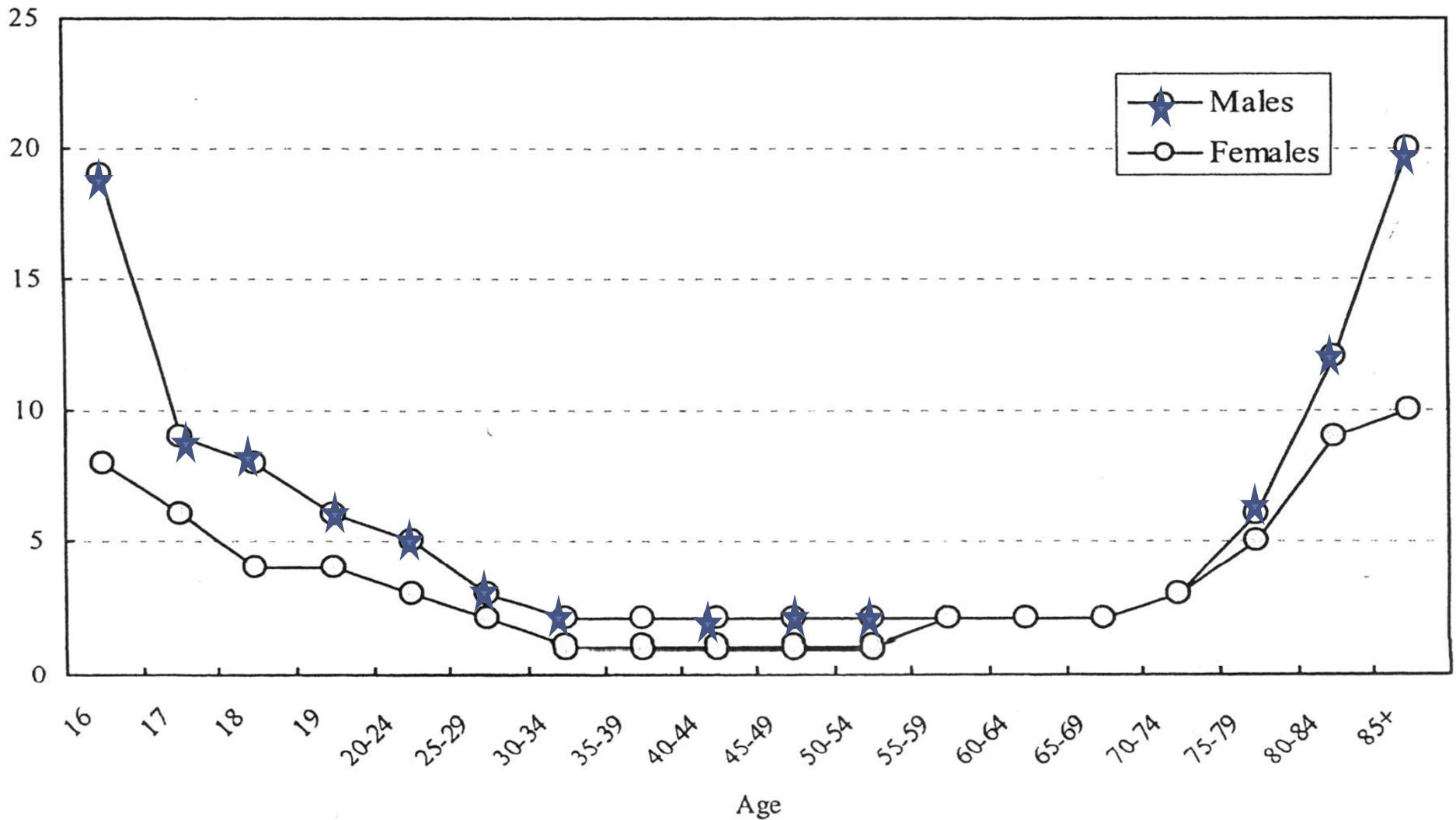


Preventing Crashes Among Novice Teenage Drivers: Research on Risk and Prevention

Bruce Simons-Morton, EdD, MPH
NICHD Associate Director for Prevention;
Senior Investigator & Chief, Health Behavior Branch
Eunice Kennedy Shriver National Institute of Child
Health and Human Development
National Institutes of Health

