Evaluation of feedback to truck drivers to increase safe driving behaviors: Preliminary findings

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Justification and Need

- Roadway incidents - leading cause of workplace death
- Truck driving is among the top 10 most dangerous occupations
- Truck transportation industry – transportation incidents injuries severe enough to require time away from work

(36.8 lost-workday incidents per 10,000 FTE per year vs. 6.1 per 10,000 FTE per year for all private industry combined, BLS 2013).

Objective

- Feedback from an onboard video recording system (OVRS) to drivers can reduce risky driving behaviors.
- A reduction in risky driving behaviors will reduce collisions, death, and injury to workers that drive on the job.
- Reduce fuel and truck maintenance costs

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Onboard Video Recording System

- Collects two types of information
- Accelerometers in system monitor vehicle performance
- Video captured inside and outside vehicle
- Coded for risky driving behaviors

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Risky Driving Behaviors

Fundamental Driving Errors

Unprofessional Driving
- Unsafe Backing
- Unsafe Braking
- Unsafe Lane Change / Merging / Passing
- Unsafe Railroad Crossing
- Unsafe Turning
- Lane Departure/Straddling Lanes
- Competitive/Aggressive Driving
- Driving the Wrong Way - On Roadway
- Driving the Wrong Way - Off Roadway
- Curb Check/Jumped Curb

Vehicle Control
- Driving with Two Hands off Wheel
- Unattended Moving Vehicle

Stopping
- Incomplete Stop at Light
- Incomplete Stop at Stop Sign
- Failure to Attempt to Stop at Light
- Failure to Attempt to Stop at Stop Sign
- False Start
- Failure to Yield to Pedestrian(s)
- Failure to Yield to Vehicle(s)

Speeding
- Moderate Speeding (≤ 10 mph Over Limit)
- Excessive Speeding (> 10 mph Over Limit)
- Exceeded Maximum Fleet Speed

Situational Awareness
- Unsafe Following (≤ 1 second)
- Unsafe Following (1.25 - 2 seconds)
- Unsafe Following (2.25 - 3 seconds)
- Unsafe Following (3.25 - 4 seconds)
- Not Checking Mirrors
- Not Scanning Road Ahead
- Not Scanning Intersection

Distracted & Inattentive Driving

Distraction
- Mobile Phone - Texting/Dialing
- Mobile Phone - Talking (Handheld)
- Mobile Phone - Talking (Hands Free)
- Operating Other Mobile Device
- Reading Paperwork
- Grooming/Personal Hygiene
- Food
- Beverage
- Smoking
- Passenger(s)
- Other Task

Fatigue
- Drowsy/Falling Asleep
- Yawning

Other Unsafe Driving

Seatbelts
- Driver Seatbelt Unfastened (≤ 20 mph)
- Driver Seatbelt Unfastened (> 20 mph)
- Passenger Seatbelt Unfastened

Outcomes

Collision
- Collision with Pedestrian
- Collision with Vehicle in Transport
- Collision with Parked Vehicle
- Collision with Train
- Collision with Pedalcycle
- Collision with Animal
- Collision with Fixed Object
- Collision with Work Zone Equipment
- Collision with Other Movable Object
- Overturn (Rollover)

Outcomes

Near Collision
- Near Collision with Pedestrian
- Near Collision with Vehicle in Transport
- Near Collision with Parked Vehicle
- Near Collision with Train
- Near Collision with Pedalcycle
- Near Collision with Animal
- Near Collision with Fixed Object
- Near Collision with Work Zone Equipment
- Near Collision with Other Movable Object

Other Outcomes
- Ran off Road
- Crossed Median/Centerline

Non-Driving Observations

Unprofessional Conduct
- Rude Gesture
- Raised Voice

Event of Interest
- Captured Passenger Incident
- Captured Roadway Incident

Equipment

Obstructed View
- Obstructed View of Driver
- Obstructed Exterior View

Tampering
- Tampering/Abusing Equipment

- Suboptimal Camera Position
- Non-Performing Camera

4 Severity Levels

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Lights-only Instant Driver Feedback

Instant Driver Feedback Lights			
Flashing[1] Light		**Moderate** Wasteful / risky driving action	**Severe** Wasteful / risky driving action
Solid Light	**Outstanding performance** Excellent driving performance	**Be mindful** Driving performance is becoming wasteful and risky	**Needs improvement** Take corrective action to improve efficiency and safety

