, there are three sections in the Medical Examination Report that are dedicated to open comments. The first section is completed by the driver for a more detailed description of his/her health history. The second section is completed by the medical examiner and is based on the medical examiner's discussion with the driver regarding his/her health history. The third section is completed by the medical examiner to discuss anything noted during the physical examination and whether the findings would affect the driver's ability to safely operate a commercial motor vehicle (CMV).

Upon receipt of the Medical Examination Report, members of the research team used a participant key to assign the anonymous participant number to the Medical Examination Report. All Medical Examination Report data were delivered to researchers in an electronic database; no manual data entry was required. Several sections of the Medical Examination Report were binary responses (yes/no), indicating the presence or absence of various medical conditions. These were recoded as "1" (yes) and "0" (no). Other sections of the Medical Examination Report included open-ended comments from the driver and medical examiner regarding prior and current medical conditions, treatment for existing conditions, recommendations for future testing/specialists, etc., and physician indications about whether a driver's ability to safely operate a CMV might be affected by these conditions. These comments were transcribed and coded by the research team. The research team reviewed the comments on each Medical Examination Report and recorded the following: (1) current diagnosed medical condition, (2) treatment for current diagnosed medical conditions (yes, no/non-compliant, unsure), and (3) potential medical

conditions (i.e., a formal diagnosis was not made by the medical examiner; however, the driver was referred to another physician to confirm diagnosis). Each specific medical condition was grouped into a general medical category.

Over 13,000 Medical Examination Reports were collected. The medical data were collected at the time of recruitment. Each driver was observed (crashes and exposure/tenure) after entry into the study. A Poisson regression model was used to model the frequency of crashes and moving violations with the Medical Examination Report during the observation period. Preliminary analyses found that drivers' age correlated with the number of crashes, but also with most of the medical outcomes. To adjust for these potential confounding and interacting effects, the regression models were stratified by age using quartiles. After stratification, each variable was evaluated individually in the regression model with adjustment to age and body mass index. Drivers' age was kept in the models, as it was a confounding factor within each stratum, especially as the age bins are relatively wide. The presentation will report the risk of future crashes and moving violations with respect to diagnosis of medical conditions.

Jeffrey Hickman, MS, PhD (Presenter)

Group Leader/Research Scientist

Virginia Tech Transportation Institute

3500 Transportation Research Plaza

Blacksburg, VA 24073

(540) 231-1542

jhickman@vtti.vt.edu

Erin Mabry, Ph.D.

Senior Research Associate

Center for Truck and Bus Safety

Virginia Tech Transportation Institute

3500 Transportation Research Plaza

Blacksburg, VA 24061

540-231-1055

emabry@vtti.vt.edu

Laurel Glenn, M.A.

Research Associate,

Virginia Tech Transportation Institute

3500 Transportation Research Plaza

Blacksburg, VA 24061

(540) 231-1543

lglen@vtti.vt.edu

Feng, Guo, Ph.D.

Associate Professor, Department of Statistics, Virginia

Polytechnic & State University/Research Scientist

Virginia Tech Transportation Institute

3500 Transportation Research Plaza

Blacksburg, VA 24061

(540) 231-1038

fguo@vtti.vt.edu

Huiying Mao

Research Assistant/ Graduate Student, Department of

Statistics

Virginia Tech Transportation Institute

3500 Transportation Research Plaza

Blacksburg, VA 24061

(540) 231-1542 (via Dr. Hickman)

mhuiying@vt.edu

Richard J. Hanowski, Ph.D.

Director, Center for Truck & Bus Safety

Virginia Tech Transportation Institute

3500 Transportation Research Plaza

Blacksburg, VA 24061

(540) 231-1513

hanowski@vtti.vt.edu

Terri Hallquist

1200 New Jersey Ave, SE

W66-410

Washington, DC 20590

(202) 366-1064

theresa.hallquist@dot.gov

Martin Walker, Ph.D.

Chief of Research, FMCSA

FMCSA Office of Research and Analysis

1200 New Jersey Avenue, S.E., Room W68-302

Washington, DC 20590

(202) 385-2364

martin.r.walker@dot.gov

PRESENTATION 3

Metabolic Syndrome in Commercial Truck Drivers:

Prevalence, Associated Factors, and Comparison with

the General Population.

Matthew S. Thiese PhD, MSPH1, Maureen Murtaugh PhD1, Jay Kapellusch, PhD2, Arun Garg, PhD2, and Kurt Hegmann MD, MPH1

1. Rocky Mountain Center for Occupational and Environmental Health, Department of Family & Preventive Medicine, University of Utah School of Medicine

2. Department of Occupational Science & Technology, Rehabilitation Research Design and Disability Center (R2D2), University of Wisconsin – Milwaukee

Intro: Commercial Motor Vehicle (CMV) drivers, such as truck drivers, experience unique health, lifestyle and occupational challenges directly associated with their profession. These factors have been linked to Metabolic Syndrome (MetS) in other working populations but have never been evaluated among commercial truck drivers in the United States. This paper aims to identify the prevalence of MetS among truck drivers, targetable risk factors and compare findings to the general population.

