

THE NATURALISTIC TEENAGE DRIVING STUDY: METHODS & SELECTED FINDINGS

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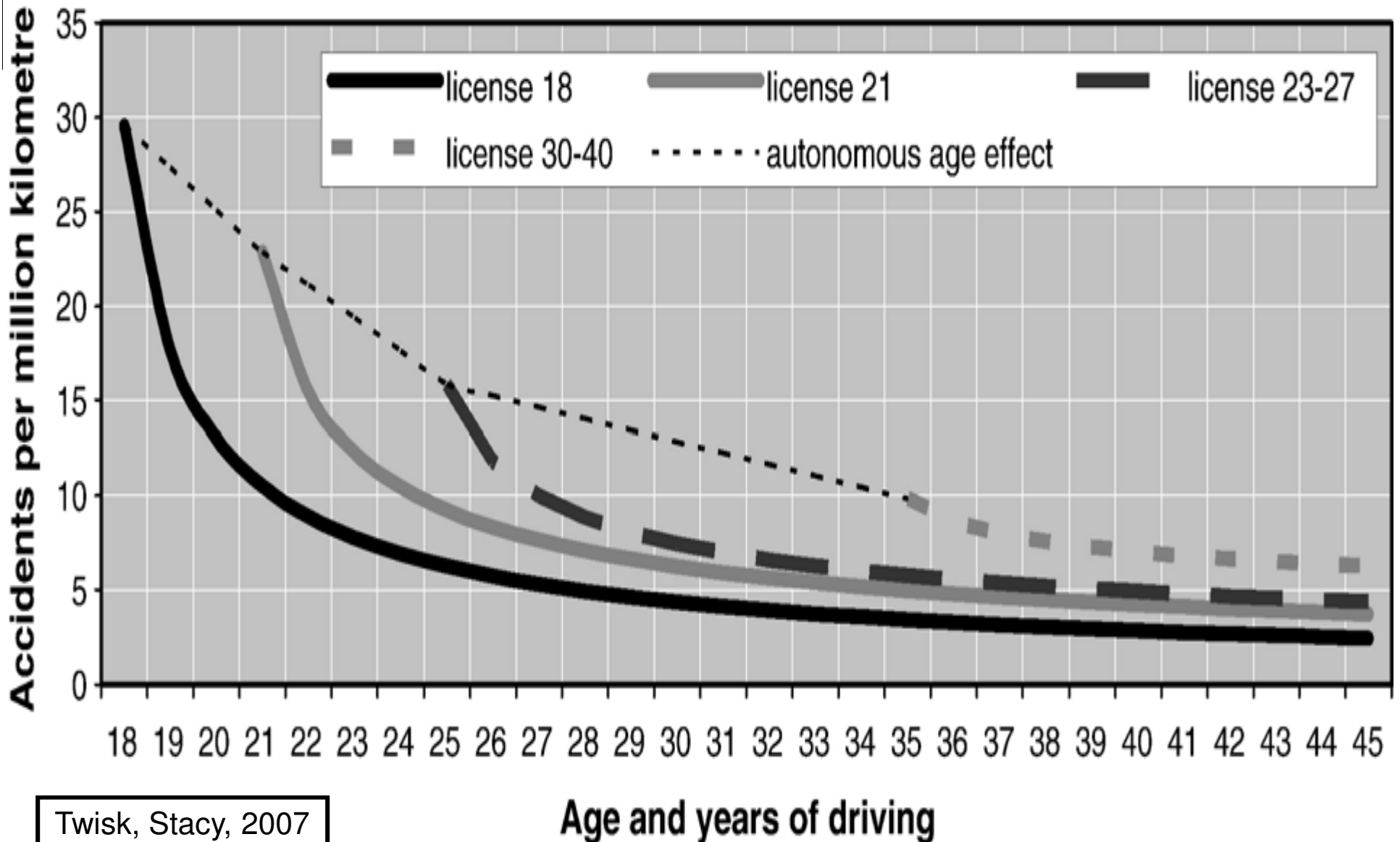
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THE YOUNG DRIVER PROBLEM

Inexperienced Drivers of All Ages Have High Crash Rates



Twisk, Stacy, 2007

STUDY PURPOSES

Determine: variability in & predictors of novice teen driving risk.