1. All LEDs will blink once when the system starts. The charts refer to LED blinking during normal operation.

- Vehicle performance only
- Green light, yellow or red flashes
- Indicators of potentially unsafe or wasteful driving

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Supervisor Coaching Feedback

- Video response center
- Supervisor coaches driver on Severity 3 and 4 events
- Reinforce company policy and safe driving
- “Going over game films to improve performance”

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Industry Partner and Study Population

Photo credit: www.peterbilt.com

- General freight trucking, local
- Trucks (26,000-33,000 lb range)
- Deliveries to convenience stores
- Afternoon, evening, night, early morning work

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Methods

- 7 business locations in 5 states (MA, NJ, MD, VA, WA), assigned to intervention or control group
- All trucks at each location were equipped with OVRS (152 total event recorders installed)
- Intervention sites (n=5) - instant driver feedback and supervisory coaching
- Control sites (n=2) – events recorded but no feedback
- Events were collected on a per vehicle per 24-hour day basis.
- Multiple drivers drove each vehicle in the study

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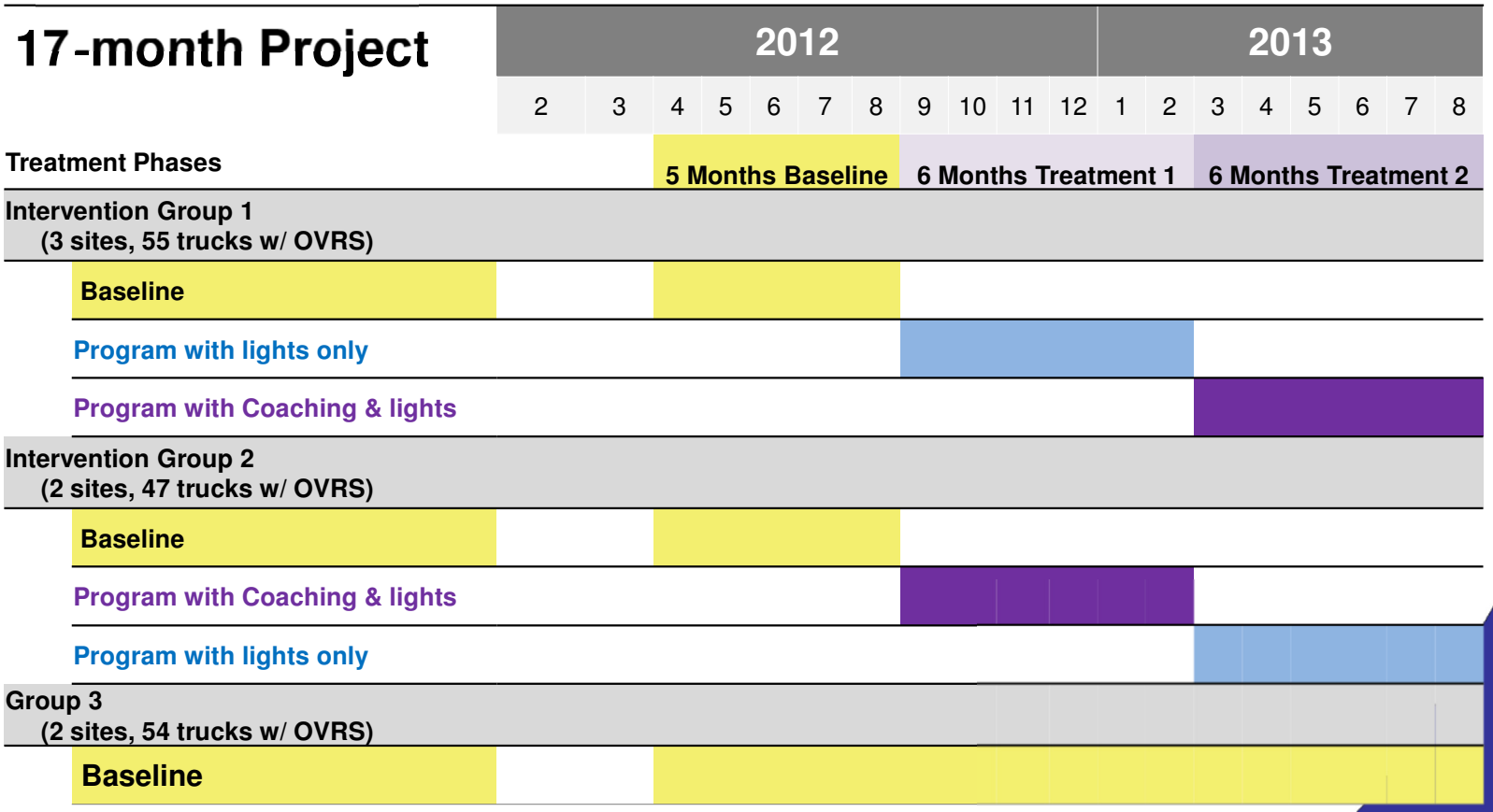
Timeline