Methods: Multi-state cross-sectional study of United States truck drivers. All participants completed a standardized computer questionnaire regarding occupational history, past medical history, physical activity, diet and psychosocial factors. Each participant had height, weight, blood pressure, blood lipid and glucose measured. Participants met criteria for MetS if they had at least 3 of the following 5 criteria: waist circumference ≥ 102 cm for men or ≥ 88 cm for women; triglycerides ≥ 150 mg/dL or currently on medication for dyslipidemia; HDL cholesterol ≤ 40 mg/dL for men or ≤ 50 mg/dL for women or currently on medication for dyslipidemia; blood pressure $\geq 130/85$ mm Hg or currently taking medication for hypertension; and hemoglobin A1c $\geq 7\%$ or prior diagnosis of diabetes mellitus.

Results: A total of 817 truck drivers were included in the analysis. MetS prevalence was calculated at 52.4% (n=428). All truck drivers were exposed to a median \pm interquartile range (IQR) of 3.0 ± 1.0 metabolic risk factors. The most common risk factor to meet MetS criteria was waist circumference (n=634, 77.0%), followed by low HDL cholesterol (n=580, 71.0%), elevated triglycerides (n=552, 67.6%),

elevated blood pressure (n=175, 21.2%), and elevated hemoglobin A1c (n=97, 11.9%). Truck drivers were 5.8 times more likely to have MetS compared to the general population.

Conclusion: Long-haul truck drivers in the United States have a high prevalence of MetS and are at greater risk than the general population. Drivers at risk for MetS are most likely to be older, obese males.

Matthew S. Thiese PhD, MSPH

Associate Professor

Rocky Mountain Center for Occupational and Environmental Health, Department of Family & Preventive

Medicine, University of Utah School of Medicine

391 Chipeta Way, Suite C

SLC, UT 84108

(801) 581-4800

Matt.thiese@hsc.utah.edu

Maureen Murtaugh PhD

Professor

Rocky Mountain Center for Occupational and Environmental Health, Department of Family & Preventive

Medicine, University of Utah School of Medicine

391 Chipeta Way, Suite C

SLC, UT 84108

(801) 581-4800

Maureen.murtaugh@hsc.utah.edu

Jay Kapellusch, PhD

Associate Professor

Department of Occupational Science & Technology, Rehabilitation Research Design and Disability Center (R2D2), University of Wisconsin – Milwaukee
PO Box 413

Milwaukee, WI 53201-0413

United States

(414) 229-5292

kap@uwm.edu

Arun Garg, PhD

Distinguished Professor

Department of Occupational Science & Technology, Rehabilitation Research Design and Disability Center (R2D2), University of Wisconsin – Milwaukee
PO Box 413

Milwaukee, WI 53201-0413

United States

(414) 229-5292

arun@uwm.edu

Kurt Hegmann MD, MPH

Professor

Rocky Mountain Center for Occupational and
Environmental Health, Department of Family &
Preventive

Medicine, University of Utah School of Medicine

391 Chipeta Way, Suite C

SLC, UT 84108

(801) 581-4800

Kurt.hegmann@hsc.utah.edu

PRESENTATION 4

The Tech4Rest Pilot Study: Engineering and Behavioral
Controls to Improve Sleep, Fatigue, and Wellbeing
Among Team Truck Drivers

Ryan Olson^{1,2,3}, Peter Johnson⁴, Steven A. Shea^{1,2},
Miguel Marino^{2,5}, Kelsey Parker¹, Fangfang
Wang⁴, Jason Malach-Fuller¹, Layla Mansfield¹, and
Rachel Springer⁵.

1. Oregon Institute of Occupational Health Sciences,
Oregon Health & Science University (OHSU)

2. School of Public Health, OHSU-Portland State
University

3. Occupational Health Psychology Program, Portland
State University

4. Department of Environmental and Occupational
Health Sciences, University of Washington

5. Department of Family Medicine, OHSU

Team commercial truck drivers work in pairs, where one
person drives while their partner sleeps. Truck
driving exposes workers to fatiguing whole body
vibrations in the seat during the work day. In team
driving, these same vibrations are also disruptive to sleep
for the driver who is resting. To address these
challenges, the Tech4Rest study is evaluating the impacts
of enhanced cab technologies (Bose Ride® II
active suspension seat and Thevorelief Mattress) and a
behavioral sleep health intervention on team
drivers' safety, health, and well-being. The active
suspension seat reduces whole body vibration by