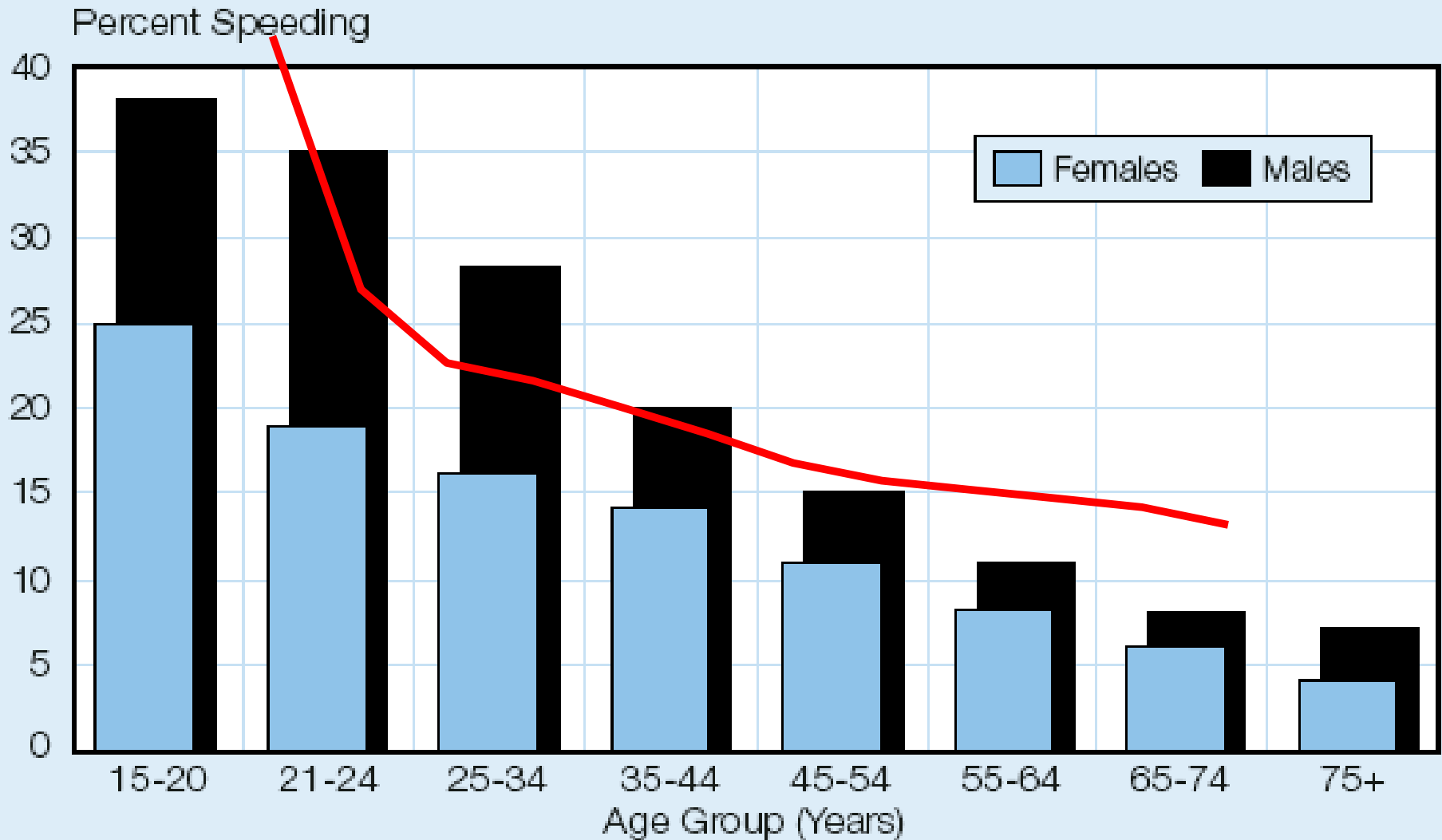
YOUNG DRIVER PROBLEM

Driver Fatal Crash Involvement/Million Miles

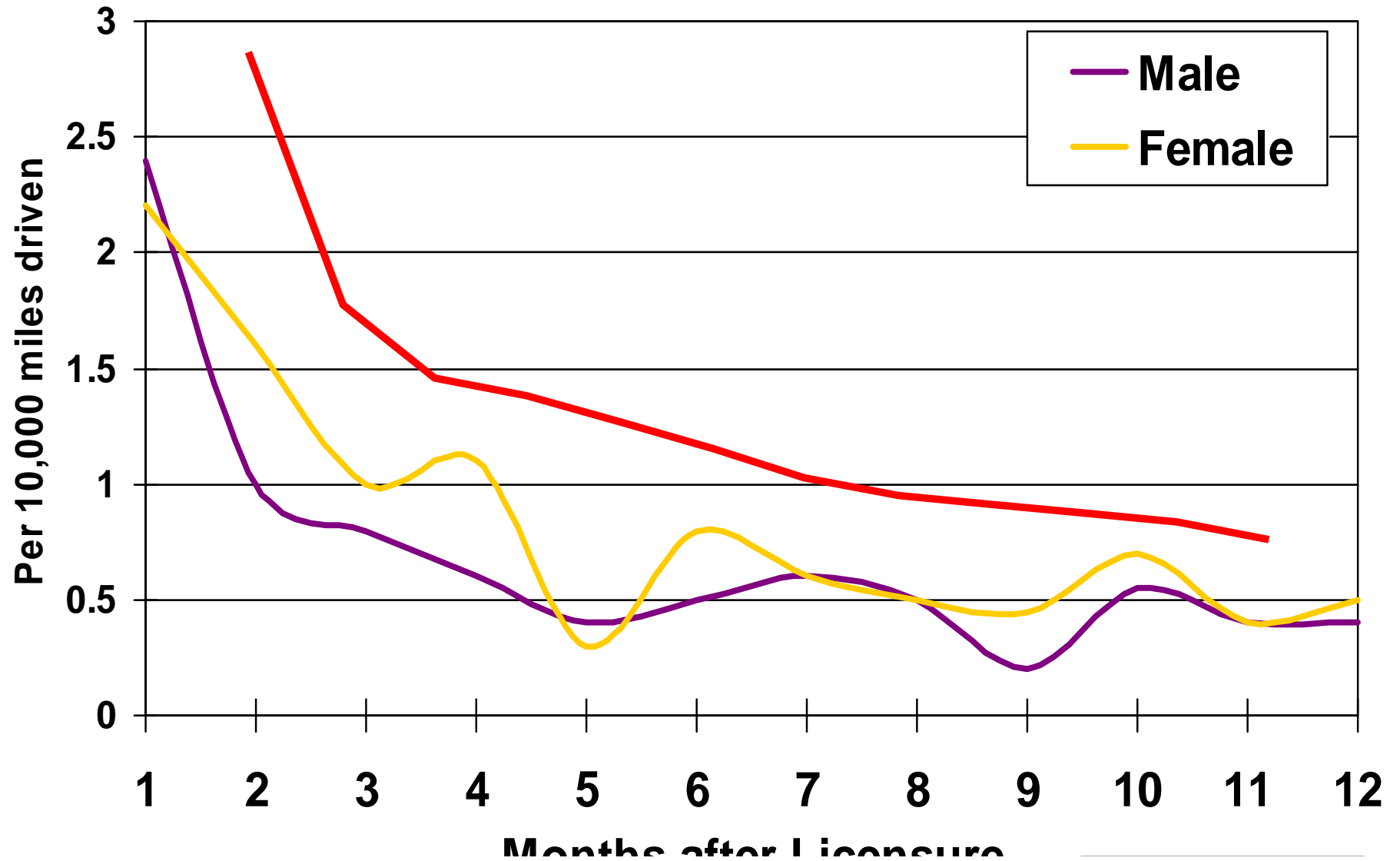


SPEEDING INCREASES ERRORS

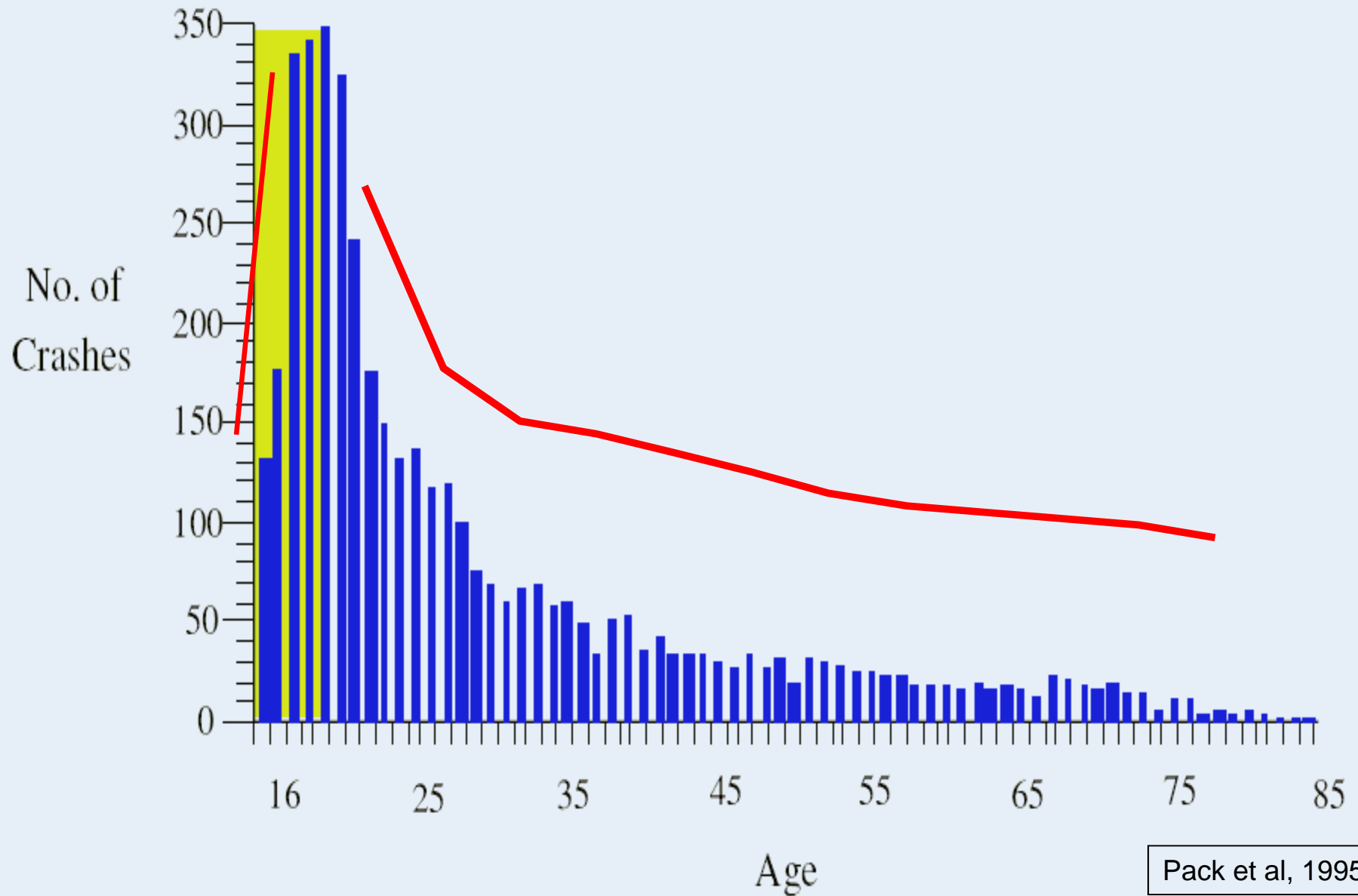
Speed-Related Fatal Crashes by Age and Sex



DRIVING ERRORS DECLINE WITH EXPERIENCE

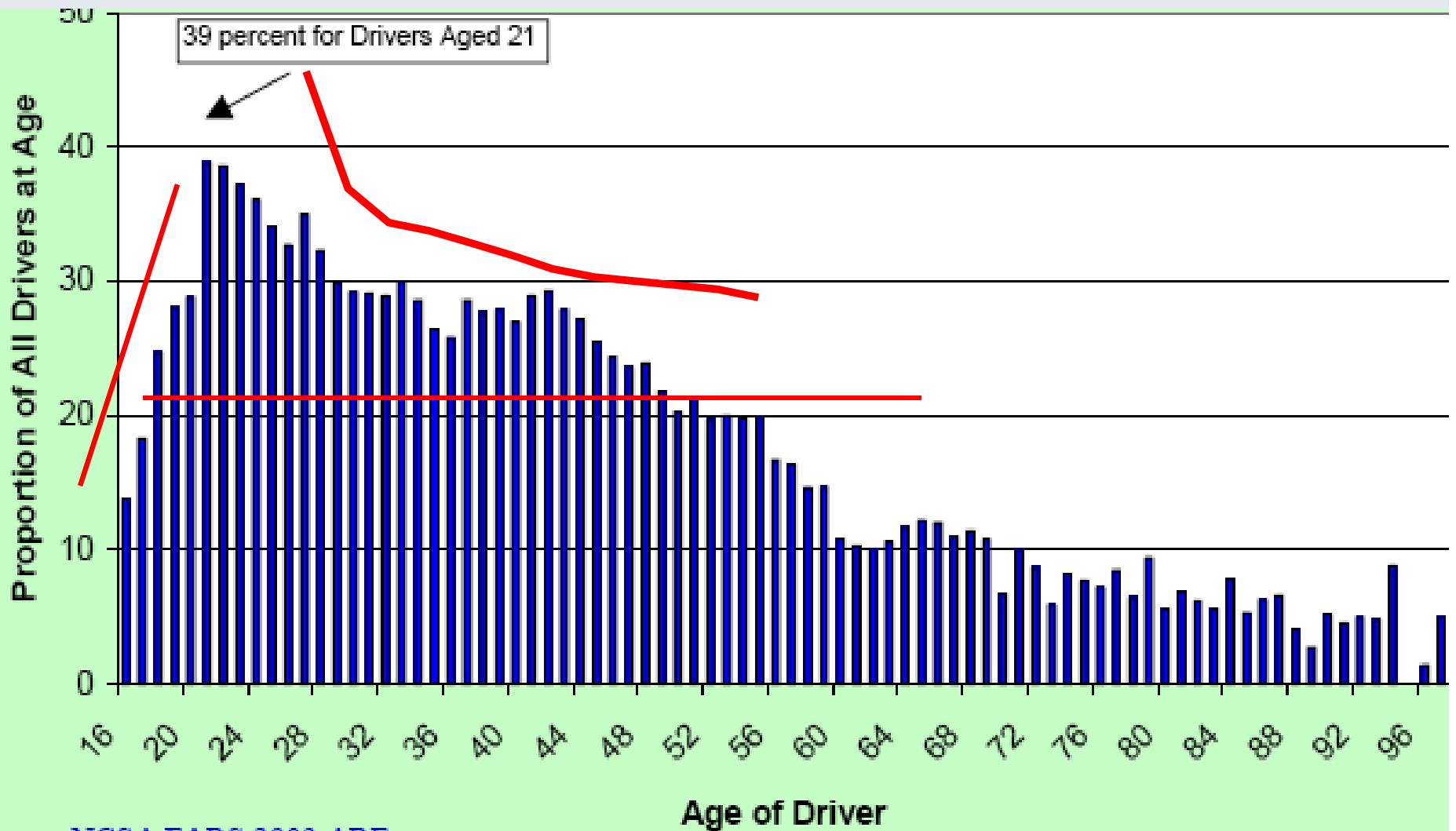


US Fall-Asleep Crashes by Age



Pack et al, 1995

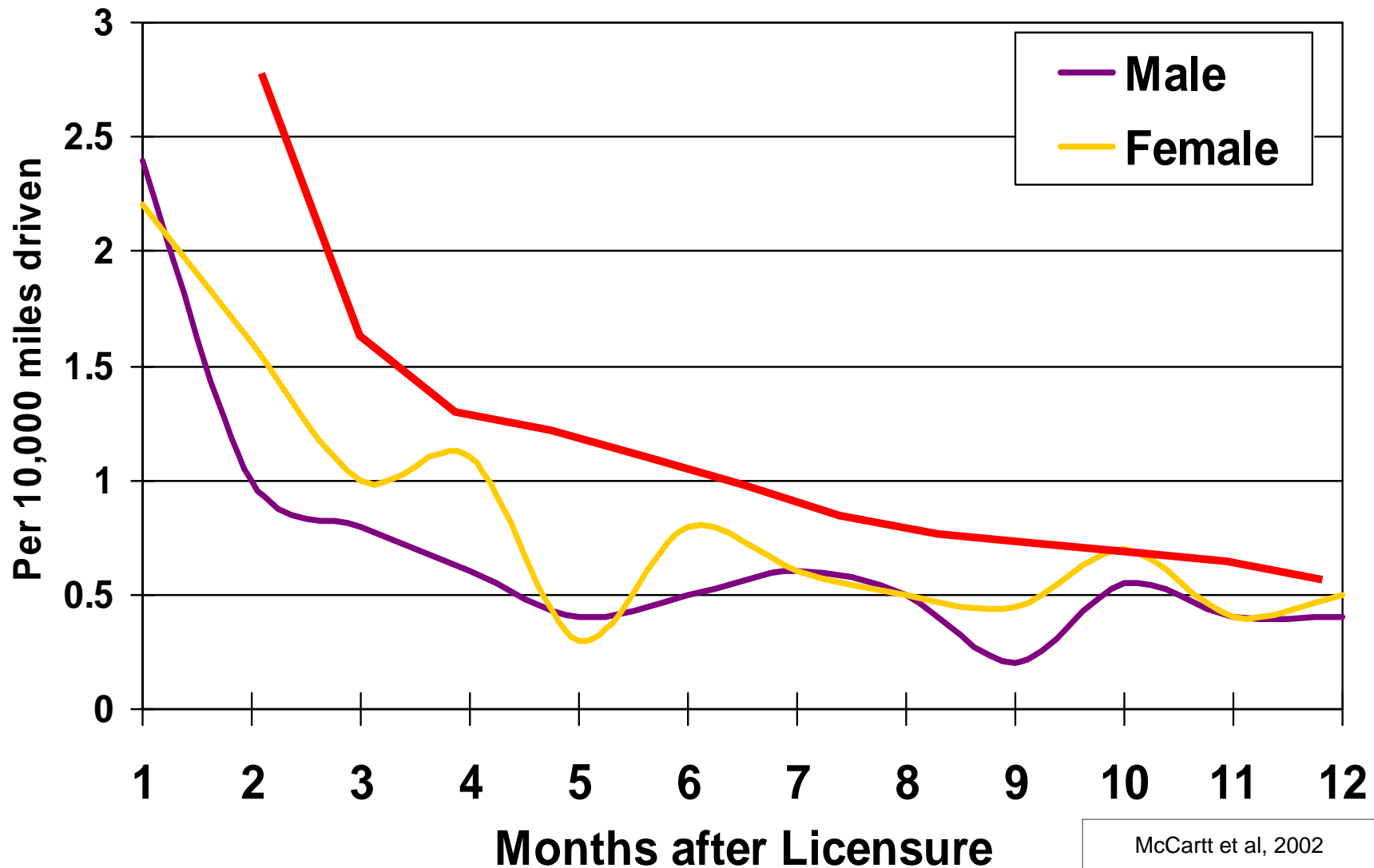
Proportion of Alcohol-Related Fatal Crashes by Driver Age