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Preliminary Data Analysis

Rate:

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Rate per 100 driving hours:

$$\text{R□□□ □□□ □□□□ □□□□□□* □□□}$$

Poisson regression adjusted for repeated measurements on the same vehicles over time

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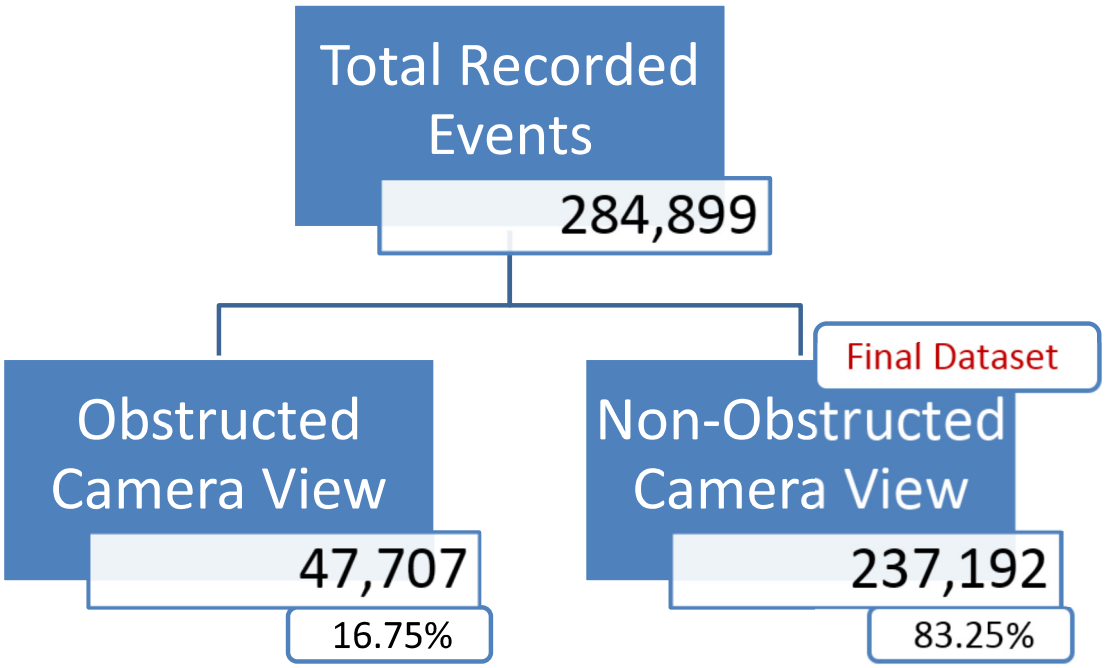
Preliminary Results

- 17-month observation period
  - 5 month baseline
  - 6 months first treatment
  - 6 months second treatment



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Event frequencies

Category	Total	Percent
Seatbelts	80,896	39.4
Speeding	46,144	22.5
Distractions (Smoking, Eating, etc.)	45,378	22.1
Mobile Use Handheld	13,034	6.4
Mobile Use Hands Free	5,258	2.6
Fatigue	5,117	2.5
Stopping	4,762	2.3
Situational Awareness	1,845	0.9
Unprofessional Driving	1,610	0.8
Vehicle Control	1,077	0.5
Collision, Near Collision	86	<0.1
Other Events	12	<0.1

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Coaching Frequency

- Drivers were coached only for severity 3 and 4 events.
  - And only during a six month period.
- Of all known drivers, 84% had a severity 3 or 4 event (in the entire 17-month study period).

