

# Motorcycle Safety and Alcohol

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# Traffic Fatalities

**4,502 Motorcyclist Deaths**

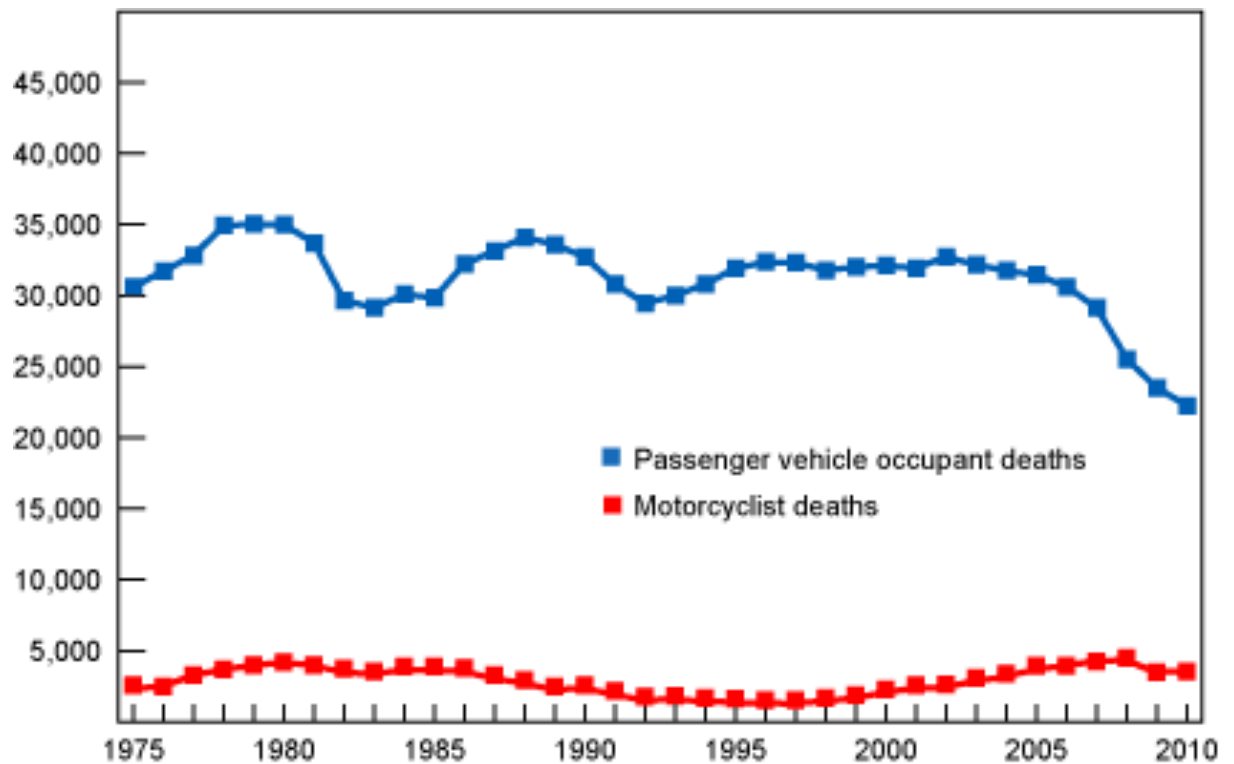