Source: NCSA FARS 2003 ARF

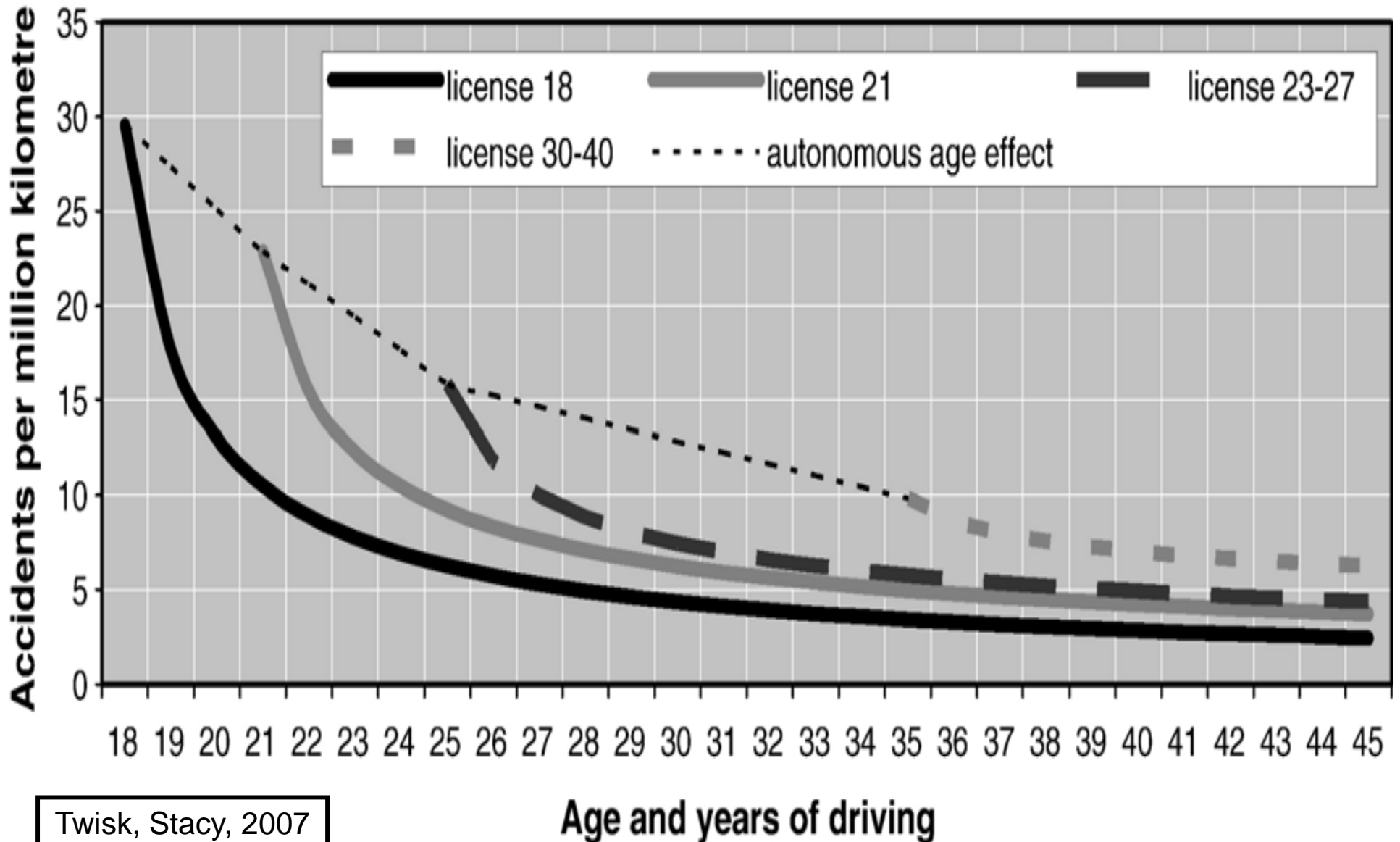
LEARNING, ERROR, AND EXPERIENCE

Error declines with practice/experience forming the learning curve



THE YOUNG DRIVER PROBLEM

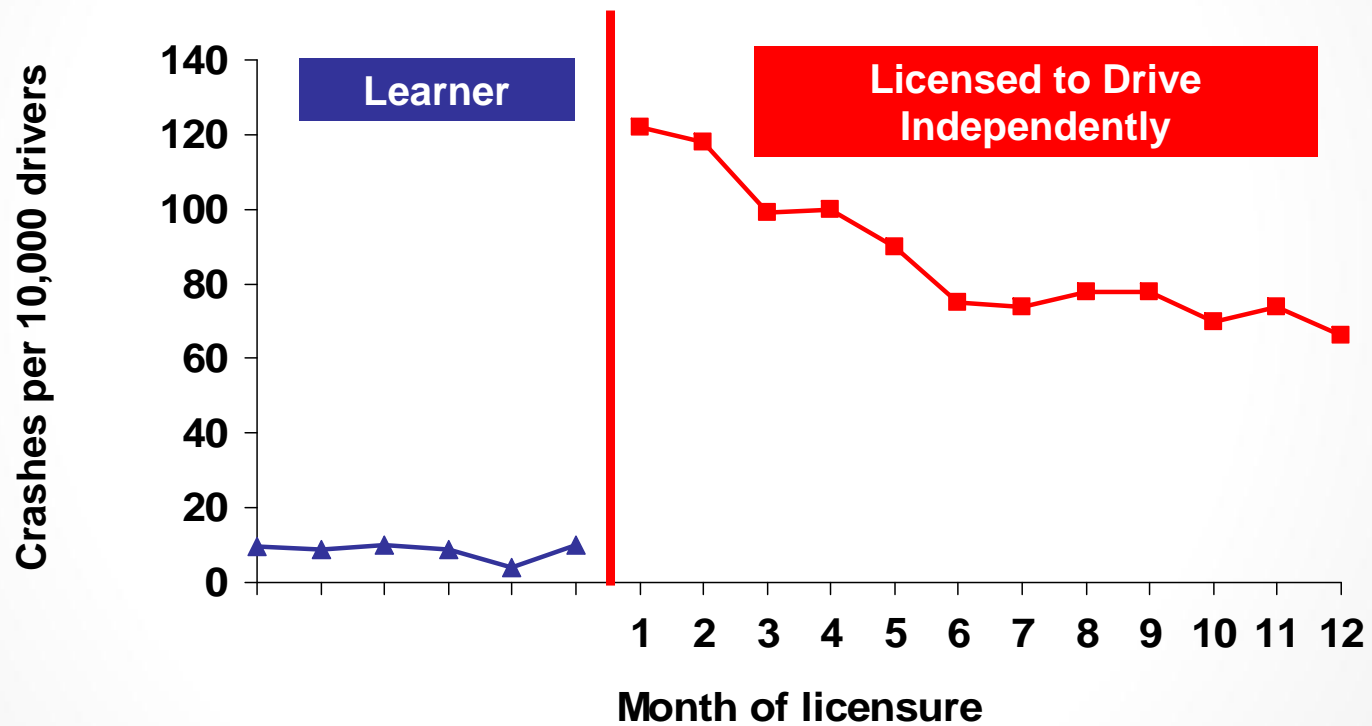
Inexperienced Drivers of All Ages Have High Crash Rates



Twisk, Stacy, 2007

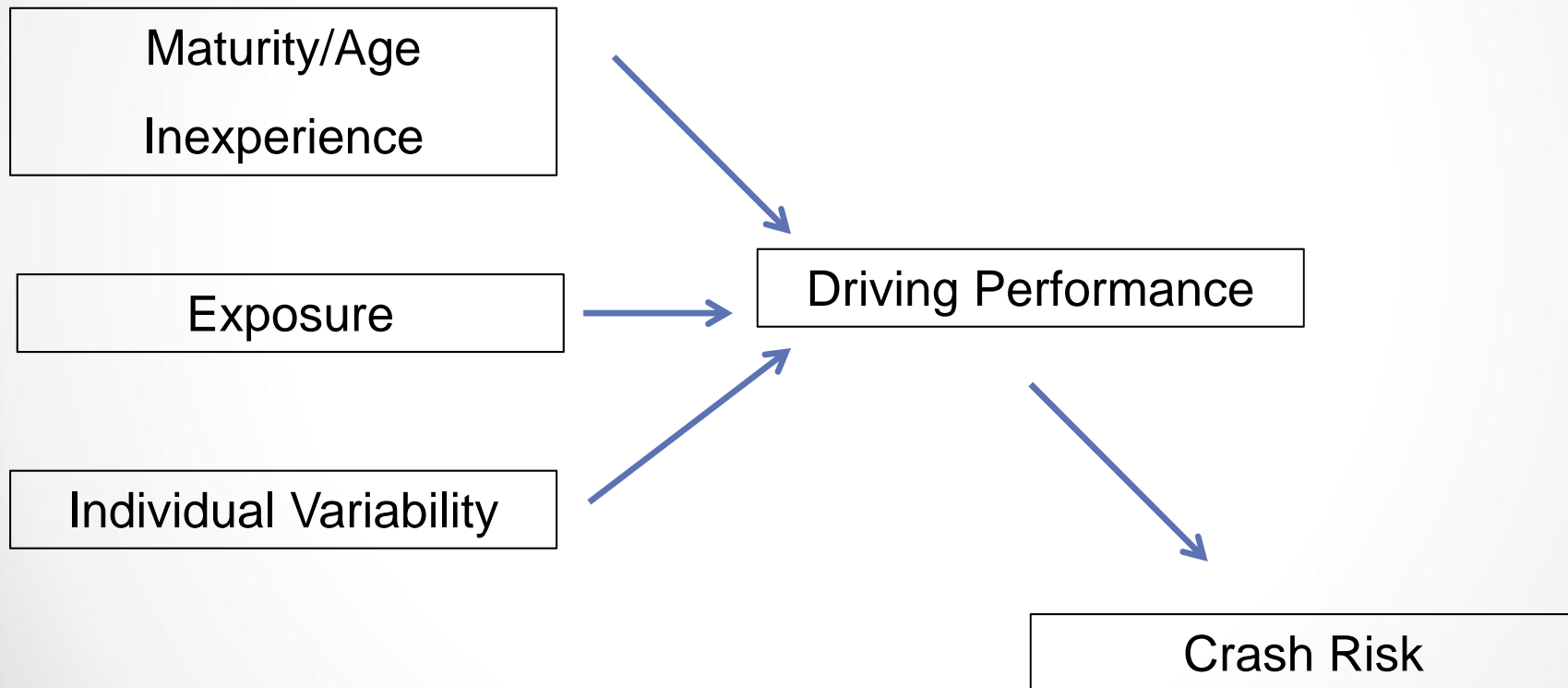
Classroom Figures: Teen Driving Risk

Crash Rate by Licensure Month



Adapted from: Mayhew et al., 2003 - Accident Analysis and Prevention

POSSIBLE CONTRIBUTING FACTORS



RESEARCH ON TEENAGE DRIVING PERFORMANCE & PREDICTORS OF RISK

1. Crash and near crash
2. Kinematic risky driving
3. Distracting secondary task engagement
4. Teen passengers



NATURALISTIC DRIVING RESEARCH

Naturalistic Teenage Driving Study (2004-2012)

A. Purpose: examine the variability in novice teen driving performance

B. Overview

- N = 42 teens and 54 parents, 18-months of driving
- Continuous data collection
- Instrumentation: accelerometers, cameras, GPS