Risk:

1. Exposure
2. Crash and Near Crash
3. Kinematic risky driving
4. Speeding

Predictors:

1. Gender
2. Personality, cognitions
3. Stress responsivity (cortisol)
4. Distraction
5. Driving conditions



STUDY DESIGN

- N = 42 teens and 54 parents, 18-months of driving; completed 9/2008
- Inclusion: <17 y.o.; license < 3wks; vehicle access; no ADHD, twins
- 20 males; 22 females; 92% white; mean age = 16.4
- Continuous data collection
- Instrumentation: accelerometers, GPS, cameras (no audio)
- Study Activities: test track at 0-12 months; vehicle instrumentation; stress test/cortisol; surveys at 0, 6, 12, 18 months; debrief
- Total for all participants: 102,000 trips, 500,000 miles/800,000 km; 5.1



DATA ACQUISITION SYSTEM

- LINUX-based PC - storage
- GPS – mileage, location
- Transmission sensor – mileage
- Accelerometers – elevated g-force events
- Video: driver/passengers, ambient light, contributing factors
- Radar



DATA REDUCTION AND CODING

Kinematic triggers

- Crash/Near Crash (CNC) (Near Crash includes evasive maneuver, but no actual contact)
- Kinematic Risky Driving (elevated gravitation force events)
- Speeding (speed limit map)