**17% All Occupant Fatalities**

**3% Registered Vehicles**

**0.6% VMT**

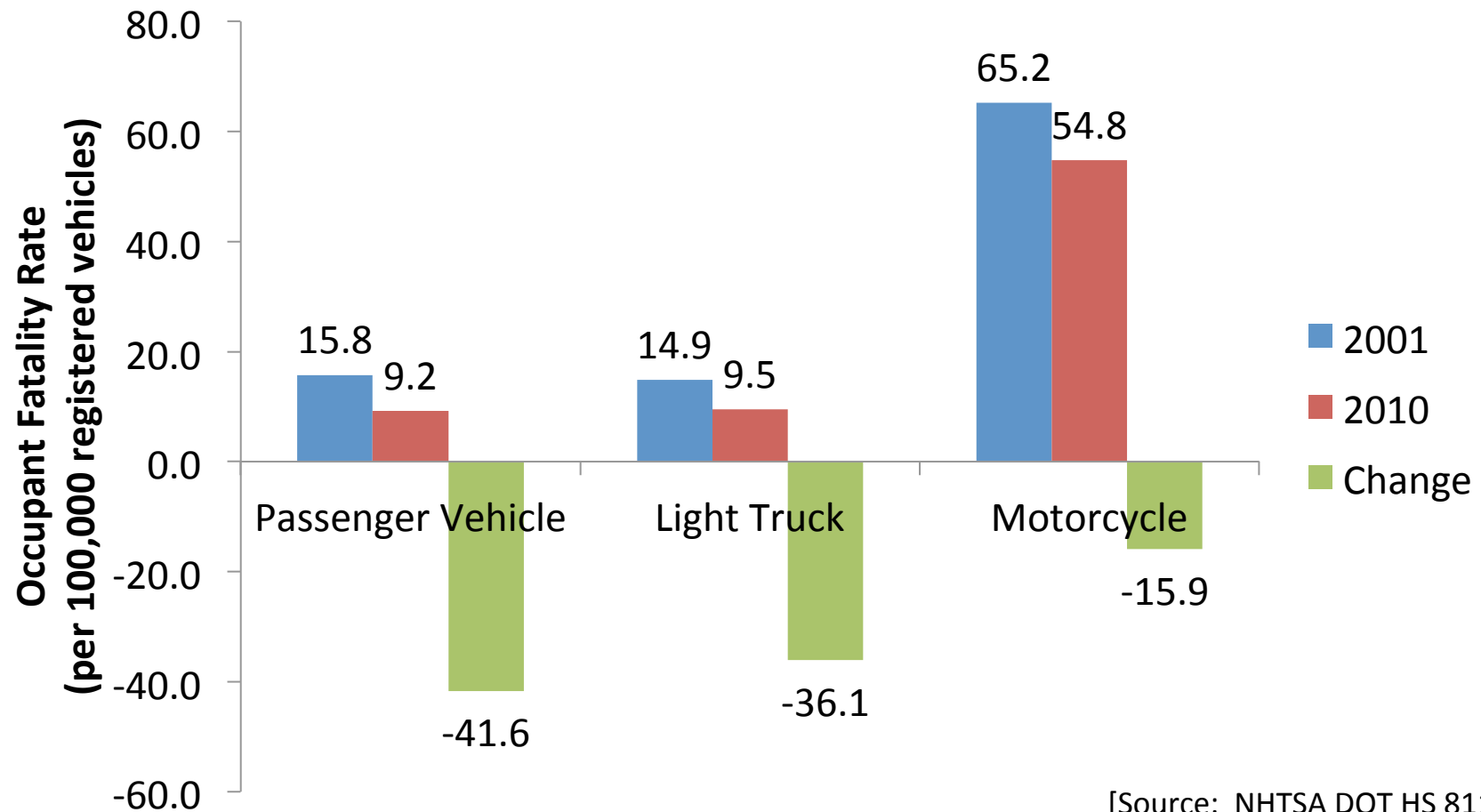
**30 x Fatality Risk**

**\$16 Billion Cost**



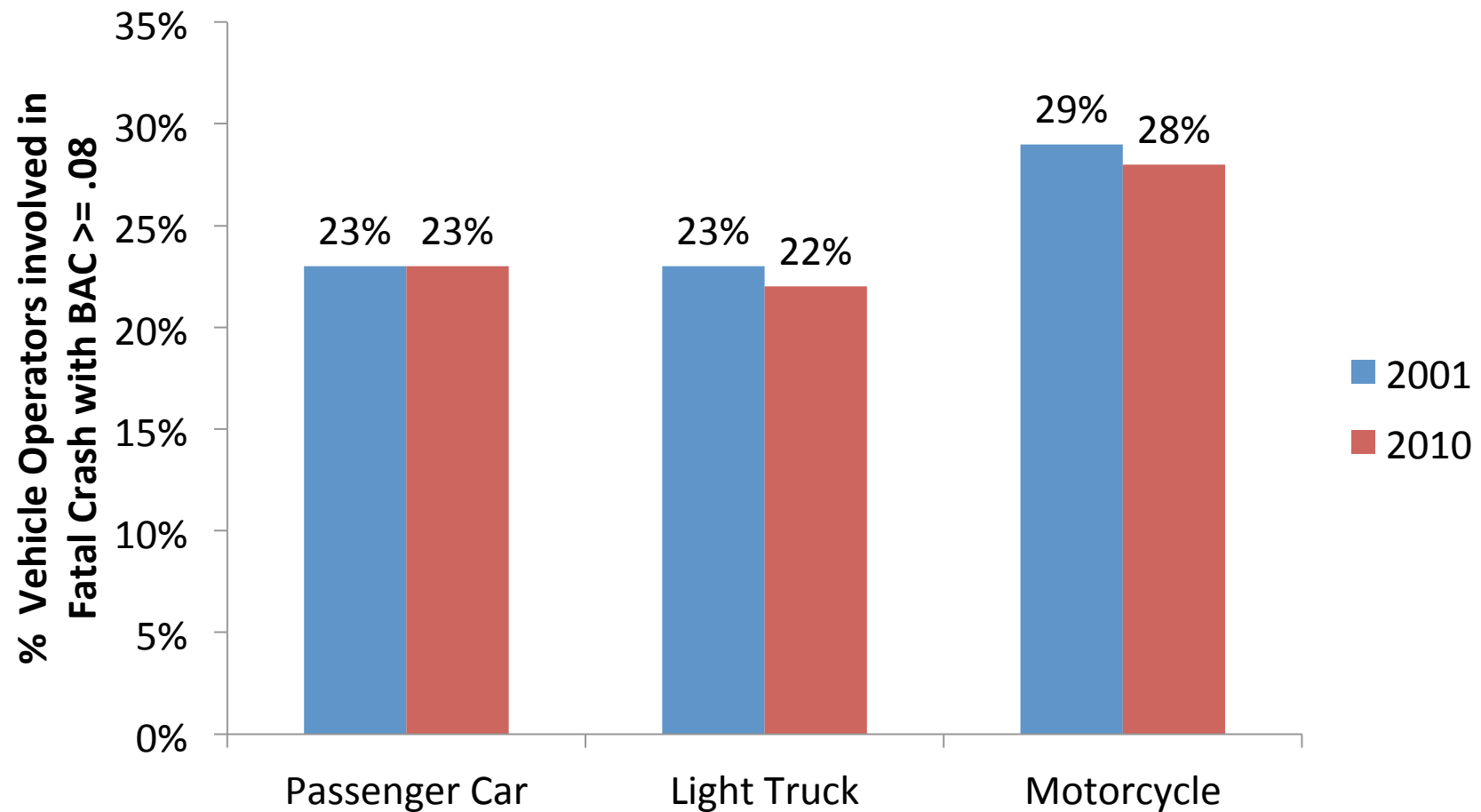