C. Surveys at 0, 6, 12, 18 months

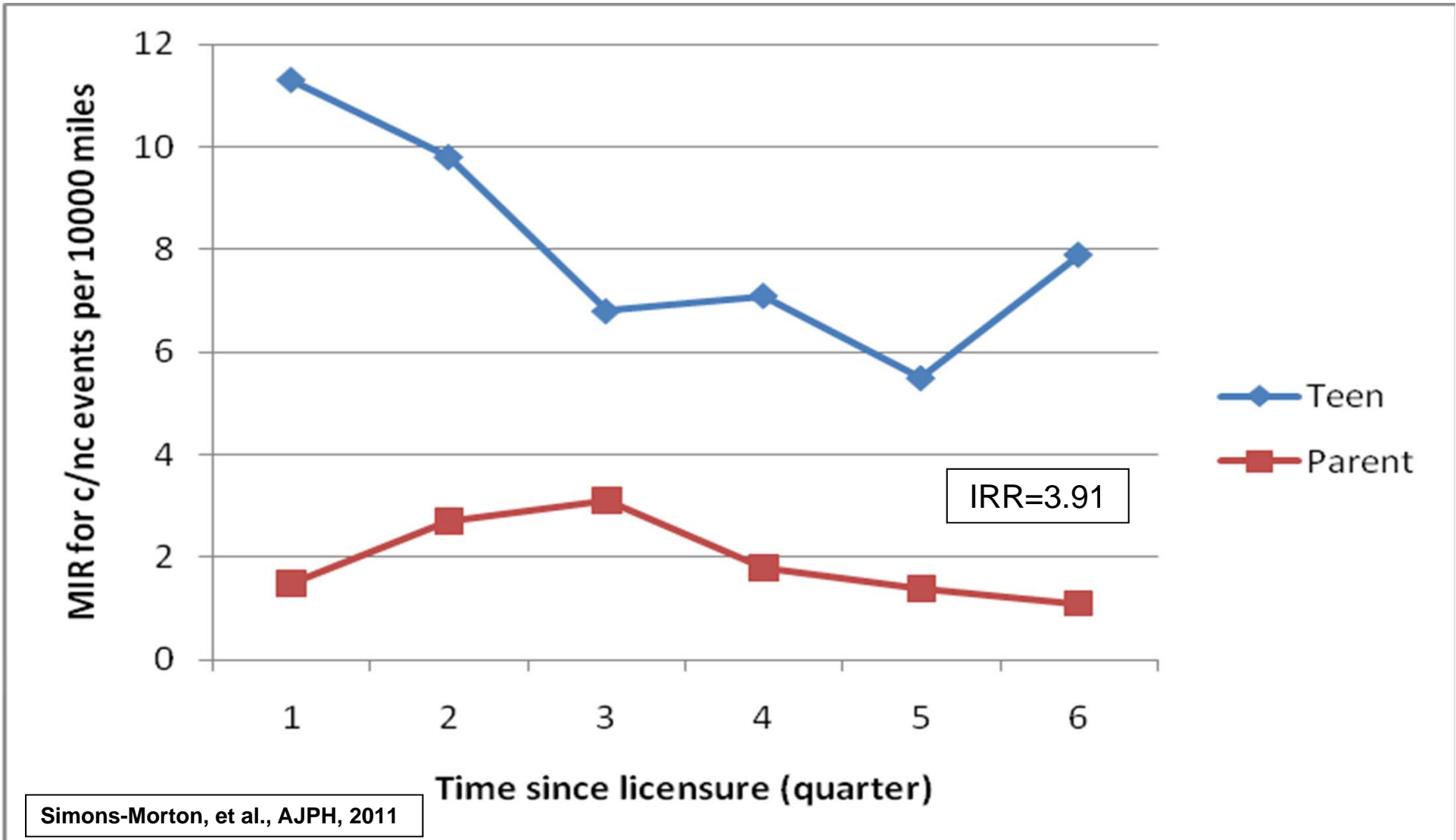


Video

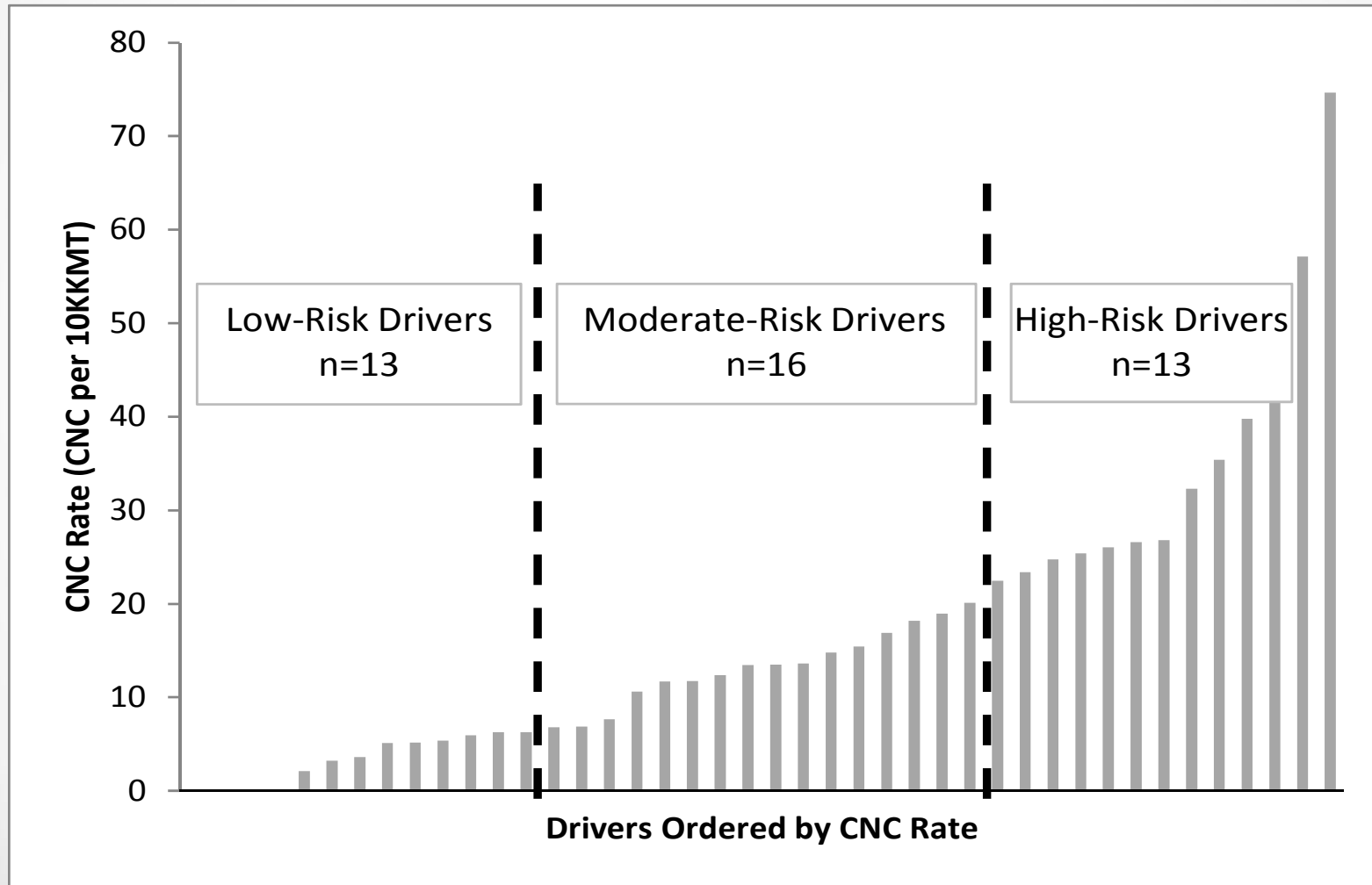


Naturalistic Teen Driving Study

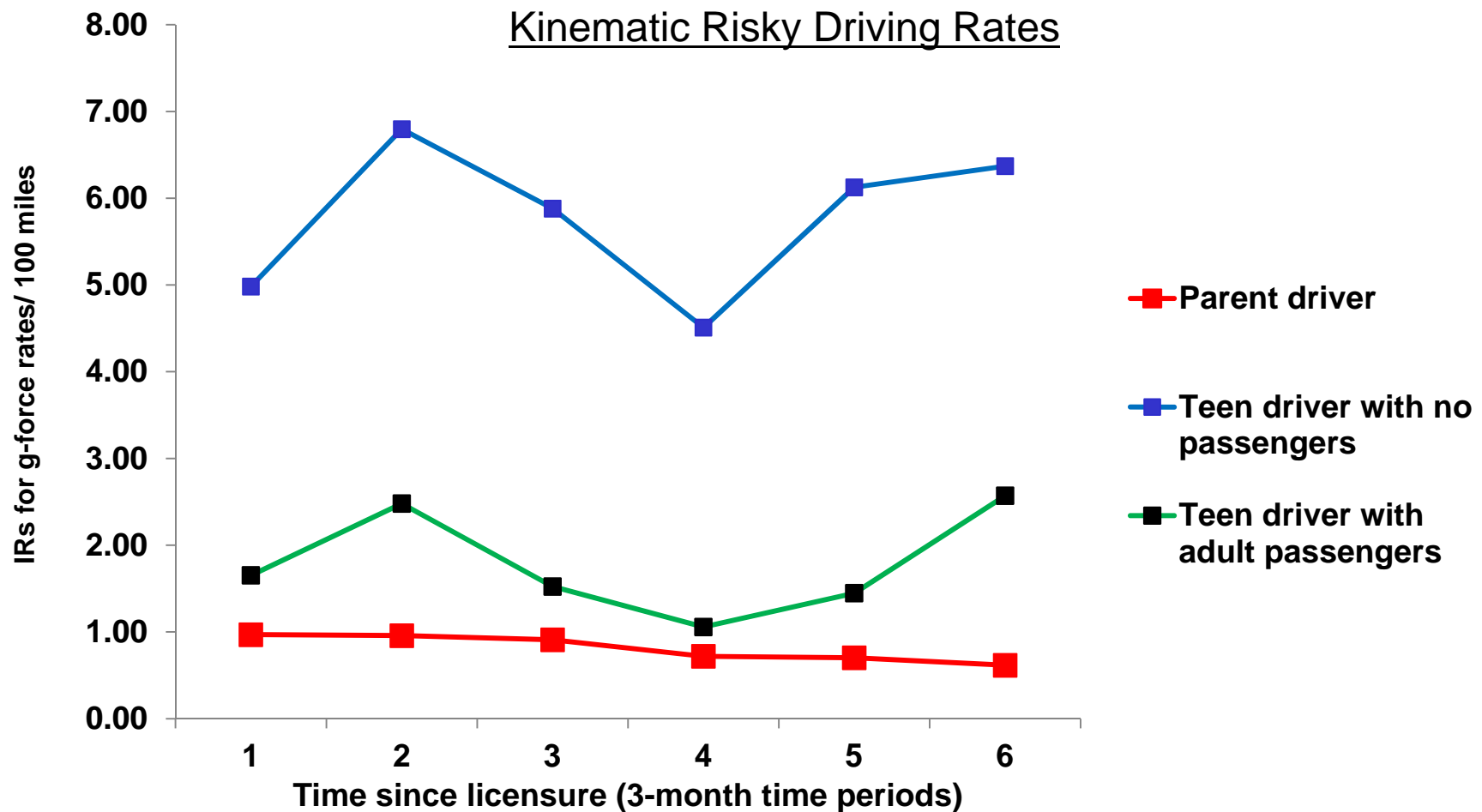
Crash/Near Crash – Teens and Parents



Variability in Crash Risk



Teenage Drivers with Adult Passengers Do Not Engage in Risky Driving



DISTRACTION INCREASES RISK

CNC Odds Ratios

Secondary Task	NTDS (Novice Drivers)		100-Car Study (Experienced Drivers)	
	OR	95% CI	OR	95% CI
Phone -Texting	4.3	1.9/10.0	n/a	n/a
Phone - Dialing	7.8	2.7/23.1	2.5	1.4/4.5
Phone - Reaching	4.7	1.8/11.7	1.4	0.3/6.1
Phone - Talking	0.8	0.4/1.5	0.7	0.5/1.1
Object (not phone) - reaching	7.8	3.5/16.8	1.2	0.6/2.3
Object (roadside) - looking	3.7	1.7/8.5	0.7	0.4-1.2
Eating	3.3	1.5/7.2	1.3	0.7/2.1
Vehicle Operations - performing	2.5	0.9/7.3	0.6	0.2/2.7
Radio/HVAC – managing	1.4	0.8/2.7	0.5	0.3/0.9

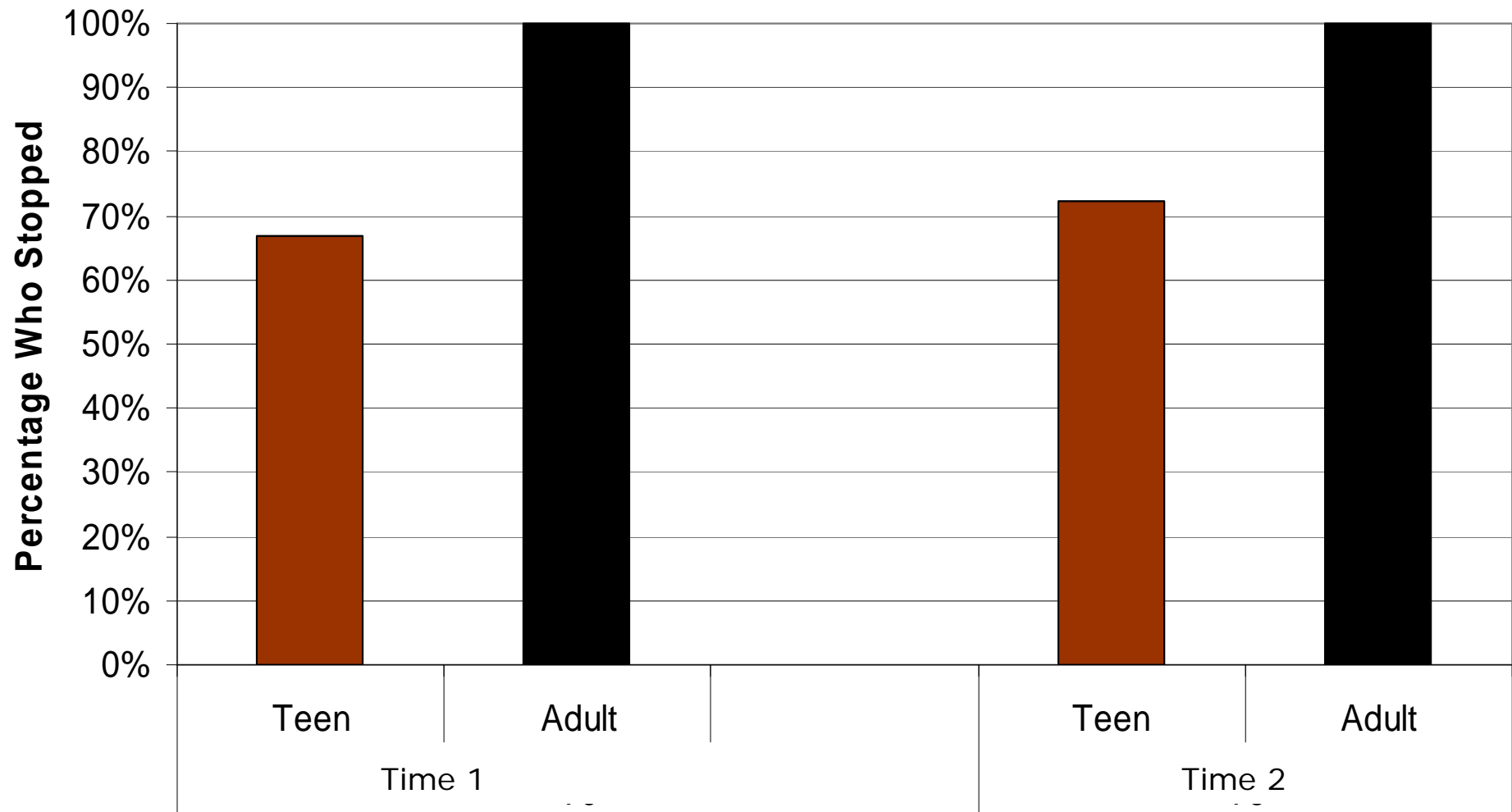
Teens and Adults Drive on Test Track Dial Cell phone When Approaching Intersection