Intervention Group 1

Site	Percent of Drivers with Severity 3 and 4 Events Coached
1	51.6
2	90.2
3	90.0

Intervention Group 2

Site	Percent of Drivers with Severity 3 and 4 Events Coached
1	92.3
2	96.2

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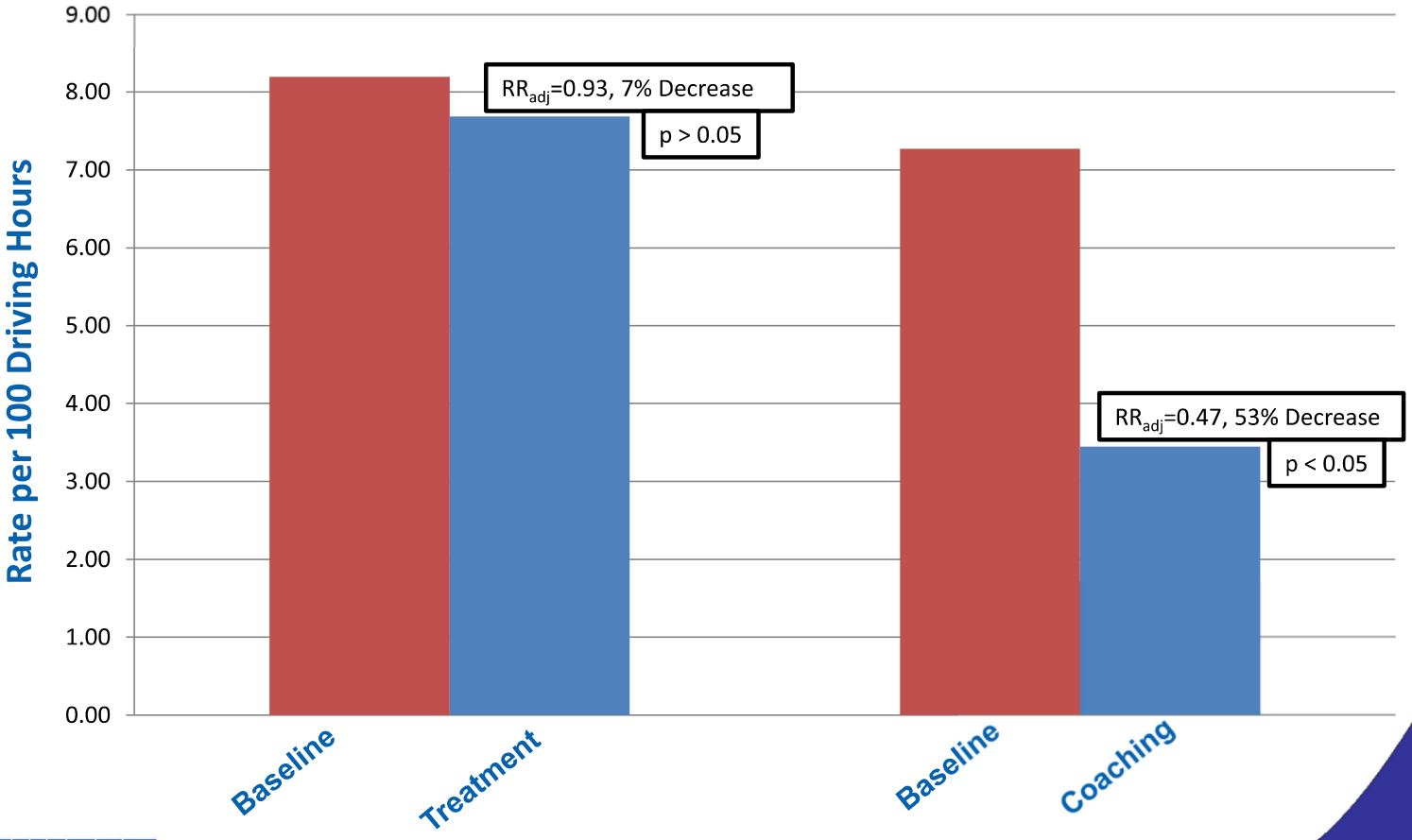
Preliminary Results – Severity 3 and 4 Events