[Source: [www.iihs.org](http://www.iihs.org), GAO-13-42]

# Fatality Risk (vehicles)



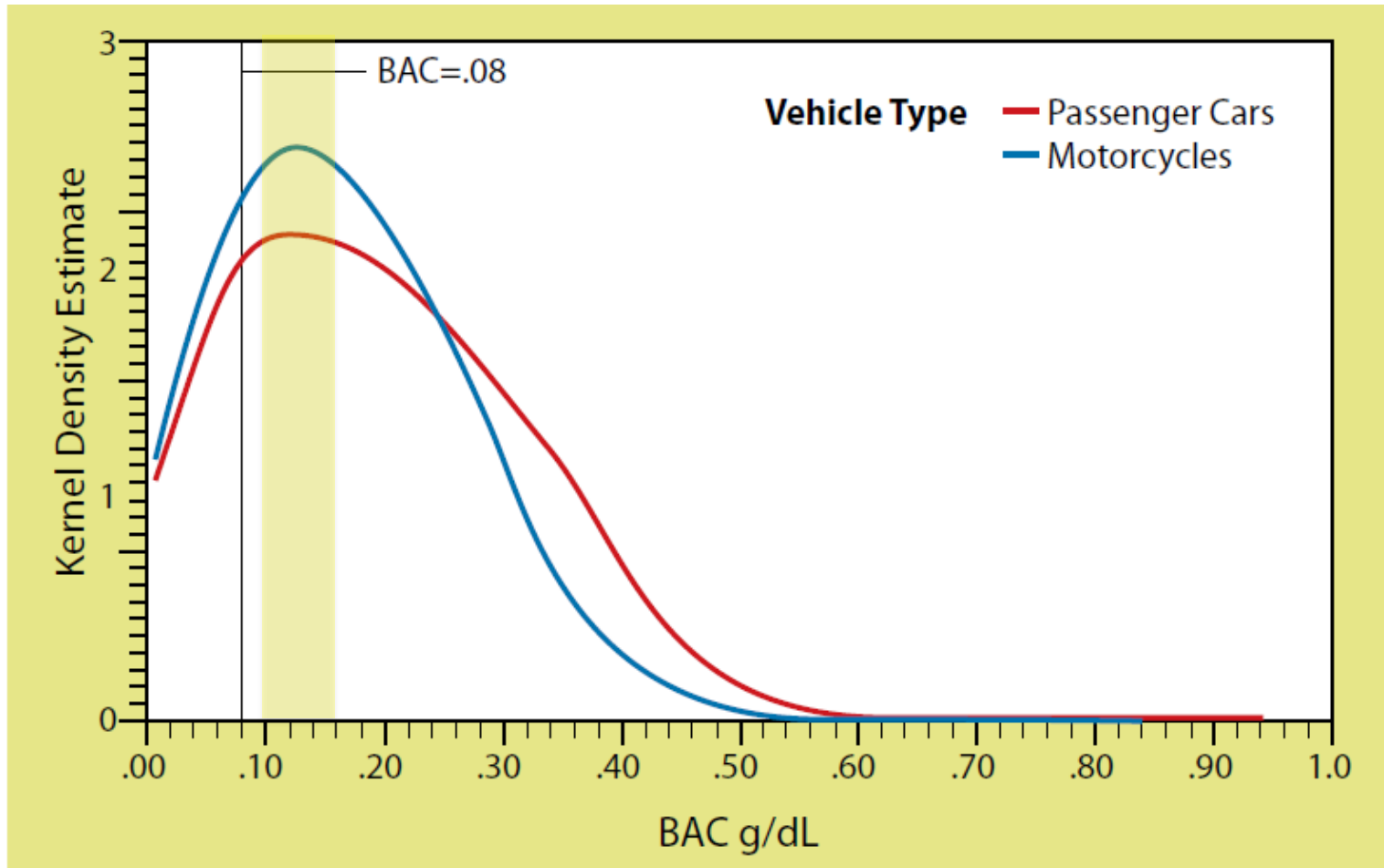
[Source: NHTSA DOT HS 811 639]