Test Track Intersection Stopping Behavior

(n=16 teens; 16 experience adults)

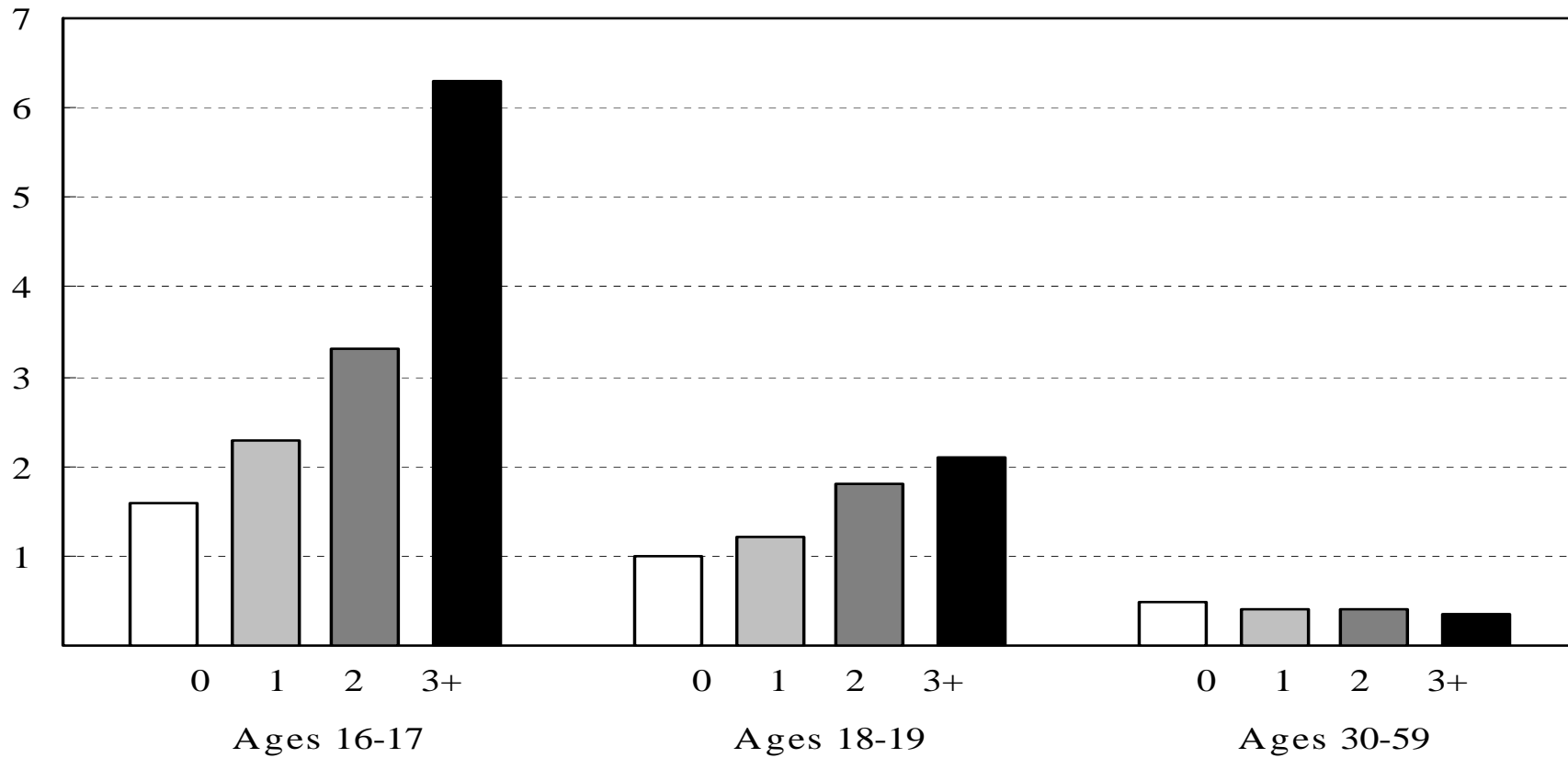
200' w/phone



Teen Passengers



Teen Passengers Increase Fatal Crash Risk

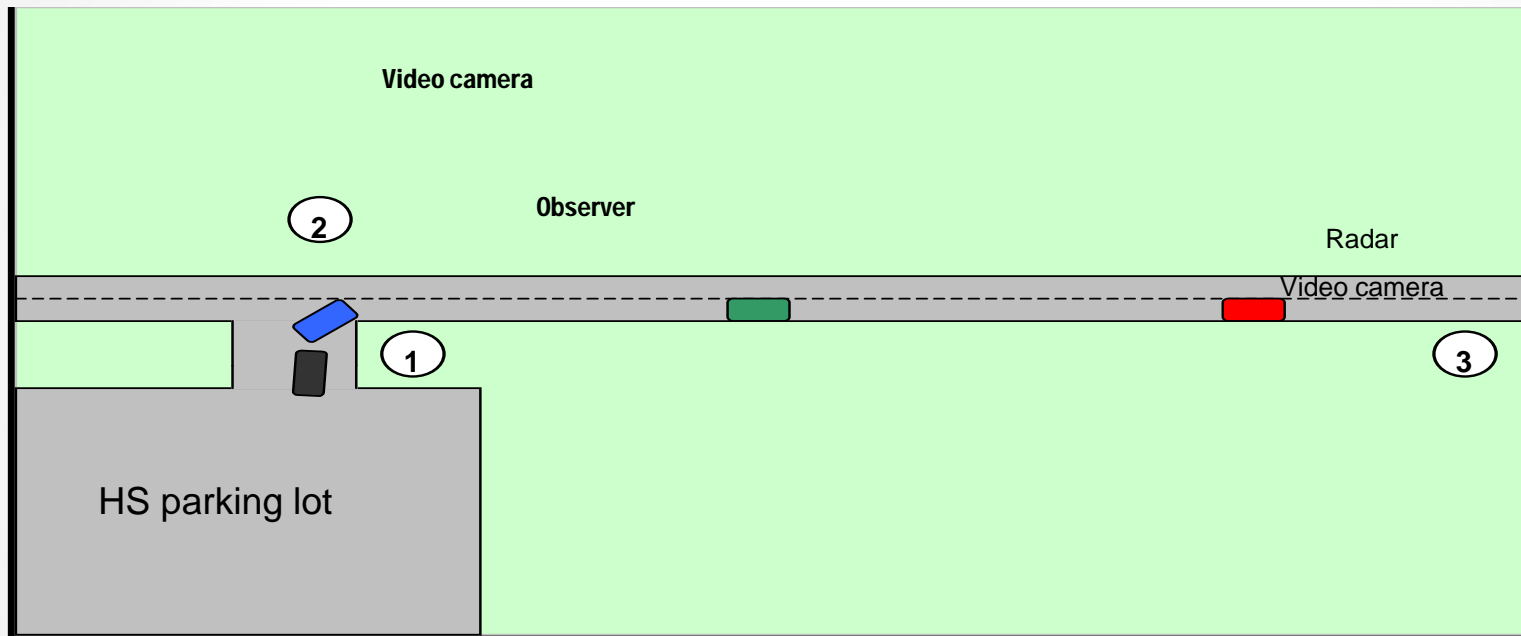


NPTS & NASS/GES

Number of passengers
Fatal crashes/10,000 trips

Chen, Baker, 2003

Observing Teen Drivers Leaving High School



10 area high schools; 3000 observations

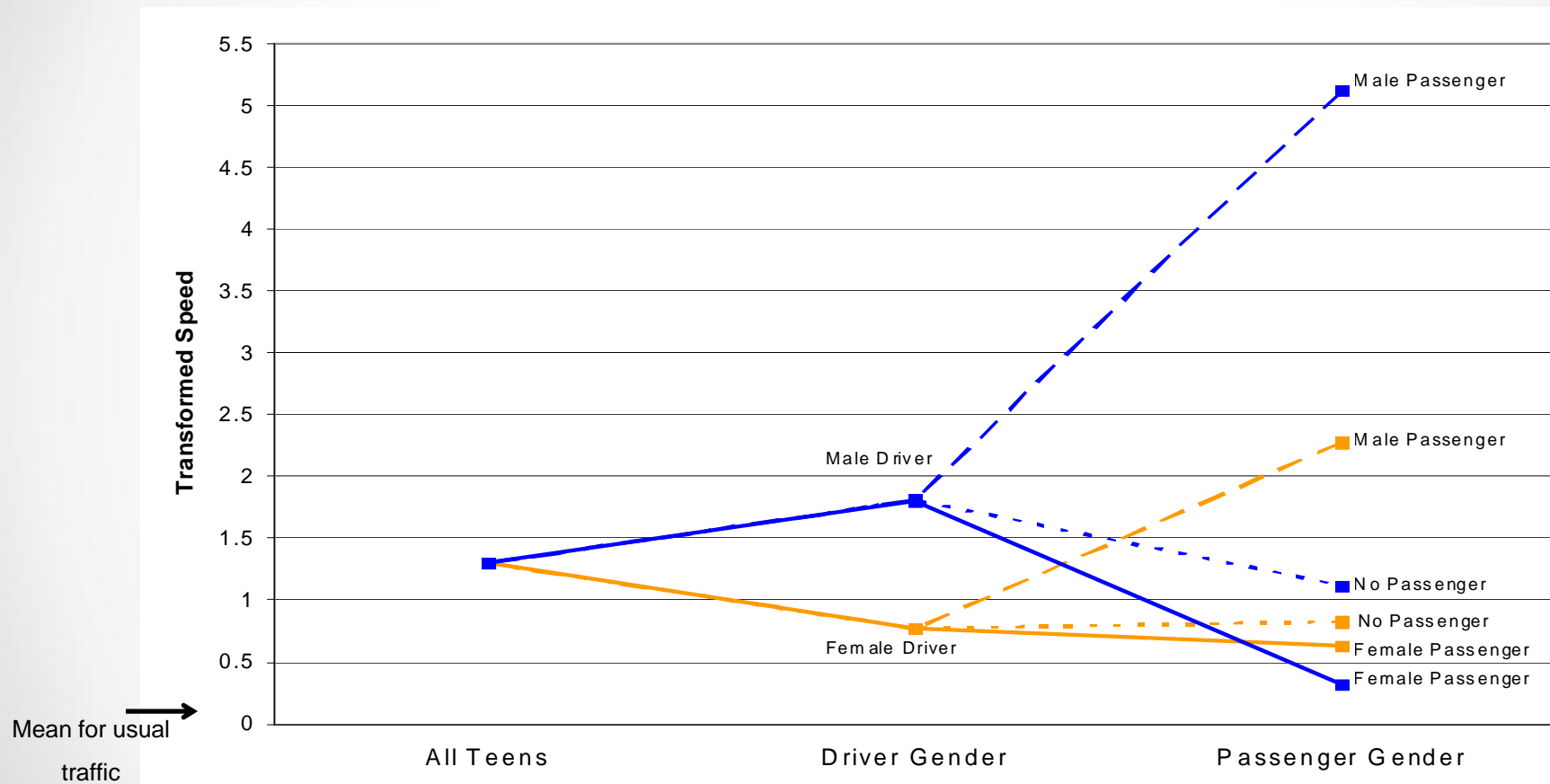
Compared teen drivers with usual traffic