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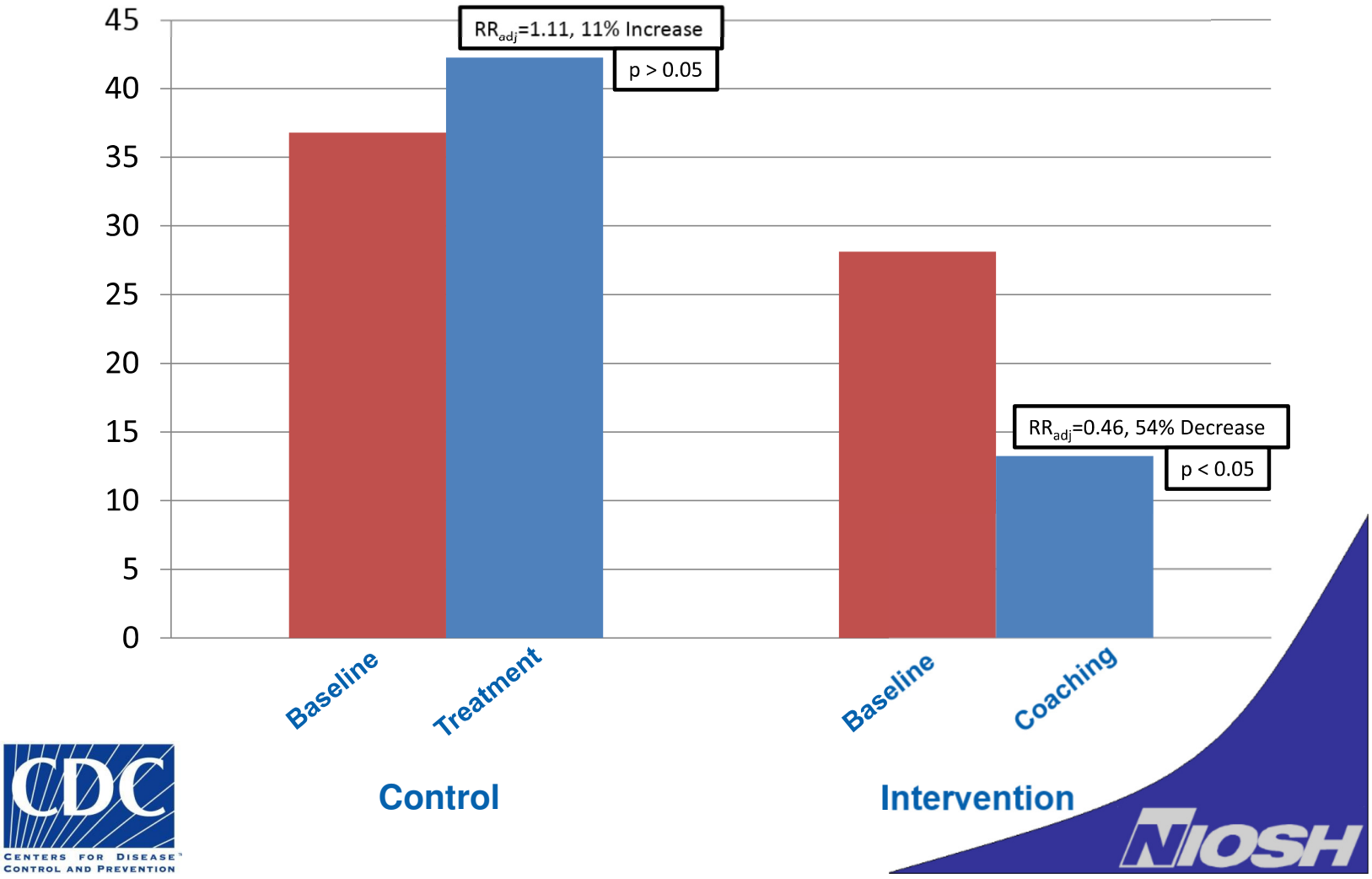
Preliminary Results – Driving Unbelted