# Alcohol Involvement



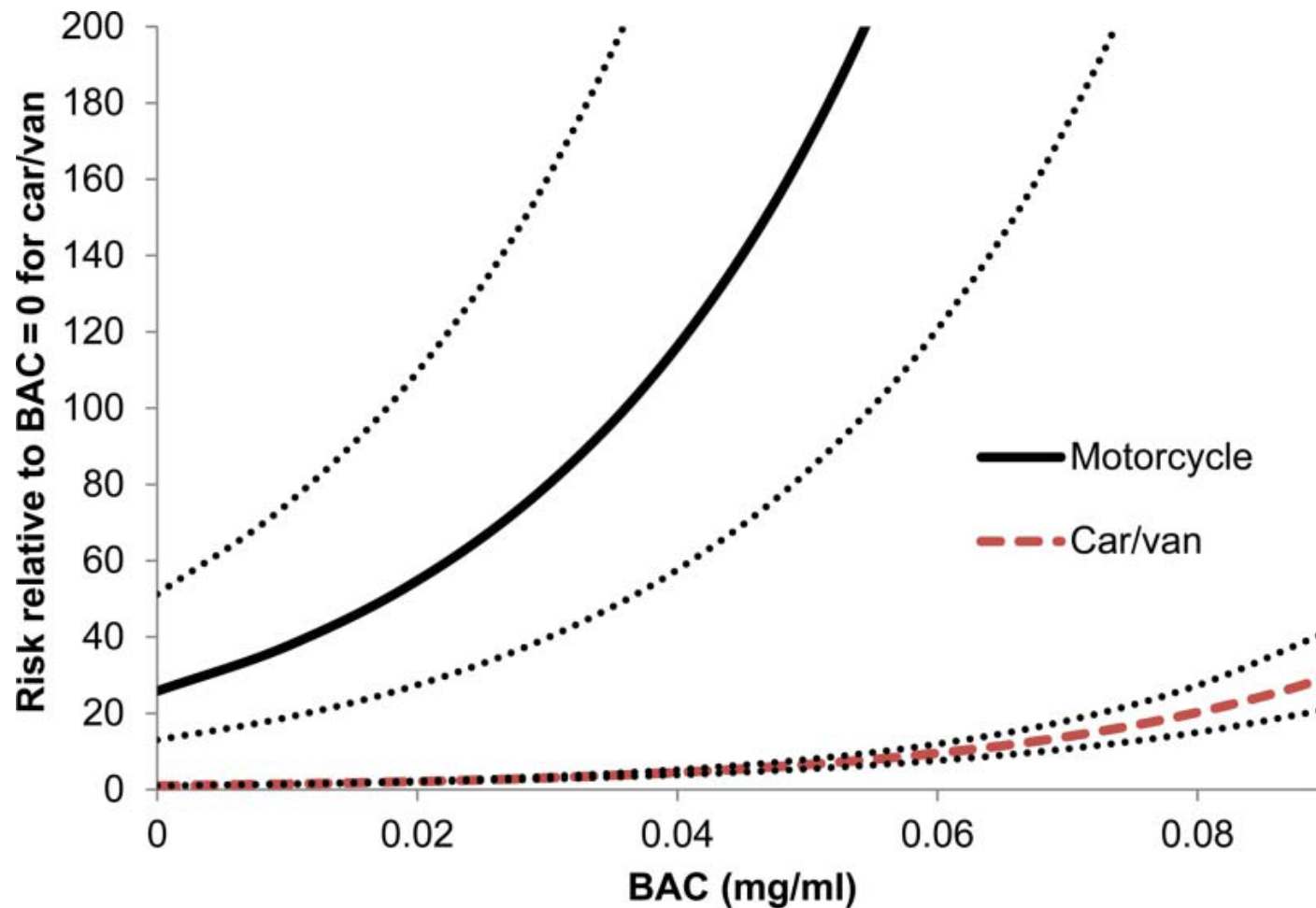
[Source: NHTSA DOT HS 811 606]