Speed - radar gun

Close following - video

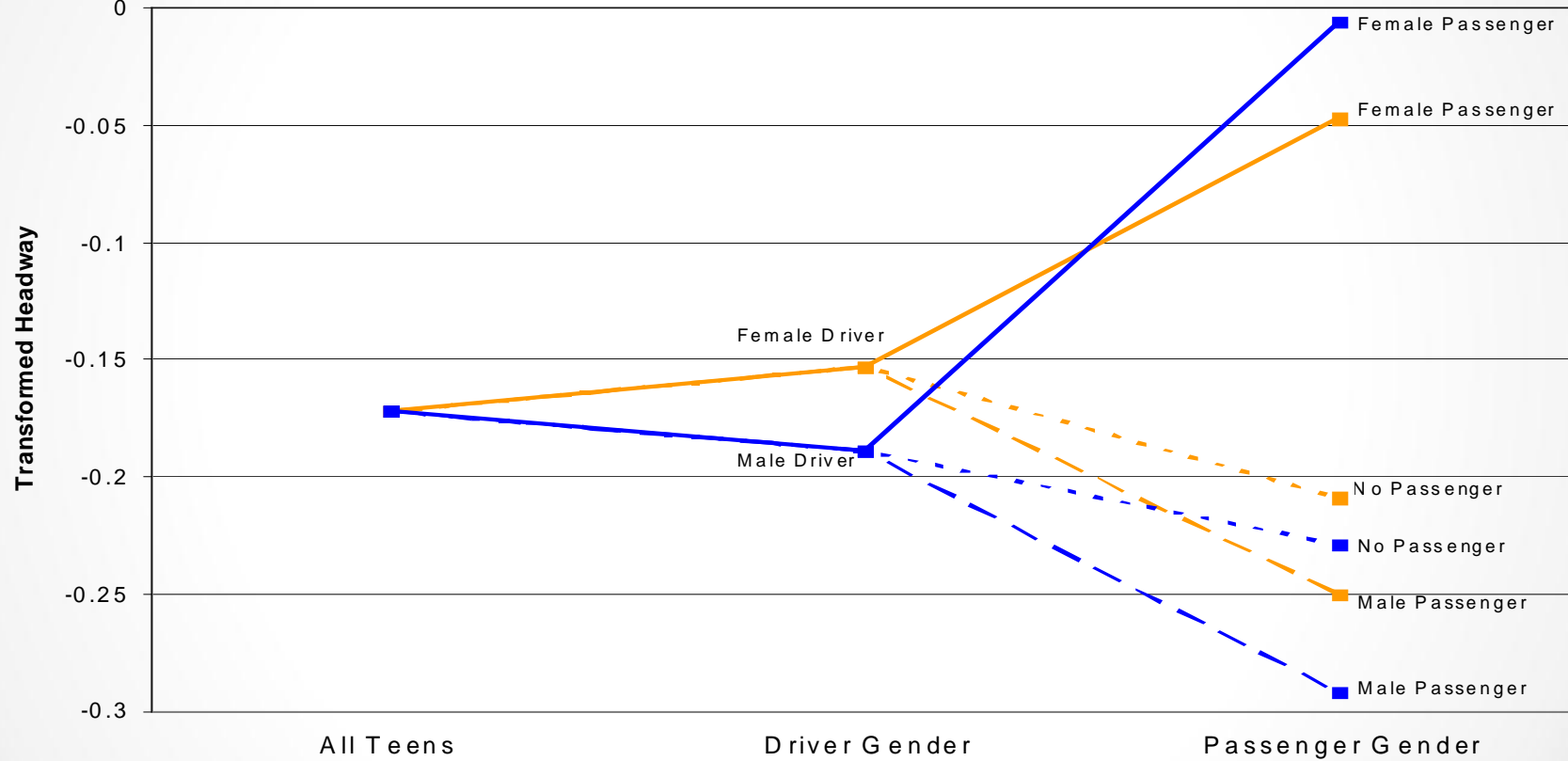
Simons-Morton. Lerner, Singer, AAP, 2005

Teen Driver Speed by Driver and Passenger Type



Teen Driver Headway

Mean for usual traffic
→ 0



DISCUSSION

1. Kinematic risky driving
2. Speeding
3. Secondary task engagement
4. Teenage Passengers

Safety Approaches To The Novice Young Driver Problem

<u>Safety Approach</u>	<u>Goal</u>	<u>Evidence of Safety Effects</u>
➤ Educate teens	Reduce risk taking	None
➤ Improve driver training	Prepare for exam	None
➤ Enhance GDL	Limit exposure	Substantial
➤ Increase higher order supervised practice	Vehicle management	None
➤ Foster parent management	Limit exposure	Good
➤ Encourage electronic monitoring	Reduce risk events	Promising

TEEN DRIVER PREDICTORS OF RISKY DRIVING

PREDICTOR	NTDS	STRENGTH OF EVIDENCE
Male vs female	Speeding	Strong
Teen passengers	CNC, KRD, Distraction	Strong
Social norms	CND, KRD, Distraction	Strong
Risk Perceptions	Speeding	Mixed
Driving Skill	Distraction	Weak
Attitudes	--	Weak
Sensation Seeking	--	Mixed
Personality	--	Mixed
Response to stress	CNC	Emerging

CAN EDUCATION AFFECT TEEN DRIVING SAFETY?

1. Alter social norms!
 - Teen drivers
 - Teen passengers
2. Increase parental involvement?
3. Add hazard detection and mitigation?

Safety Approaches To The Novice Young Driver Problem

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EVALUATIONS OF DRIVER TRAINING

- “More skillful drivers do not necessarily crash less; attitudes do not reflect driving behavior; regardless of skill drivers must actually drive more safely to minimize risk.” (Lonerio, Meyhew, 2015).
- When DE leads to early licensure, it increases crash risk.

Approach	Objective	Evidence of Safety Effect
DeKalb Study	Evaluate intensive vs usual DE	No long-term effects
Vernick et al, 1999	Review	No benefits
Meyhew & Simpson, 2002	Review	No benefits
Nichols, 2003	Review	Fewer violations
Elvik & Vaa, 2004	Meta-analysis	No benefits
LSEDE, 2015	Oregon, Manitoba evaluation	Probably no benefits

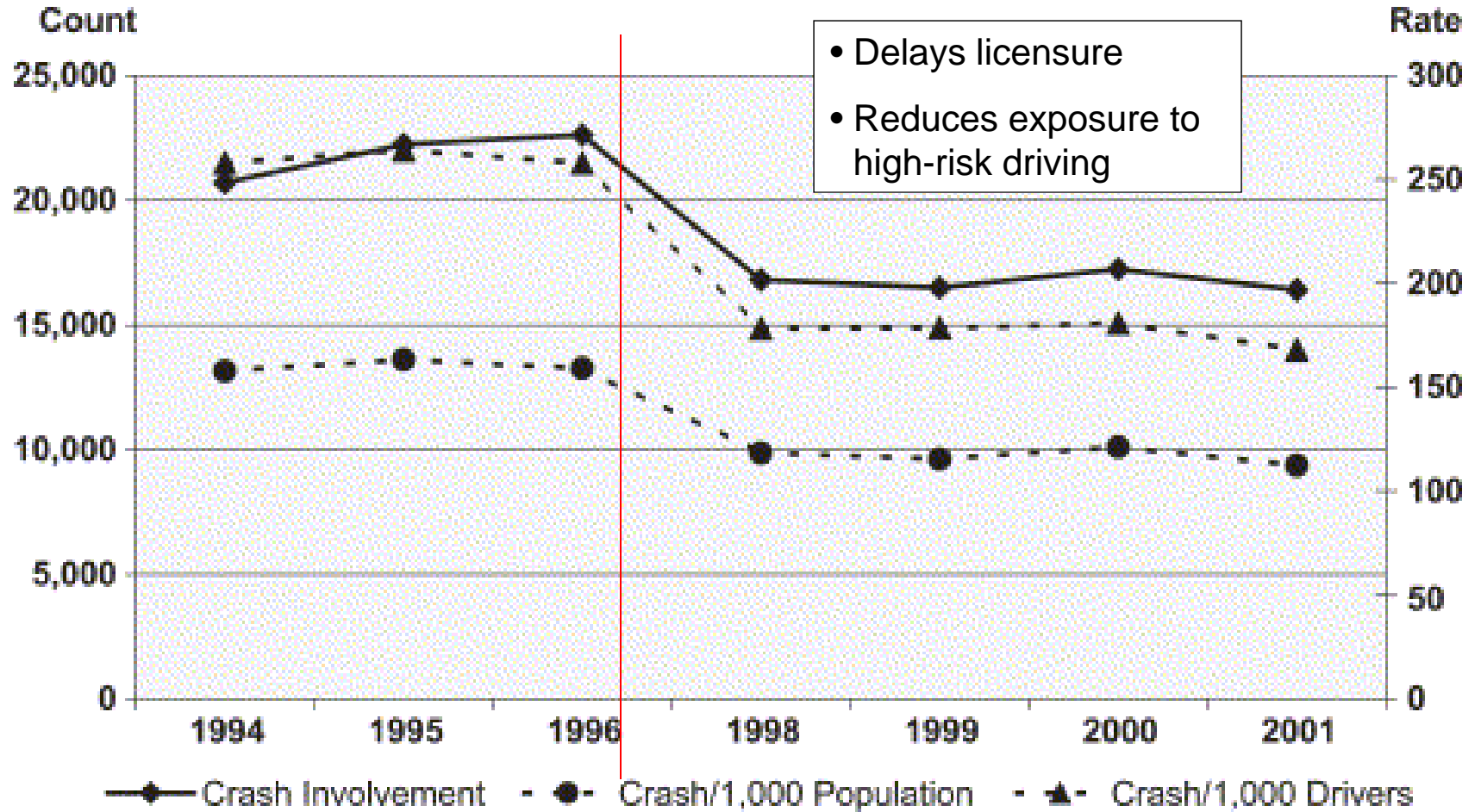
IMPROVING DRIVER EDUCATION

1. Increase hours of on road training?
2. Change focus to safety during independent driving.
3. Increase higher order instruction.
4. Link with GDL and parental management.
5. Add hazard perception and mitigation component?

Safety Approaches To The Novice Young Driver Problem

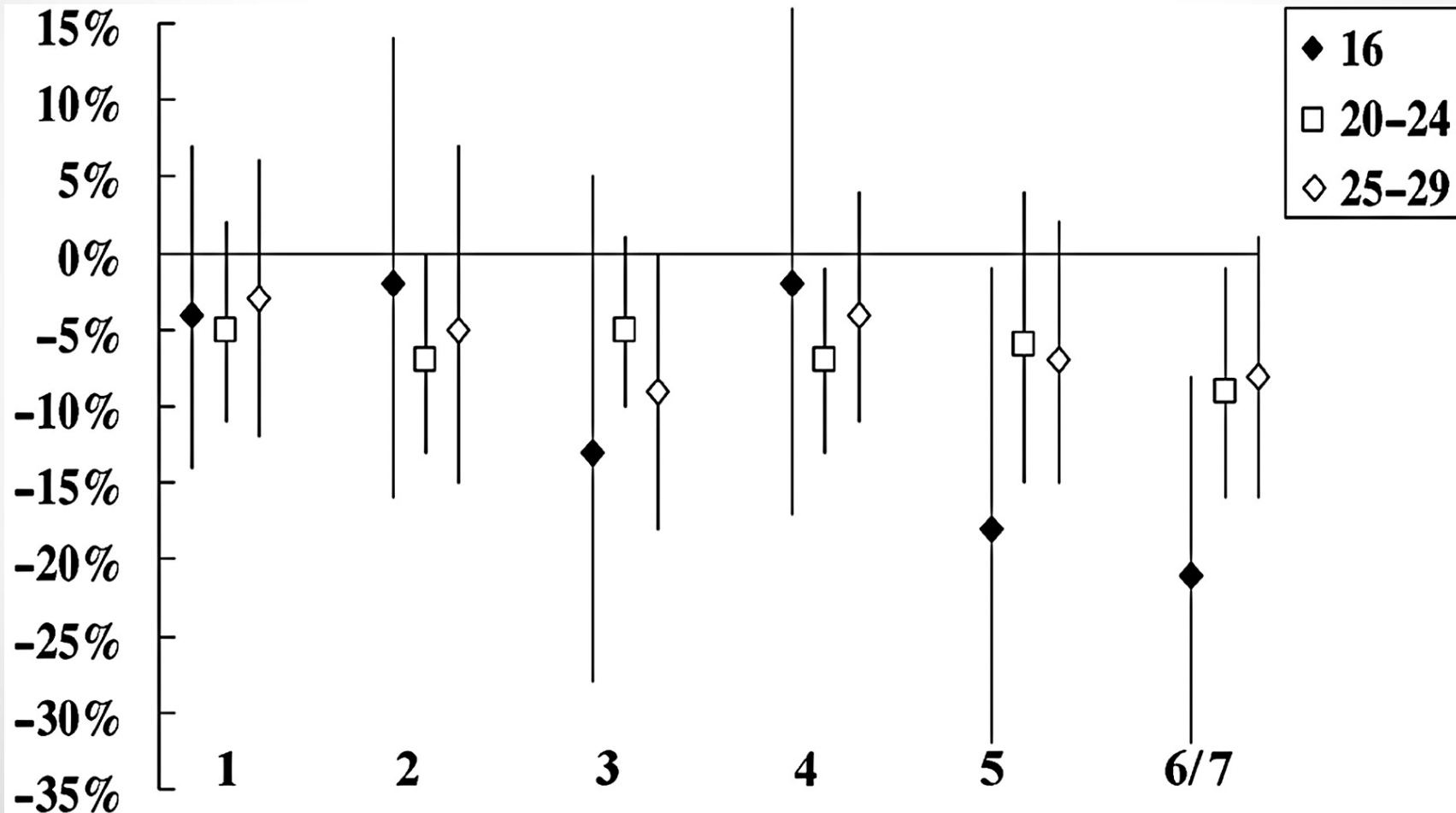
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Effects of GDL in Michigan



GDL POLICY ANALYSES

Fatal Crash Rate Declines by Number of Graduate Driver Licensing Components



GRADUATE DRIVER LICENSING

Diffusion of Effective Innovation

CHARACTERISTIC	DESCRIPTION
Relative advantage	3-stage GDL reduces crashes (Chen, Baker, Li, 2007; Williams et al., 2012)
Compatibility	No required changes licensing procedures
Adaptability	States can select among recommended provisions (IIHS)
Acceptability	Survey's indicate wide-acceptance (Williams & McCartt, 2014; Williams, Tefft, Grabowski, 2012)
Simons-Morton & Winston (2006). Translational Research in Child and Adolescent Transportation Safety. Evaluation & Health Professions, 29:33-64.	