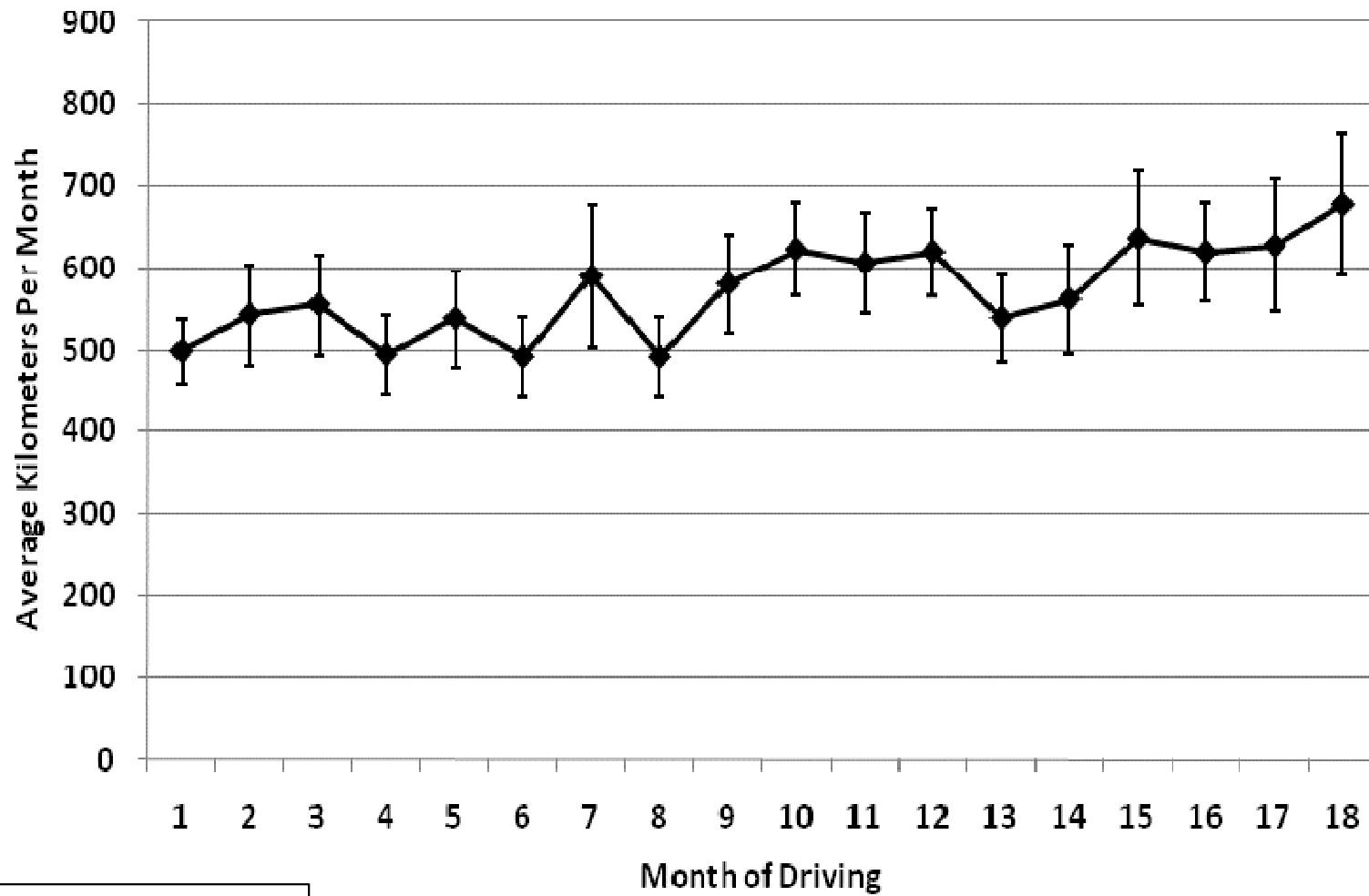
Coding

- Trained coders in supervised lab
- Protocols
 - Trip files: occupants; time; seat belts, etc
 - CNC contributing factors (distraction, driving conditions)
- Inter-rater reliability; adjudication by senior staff

ANALYTIC ISSUES & METHODS

- ◆ Small sample with unusual data structure
 - Few participants
 - Many repeated measures
- ◆ Near Crashes combined with Crashes
- ◆ Data aggregated over time (e.g. quarters)
- ◆ Poisson distribution for count data
- ◆ Other unique approaches