# Alcohol Fatalities



[Source (2000-2004): NHTSA DOT HS 810 754]

# BAC Risk Curve



[Source: Keall et al, 2013]

# Operating Skills

## Driving

car  
lane  
make  
may  
must  
road  
stop  
traffic  
turn  
**vehicle**

## Riding

ahead  
behind  
brake  
driver  
front  
may  
lane  
**motorcycle**  
see  
road  
rear  
stop  
turn  
space  
traffic

# Alcohol Impairment





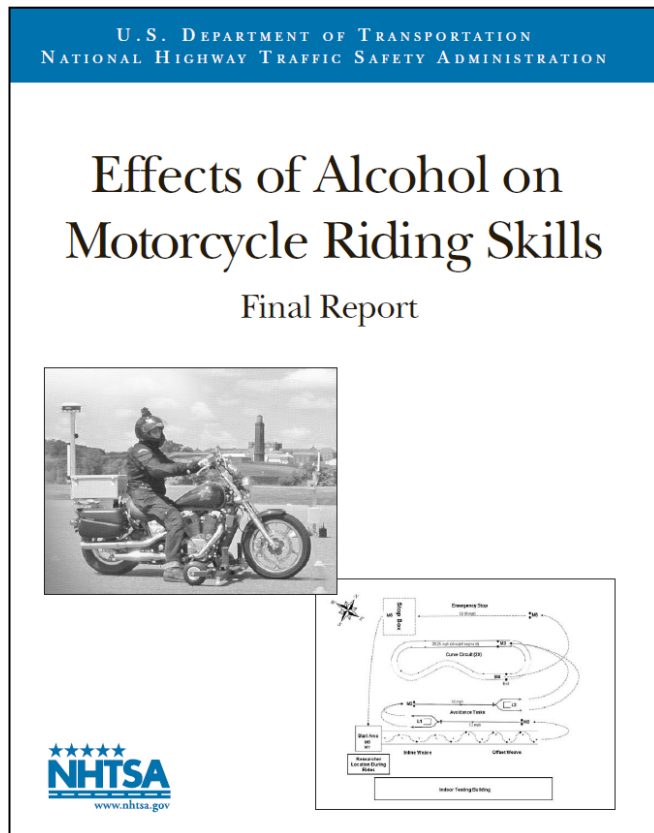
# Research Questions

How does alcohol affect riding skills?

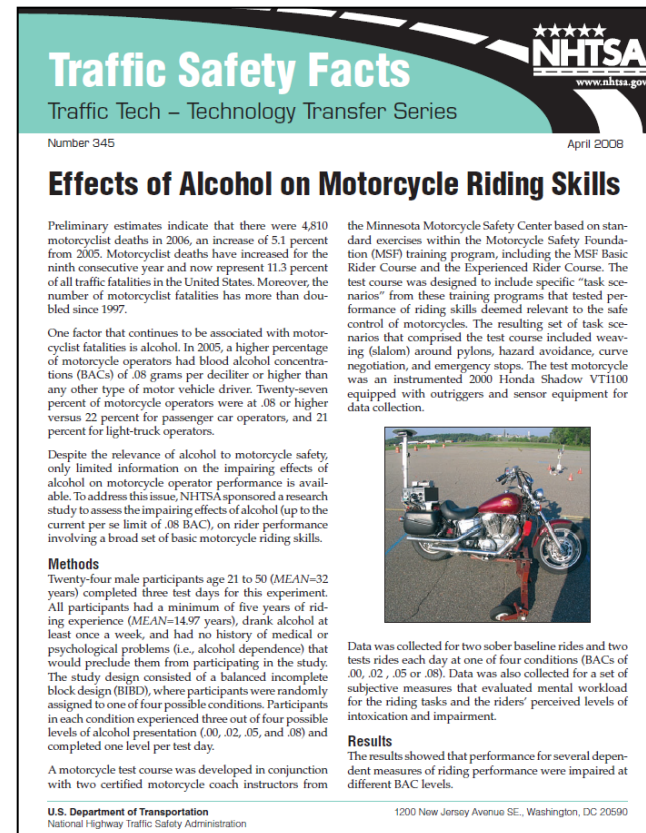
At what level do these effects appear?