IMPROVING GDL EFFECTIVENESS

1. Increase parent management?
2. Make state GDL conform to recommended standards for GDL.
 - Long practice period
 - Limits on teenage passengers
 - Limits on late night driving

Safety Approaches To The Novice Young Driver Problem

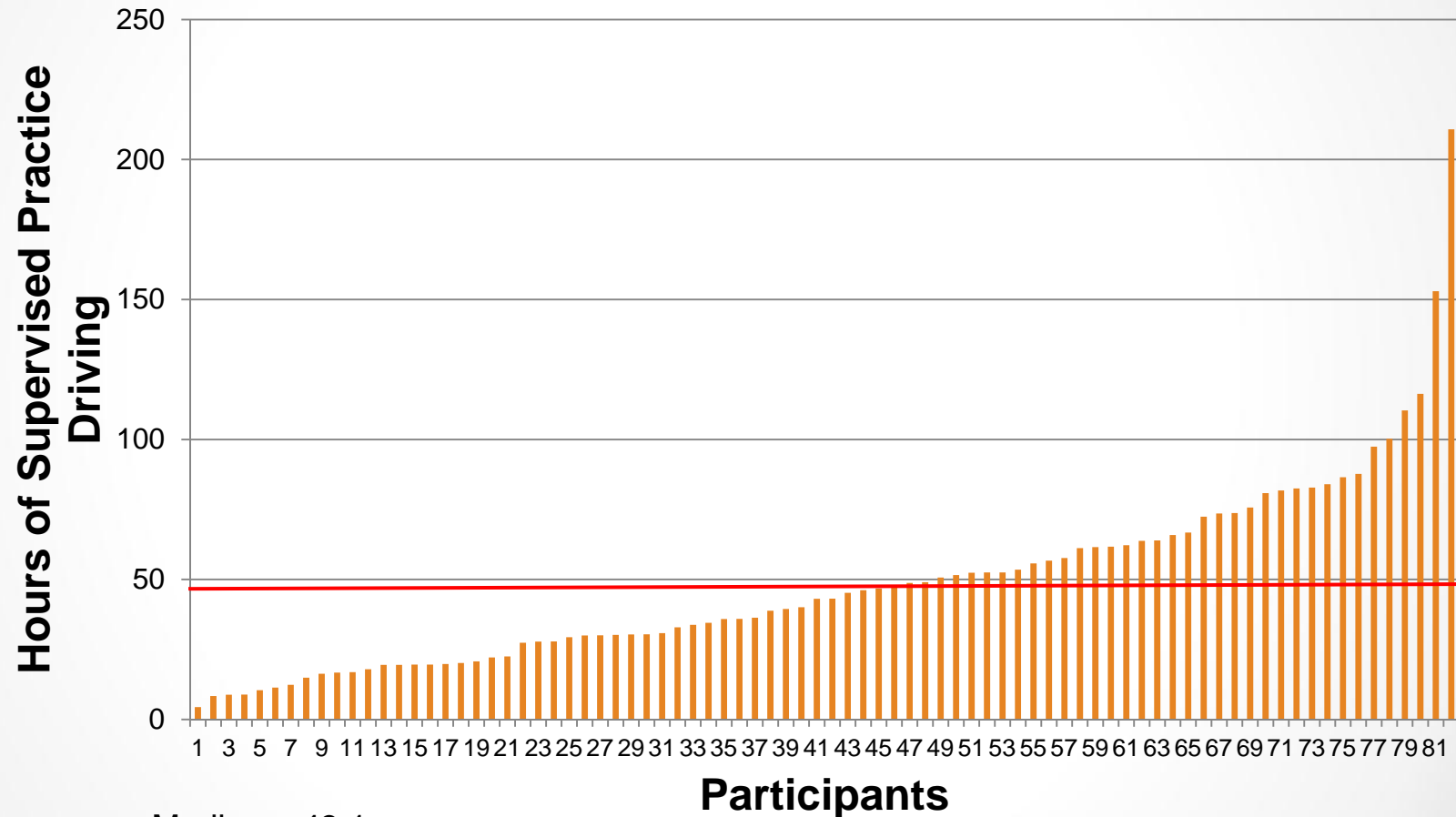
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SUPERVISED PRACTICE DRIVING: A NATURALIST DRIVING STUDY

Purpose: Examine the nature and extent of supervised practice driving:

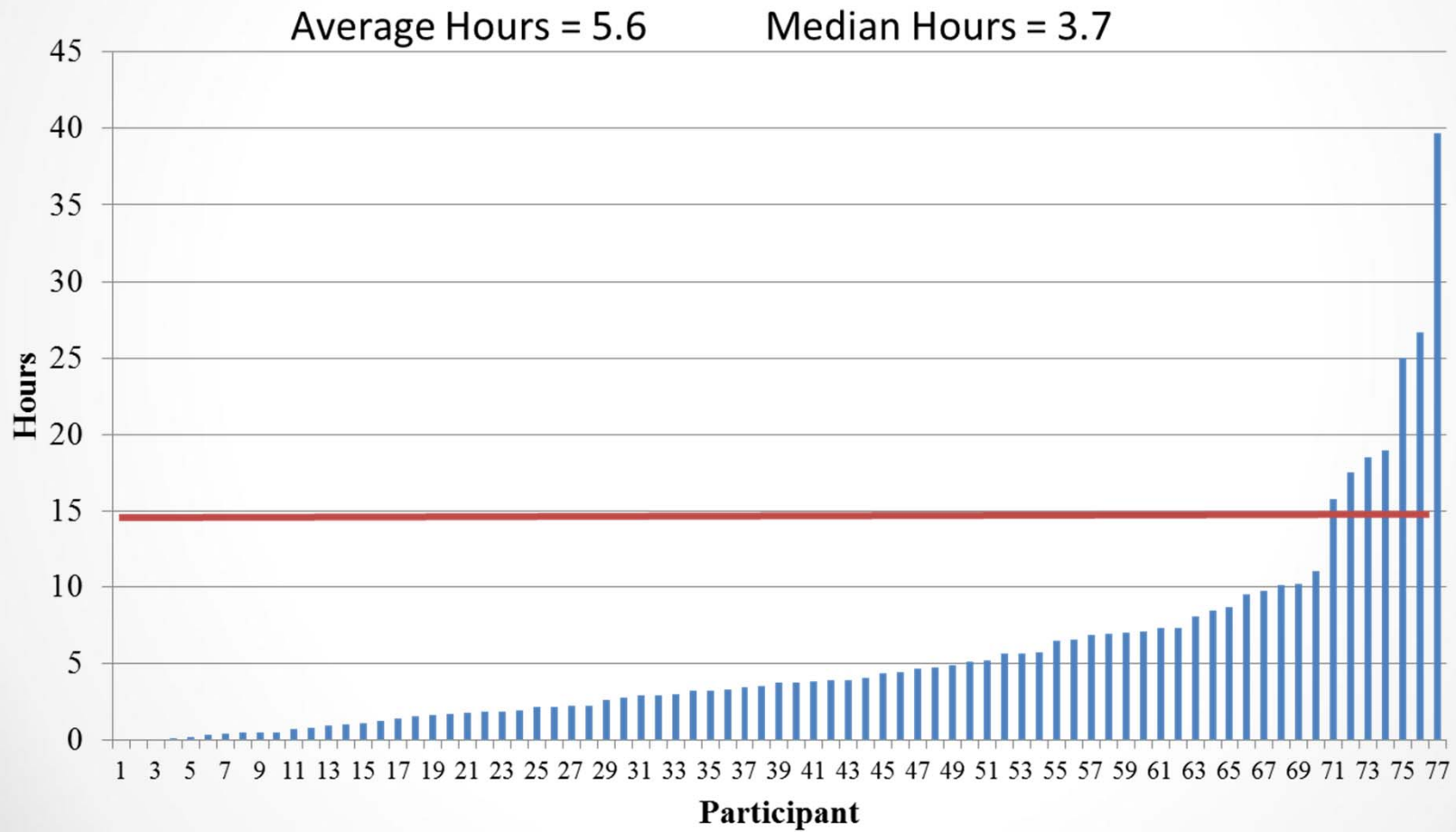
Preliminary Data: 76 participants

SUPERVISED PRACTICE HOURS



- Median = 43.1
- Mean = 48.6 +/- 33.8
- Mini – Max = 4.4 – 210.7

SPD NIGHT HOURS (Requirement = 15)



Parent Driving Instruction Topics

1st 10 Hours

Topic [†]	Exclusively Proximal Instruction [#]	Exclusively Higher Order Instruction [*]	Combination of Proximal and Higher Order Instruction
Navigation	94.1%	4.0%	1.9%
Warning/Detect Hazard	75.2%	15.6%	9.2%
Vehicle Handling or Operation	84.9%	6.7%	8.3%
Remark on Driving Behavior	74.3%	17.2%	8.5%
Asks Question - Driving Task	80.0%	18.9%	1.1%
Rules of the Road	78.1%	15.1%	6.8%
[#] Proximal relates to the present driving task or immediate future [*] Higher order relates to principles of driving			

Safety Approaches To The Novice Young Driver Problem

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RESEARCH ON PARENTAL MANAGEMENT OF TEENAGE DRIVERS



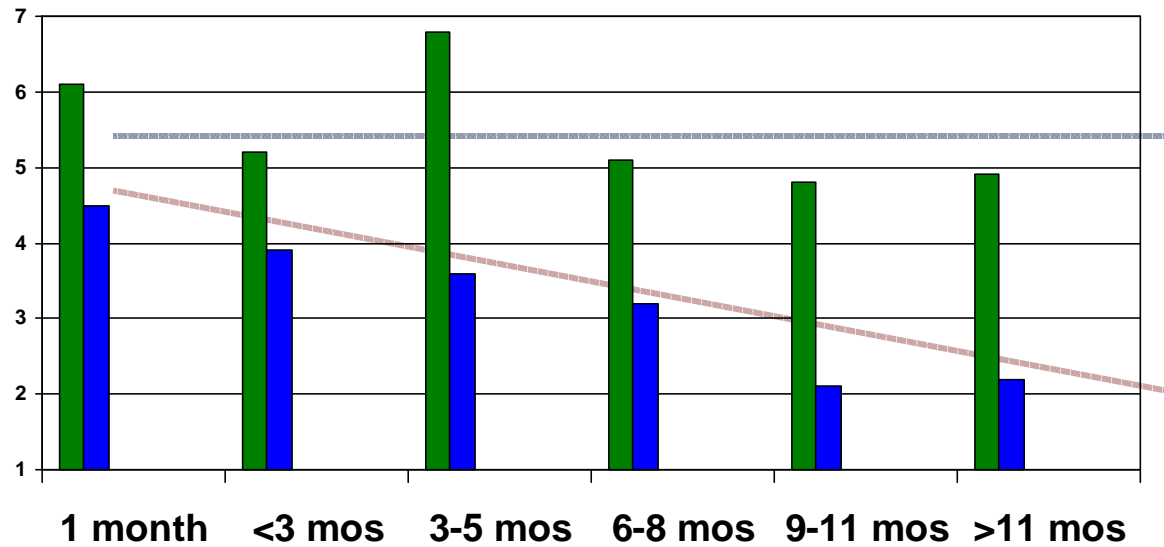
Authoritative Parents are Demanding and Responsive