TEEN DRIVING EXPOSURE

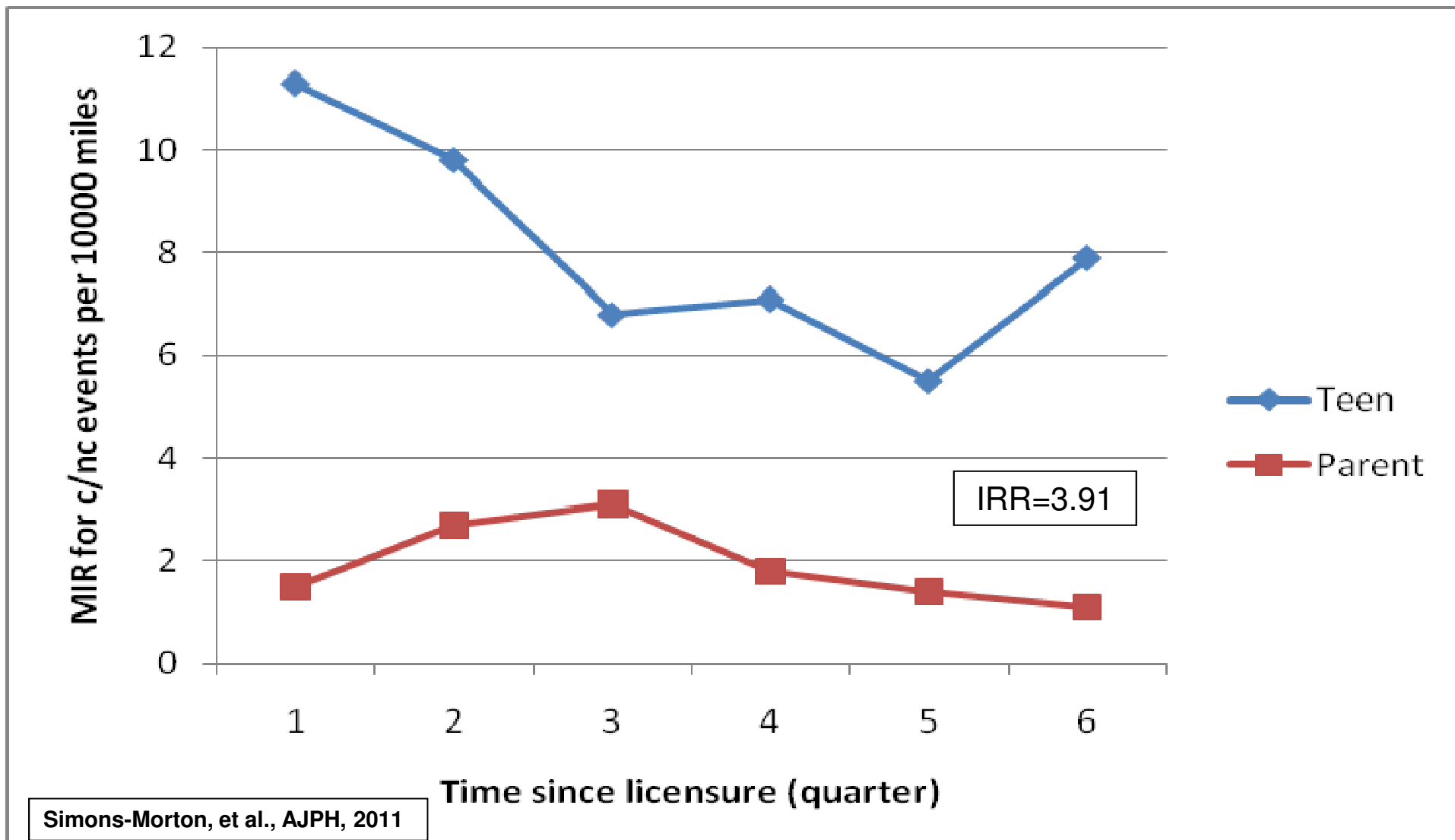


Lee et al., AAP, 2011

CRASHES & NEAR CRASHES

	Teens M	Teens F	Adults M	Adults F	Total
Crash	13	25	1	1	40
Near-Crash	118	117	19	16	270

TEEN & PARENT CRASH/NEAR CRASH Incidence Rate Ratios



Gravitational Force Events “Kinematic Risky Driving”