# Project

## Report



## Summary



# Acknowledgements

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NHTSA

MHSRC

MMSC

St. Cloud State University

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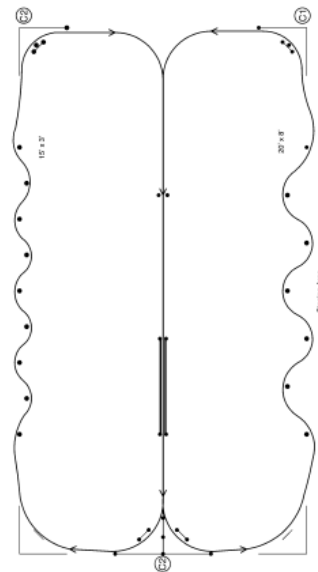
# Skills

## Exercise 6

20 minutes – Riding Demo

1. Read objective
  - To be able to effectively maneuver the motorcycle
2. Explain range setup
  - Down the middle: a pause-n-go, a clutch control lane, and a left and right perimeter turn
  - On the long sides of the range, an offset weave and a perimeter turn
3. Provide instructions
  - Ride down the center of the range for the pause-n-go, the clutch control lane, and a perimeter turn left or right
  - On the long sides, weave around the cones starting on the outside of the first cone
  - Slow at the end and make a perimeter turn
  - Check traffic and repeat up the middle
4. Provide demo
  - Note evaluations and provide signals
    - Coordinate throttle, clutch, and brake use
    - Keep head and eyes up
    - Maintain appropriate following distance
    - Check for traffic
    - Maintain a safety margin
5. Conduct exercise
  - Start riders down middle
  - Have riders work toward very low speeds in clutch control lane
  - Initially distribute riders evenly on long sides
6. Stage riders in parking area
7. Debrief

## Controls-Skills Practice



- Offset Weave
  - Balance (slow speed)
  - Control (turning)
  - Safety Margin



# Skills



## Exercise 16

30 minutes – Riding Demo, Simulated Practice, 2 Parts

1. Read objective
  - To be able to avoid hazards by swerving or stopping quickly
2. Explain range setup
  - 2 separate barriers and an offset weave on outside perimeter
3. Provide instructions
 

**Part 1 – Swerve**

  - On signal and one at a time, approach barrier at around 12 mph in 2nd gear
  - Maintain a steady speed
  - Swerve in direction signaled without braking
  - When straight, downshift and stop next to RiderCoach
  - After coaching, practice the offset weave and return to end of same line

**Part 2 – Swerve or Brake**

  - After some time, the RiderCoach will add a stop signal, providing 3 options: swerve left, swerve right, brake in straight line
4. With riders at coach position, provide demo
  - Note evaluations and provide signals

**Part 1 – Swerve**

  - Keep head and eyes up
  - Keep speed under control
  - Keep body upright, independent of motorcycle lean
  - Maintain steady speed when swerving
  - Do not brake while swerving
  - In weave, maintain steady speed

**Part 2 – Swerve or Brake**

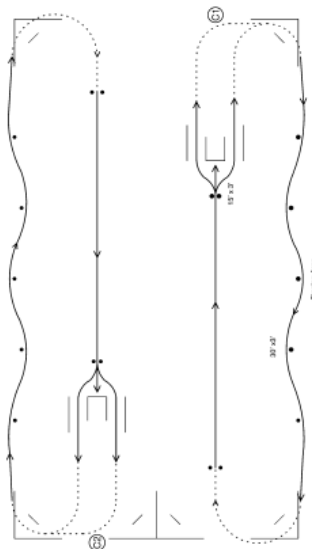
  - When stopping, downshift and brake smoothly in a straight line
  - In weave, maintain steady speed
5. Provide simulated practice
  - Swerving with upper body straight
6. Conduct exercise
  - Provide early signals, no surprises
  - For Part 2, tell riders that first signal will be a stop signal, then signals will be random

## Avoiding Hazards

7. Stage
  - Keep near-side riders in place
  - Direct far-side riders to turn left after last swerve-stop and join the near group
8. Debrief

**Notes:**

- The cue cones are 15' from the barrier and 3' apart
- The weave cones are 30' apart with a 3' offset