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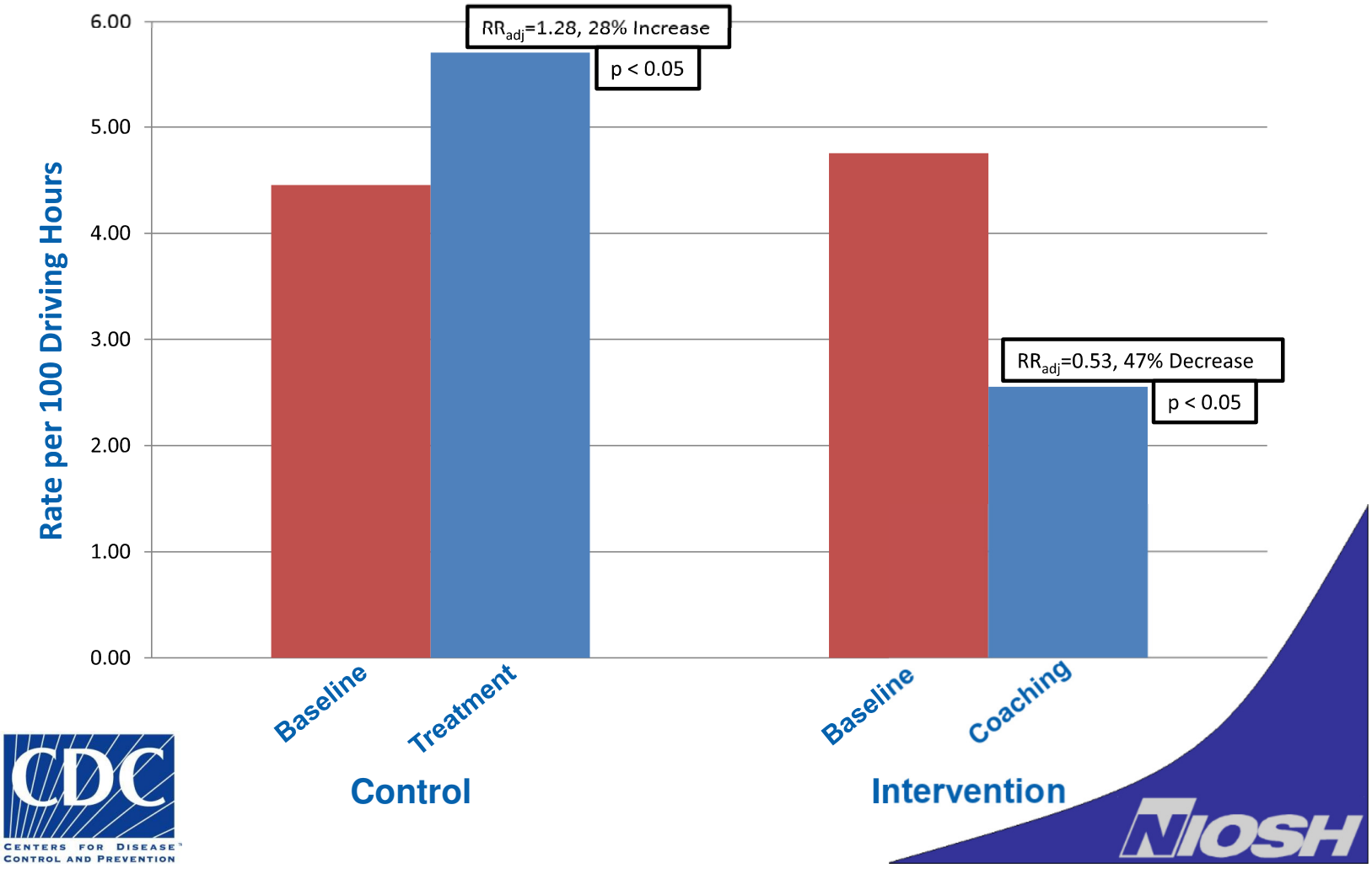
Preliminary Results – Handheld Device Usage



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Limitations

- Coaching frequency (52-96% of drivers)
- Variation in coaching quality and content
- Camera obstructed view
- Linking events to individual drivers (either reliable key punch or schedule upload)

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Discussion and Forthcoming Analyses

- Preliminary data show that coaching plus lights feedback are effective in reducing several risky driving behaviors of key interest to fleet managers
- Examine a number of other outcomes
- Auto liability and workers' compensation claims
- Driver-level analysis to look more closely at the effect of coaching on driver behavior
- Look at economic factors and outcomes related to fuel consumption
- Acceptance and perceptions of this technology by drivers and managers

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