Parental Restrictions on Trip and Risk Conditions

Never
allowed

Always
allowed



■ Trip limits ■ Risk Limits ■ ■ ■ ■

Hartos, Simons-Morton. 2001



CHECKPOINTS PARENT MANAGEMENT PROGRAM

Persuasive Communications

- video
- newsletters
- driving agreement



Parent Management of Teen Driving

- increase limits on teen driving



Mediators¹

- risk perceptions
- restriction norms, expectations, efficacy



¹Protection motivation theory



The Checkpoints Parent-Teen Driving Agreement

PART I: These are absolutes — ones that apply to every trip, every time

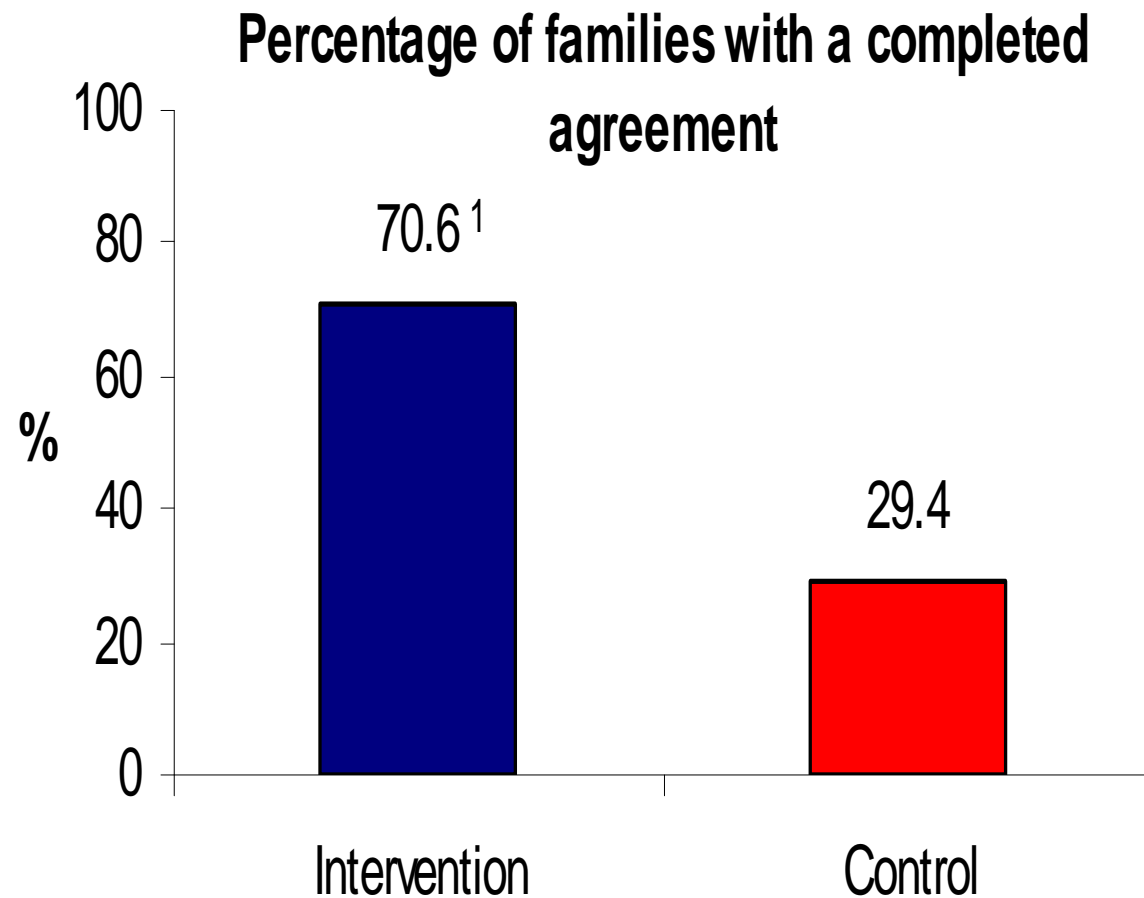
Teen driver will:	Parent will:
<input type="checkbox"/> Always obey all traffic laws <input type="checkbox"/> Never speed, tailgate, or cut others off <input type="checkbox"/> Always wear a seat belt and require all passengers to wear seat belts <input type="checkbox"/> Never drive after taking any drugs or alcohol or ride with a driver who has taken any drugs or alcohol <input type="checkbox"/> Always tell parent/guardian where going and with whom <input type="checkbox"/> Always call home if going to be late <input type="checkbox"/> Always call home if for any reason it is not safe to drive or ride	<input type="checkbox"/> Be a good role model behind the wheel <input type="checkbox"/> Point out and discuss safe and dangerous driving situations and practices <input type="checkbox"/> Apply rules fairly and consistently <input type="checkbox"/> Consider necessary exceptions to driving limits <input type="checkbox"/> Provide a safe ride home (no questions asked at that time)

PART II: These need to be tailored to your teen's driving progress

DRIVING PRIVILEGES	<i>Nighttime</i>	<i>Teen passengers</i>	<i>Weather</i>	<i>Road types</i>	<i>Review date</i>	<i>We agree Initials</i>
Checkpoint 1 Month 1	8 pm	None	Dry	Local		____
Checkpoint 2 Months 2-6	9 pm	None	Moderate	No high speed		____
Checkpoint 3 Months 7-12	11 pm	1	Most	Most		____

WE AGREE (sign) _____ PARENT _____ TEEN

Checkpoints in Driver Education



Zakrajsek, Simons-Morton, Shope, F&CH, 2009.

CHECKPOINTS PROGRAM

Tx Group Improvements in Driving Outcomes

	Intervention <i>m (sd)</i>	Control <i>m (sd)</i>	<i>p</i>
Overall High Risk Driving (past week) – 19 items	0.50 (0.5)	0.82 (0.9)	.04
Sped in residential or school zone	1.51 (1.7)	2.20 (2.3)	.09
Drove 10-19 mph over limit	0.31 (0.1)	0.80 (1.8)	.10
Drove 20+ mph over limit	0.02 (0.1)	0.28 (0.7)	.02
Tailgated	0.08 (0.3)	0.37 (1.0)	.07
Went through intersection on yellow	1.79 (2.2)	3.15 (3.9)	.04
Raced another vehicle	0.05 (0.2)	0.24 (0.7)	.07
Drove to show off	0.03 (0.2)	0.15 (0.4)	.08

IMPROVING PARENT MANAGEMENT

1. Increase hours of on road training?
2. Change
3. Add monitoring (i.e., DriveCam)

Safety Approaches To The Novice Young Driver Problem

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Event Recorders Provide Feedback and Enable Parent Monitoring



DriveCam TeenSafe Driver Feedback



HAND OVER THE KEYS WITH CONFIDENCE.

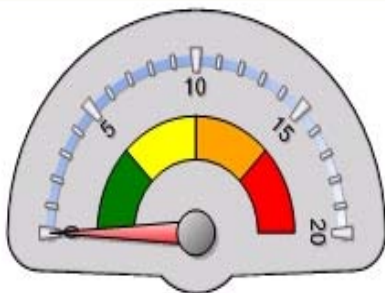
[Home](#) [Events](#)

Welcome, Rusty Weiss | [Help](#) | [Sign Out](#)

Select Driver:

Dashboard for:

Risk Level



Risk Level is Low as of
Tuesday, October 30, 2007

Events

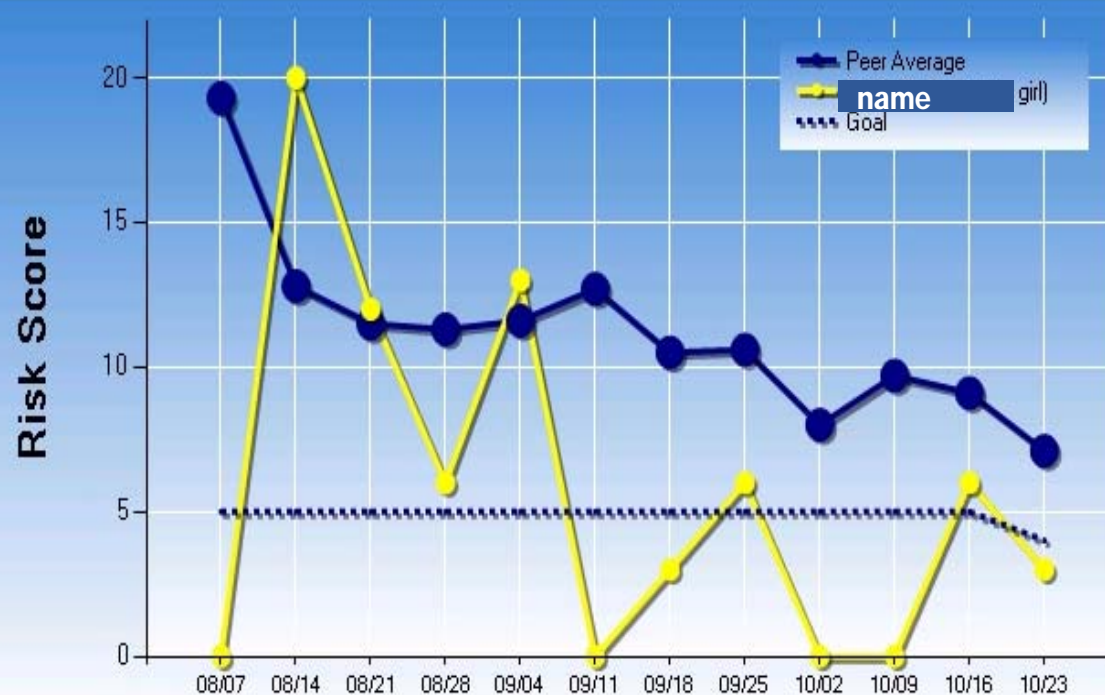


New Events: 0

Overdue Events: 6

[View events for Caitlin Butler \(teen - girl\)](#)

Overall Performance for the Last 12 Weeks



[About DriveCam](#) | [Customer Support](#) | [Privacy Policy](#) | [Terms Of Service](#)

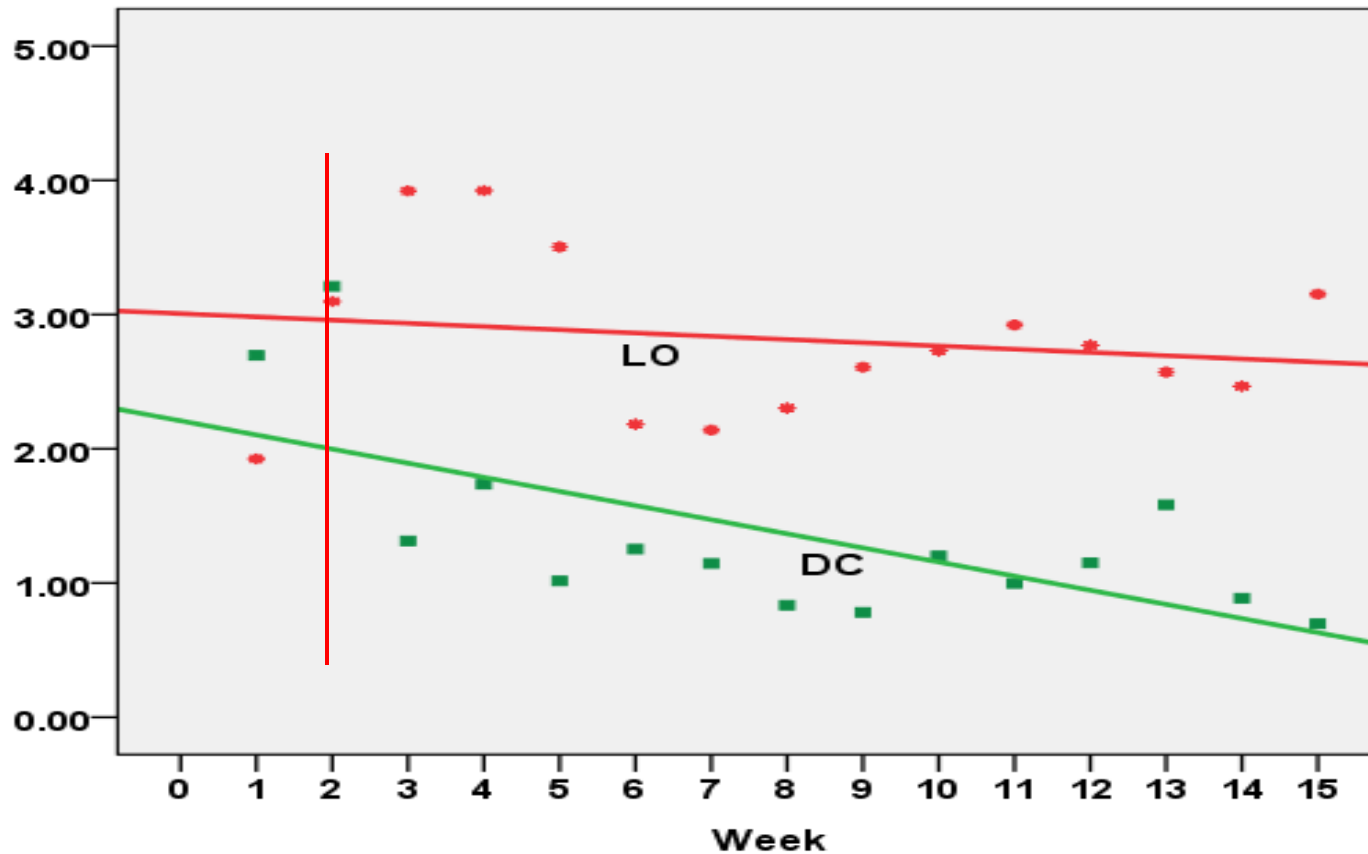
Copyright © 2006-2007 DriveCam, Inc. All rights reserved.

Randomized Trial:

Group #1: Immediate Feedback to Teen (LO)

Group #2: Lights+ Feedback to Family (DC)

Teen Events/100 miles for LO and DC Groups in 15 Weeks



Simons-Morton, Bingham, Shope, et al.,
Journal of Adolescent Health, 2012.

Thank you!

Collaborators

CDM, Inc

DriveCam Inc

U Michigan

UMass

Virginia Tech