- Hazard Avoidance
  - Reaction Time
  - Control (avoidance)
  - Safety Margin



# Skills

## Experienced Rider Course

### Exercise 9

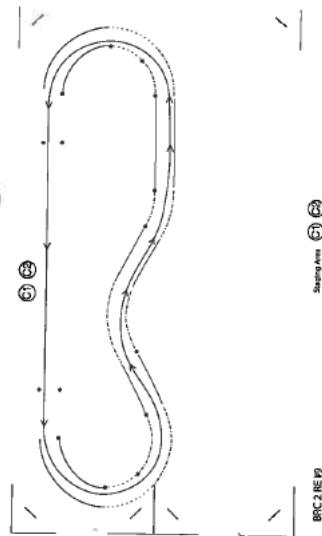
25 minutes - Riding Demonstration - Reversal

### Multiple Curves

1. Read Objective
    - To improve skills when negotiating multiple curves
  2. Explain Range Setup
    - A circuit consisting of multiple curves with various radii
  3. Provide Instructions
    - On signal and in small groups of riders, ride the circuit
    - Maintain a slow, steady speed in curves and use proper cornering techniques
    - Increase speed in long straightaway (20-25 mph) and slow to a suitable entry speed before first curve
    - Keep an adequate safety margin and following distance
    - On signal, the exercise will be reversed
  4. Provide Demonstration with Riders in Coach Position and Note Evaluations and Signals
    - Maintain precise control
    - Use a low gear and keep speed low in curves
    - Select an appropriate entry speed for all curves at end of straightaway
    - Use smooth, proper lines to setup and negotiate curves
    - Look well ahead, applying SEE
    - Avoid deceleration in a curve
  5. Conduct Exercise, with Reversal (use groups of no more than 3 riders)
    - Start riders by spacing them 6-8 seconds apart
    - Have riders complete 3 or 4 revolutions each direction
    - Move each group of riders to staging area for debrief
    - Do not allow this to become a competitive exercise
    - Do not allow speeds to become excessive
    - Encourage riders to avoid excessive lean angles which cause parts to drag
  6. Stage Riders in Staging Area
  7. Debrief
- Break

#### Classroom Cards Discussion

10. Alcohol/Drugs Effects + Fatal Vision Activity
11. Safety Oval



- Curve Circuit
  - Control (speed choice, lane position)



# Skills

## Exercise 9

30 minutes – Riding Demo, *Simulated Practice*,  
2 Parts

1. Read objective
  - To be able to stop quickly
2. Explain range setup
  - 2 lanes on each side of the range
  - 2 crossed pause-n-gos in middle of the range
3. Provide instructions
 

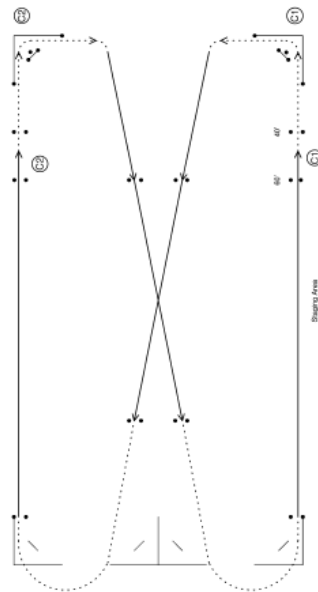
**Part 1 – Stop using cue cones**

  - On signal, ride down the middle of the range through the crossed pause-n-gos
  - Ride to a start point for stop lane
  - On signal and one at a time, approach stopping area at about 15 mph in 2nd gear
  - Stabilize speed early
  - As front wheel passes the cue cones, downshift keeping the clutch squeezed, and make a quick stop using both brakes
  - Once coached, make the perimeter turn and ride through the crossed pause-n-gos

**Part 2 – Stop on RiderCoach signal**

  - When a RiderCoach moves inside stopping area, stop quickly on command
4. With class at stop point, provide demo
  - Cover evaluations and provide signals
    - Keep head and eyes up
    - Use brakes firmly, not grabbing the front brake or locking the rear brake
      - If rear wheel locks; use less pressure next time
    - Shift with precision
  - Maintain a safety margin
5. Provide *simulated practice* of stop procedure
6. Conduct exercise
  - To start, distribute riders evenly
  - Part 1: use cue cones
  - Part 2: use stop signal
7. Stage riders in parking area
8. Debrief

## Stopping Quickly



- Stopping Quickly
  - Reaction Time
  - Control (braking)