approximately 50% and reduces driver fatigue at the end of their driving shift. The Thevorelief mattress system includes a unique Lattoflex suspension system that may alter vibration frequency profiles in moving trucks, and thereby improve sleep compared to conventional mattresses. The behavioral physical activity and sleep health intervention, named Fit4Sleep, is adapted from the effective SHIFT (Safety & Health Involvement For Truck drivers) weight loss and health promotion program. Fit4Sleep focuses on promoting physical activity, which is sleep protective, and healthy sleep hygiene practices. Fit4Sleep involves a 3-month walking competition between teams supported with self-monitoring of sleep targets (sleep hygiene practices, sleep duration, sleep quality), health coaching, and training on exercise, sleep, and fatigue management. The Tech4Rest study is a five-year research project within the Oregon Healthy Workforce Center – a NIOSH Center of Excellence in Total Worker Health®.

We will report preliminary results from the Tech4Rest pilot study prior to initiating a multi-year cluster randomized controlled trial. The pilot is supported with funding from the Oregon Healthy Workforce Center (NIOSH grant# U19 OH010154) and a Safety and Health Improvement grant from the Washington State Department of Labor and Industries (grant# 2014YH00280). In the first phase of the pilot, 5 teams (10 drivers) will sequentially evaluate a standard coil spring mattress and a Thevorelief mattress. Participants will spend two-to-three weeks in each condition with measurements (see below) at baseline and after each test period. In the second phase of the pilot, 5 additional teams (10 additional drivers) will participate in the mattress conditions in reverse order and then spend three months in a multi-component phase including their preferred mattress, installation of a Bose Ride® II seat, and participation in the Fit4Sleep program. Measures collected to assess each phase include daily pre/post shift Psychomotor Vigilance Task performance, actigraphically measured sleep quality and quantity, truck-monitored measures of driving performance (e.g., miles per gallon, hard braking), whole body

vibration exposure measurements, and self-reported measures of driver sleep (quality and quantity), fatigue, and well-being. By the time of the symposium, we anticipate being able to present results from phase one of the Tech4Rest pilot study as well as preliminary results from phase two.

Ryan Olson, PhD

Associate Professor, Oregon Institute of Occupational Health Sciences, Oregon Health & Science University (OHSU)

Associate Professor, OHSU-Portland State University (PSU) School of Public Health
Affiliated Faculty, Occupational Health Psychology Program, PSU

Oregon Health & Science University
3181 SW Sam Jackson Park Rd, L606
Portland, OR 97239
(503) 494-2501

olsonry@ohsu.edu

Peter Johnson, PhD

Professor, Environmental and Occupational Health Sciences

Adjunct Associate Professor - Industrial Engineering
University of Washington

4225 Roosevelt Way NE, Suite 100
Seattle, WA 98105
(206) 221-5240

petej@u.washington.edu

Steven A. Shea, PhD

Director and Professor, Oregon Institute of Occupational Health Sciences, Oregon Health & Science University (OHSU)

Professor, OHSU-PSU School of Public Health
Oregon Health & Science University
3181 SW Sam Jackson Park Rd, L606
Portland, OR 97239

(503) 494-2517

sheast@ohsu.edu

Miguel Marino, PhD

Assistant Professor, Department of Family Medicine

Assistant Professor, OHSU-PSU School of Public Health
Oregon Health & Science University
3181 SW Sam Jackson Park Rd, Portland OR

(503) 494-3233

marinom@ohsu.edu
Kelsey Parker, PhD
Research Associate, Oregon Institute of Occupational
Health Sciences
Oregon Health & Science University
3181 SW Sam Jackson Park Rd, L606
Portland, OR 97239
(503) 494-6580

parkkel@ohsu.edu
Fangfang Wang, MS
Doctoral Student, Environmental and Occupational
Health Sciences
University of Washington
4225 Roosevelt Way NE, Suite 100
Seattle, WA 98105
(206) 221-5240

fangfw@u.washington.edu
Jason Malach-Fuller, BS
Research Assistant 2, Oregon Institute of Occupational
Health Sciences
Oregon Health & Science University
3181 SW Sam Jackson Park Rd, L606
Portland, OR 97239
(503) 494-6580

malachfu@ohsu.edu
Layla Mansfield, MS
Senior Research Assistant, Oregon Institute of
Occupational Health Sciences
Oregon Health & Science University
3181 SW Sam Jackson Park Rd, L606
Portland, OR 97239
(503) 494-6580

Rachel Springer, MS
Research Associate and Biostatistician, Department of
Family Medicine
Oregon Health & Science University
3181 SW Sam Jackson Park Rd, Portland OR
(503) 494-3233
springra@ohsu.edu