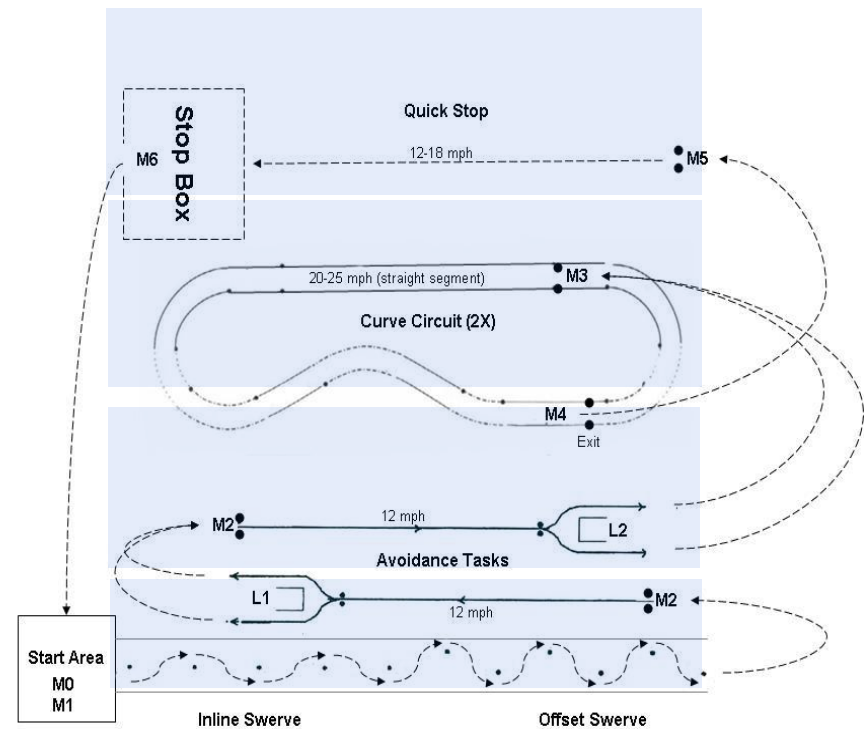


# Environment

## Track

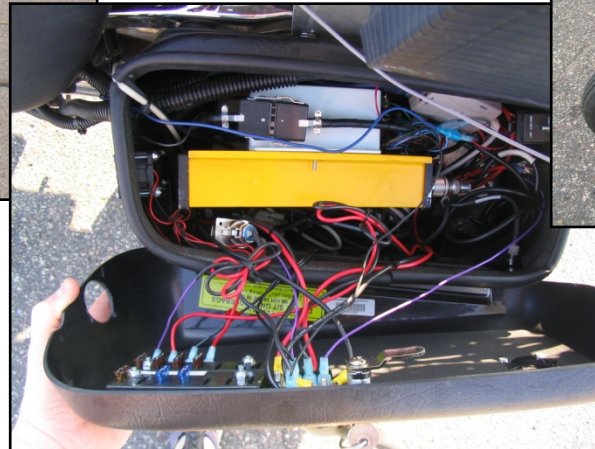


## Circuit





# Motorcycle



# Method

Day	Order			
	1	2	3	4
1	0.00	0.02	0.05	0.08
2	0.02	0.05	0.08	0.00
3	0.05	0.08	0.00	0.02

- 24 male subjects
  - Moderate drinkers
  - 21-50 years old
  - 5+ years experience
- Three days
- Random BAC order
- Two test laps

# Dosing

Target BAC	Acceptable BAC Ranges	Pre-Ride Mean (SD)	Post-Test Mean (SD)
0.02	0.01-0.03	0.025 (0.007)	0.013 (0.008)
0.05	0.04-0.06	0.052 (0.006)	0.046 (0.009)
0.08	0.07-0.09	0.080 (0.007)	0.079 (0.009)

# Results



## Offset Weave

- BAC 0.08 produced more missed or hit pylons.
- BAC 0.08 resulted in closer passing distance (shorter safety margin).



# Results



## Hazard Avoidance

- BAC 0.08 produced more errors (direction).
- BAC 0.08 and 0.05 produced slower reaction time.
- BAC 0.08 and 0.05 resulted in closer passing distance (shorter safety margin).

# Results



## Curve Circuit

- All alcohol levels produce faster maximum speeds.
- All alcohol levels produce more speed variability.
- BAC 0.08 resulted in more lane boundary violations.

# Results



## Stopping Quickly

- Alcohol increased maximum deceleration rate.
- Higher alcohol (BAC 0.08, 0.05) produce more deviation in stopping path than low alcohol (BAC 0.02).



# Results



## Subjective Reports

	BAC0.02	BAC0.05	BAC0.08
Intoxicated	↑	↑	↑
Impaired		↑	↑
Willing		↓	↓
Effort			↑



# Discussion

- Alcohol effects on rider skills consistent with motorcycle crash types:
  - Speeding
  - Delayed reaction
  - Rider Error
  - Road departure
- Effects apparent at BAC 0.05
- Subjective intoxication at BAC 0.02

# Thank You!