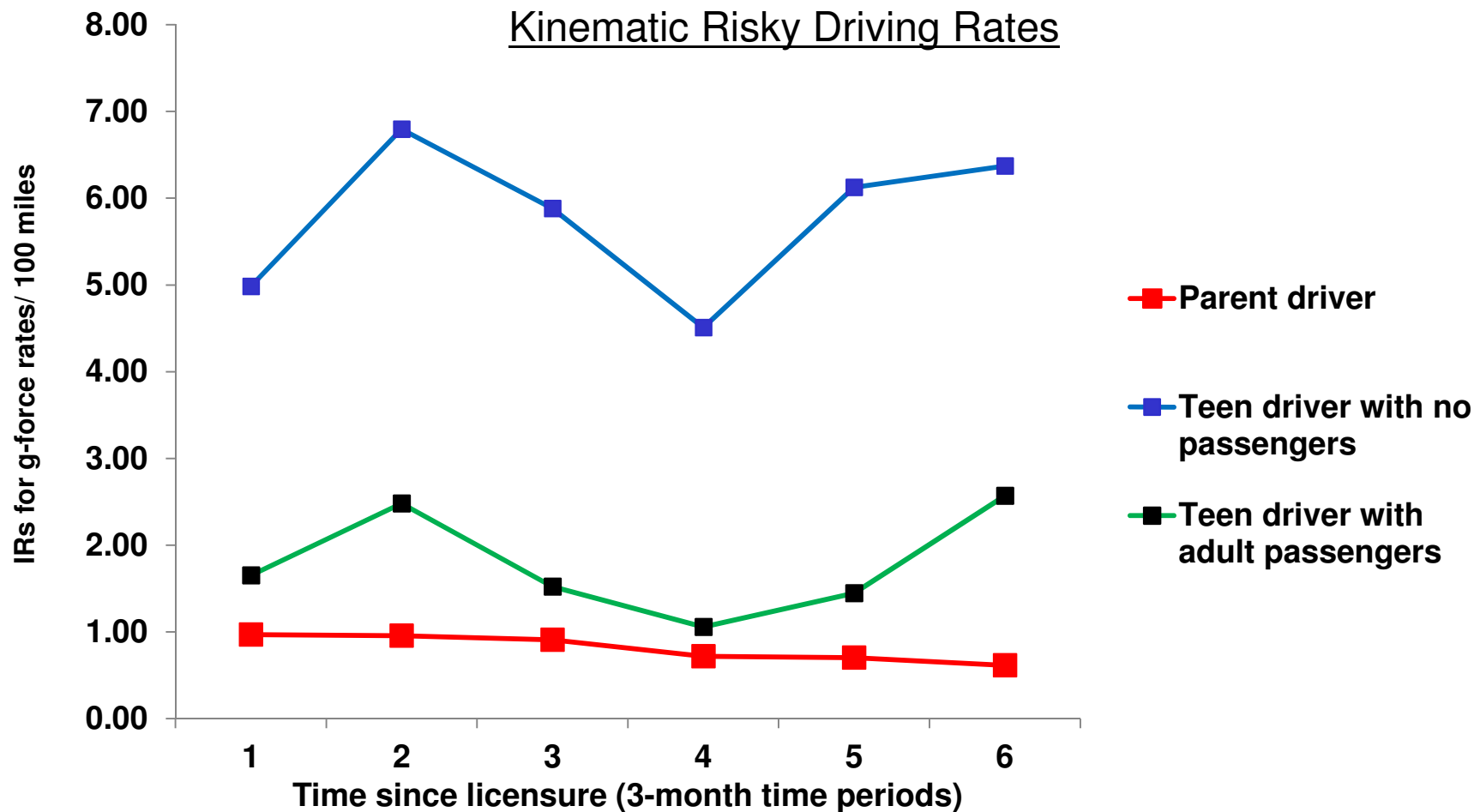
Acceleration Event	Gravitational Force
Longitudinal deceleration/hard braking	≥ -0.45 g
Longitudinal acceleration/rapid starts	≥ 0.35 g
Lateral/hard left or hard right turn	≥ -0.50 g
Yaw/ Δv between turn & correction	± 6 degrees w/i 3 seconds

alpha = .78 (teen); .68 (parent)

Simons-Morton, et al., AJPH, 2011

TEEN AND ADULT KRD

With and Without Adult Passengers



OTHER NTDS ANALYSES

1. CNC variability (Dr. Guo)
2. Distraction (Dr. Klauer)
3. Psycho-social predictors of risk (Dr. Ehsani)
4. CNC prediction by cortisol responsivity (Dr. Ouimet)
5. Analytic challenges & opportunities (Dr. Albert)

Selected Publications

- Guo, F., Simons-Morton, B.G., Klauer, S.G., Ouimet, M.C., Dingus, T., Lee, S.E. (2013). Variability in crash and near crash risk among novice teenage drivers: A naturalistic study. *Journal of Pediatrics*, 163, 1670-1676.
- Jackson, J., Albert, P.S., Zhang, Z., and Simons-Morton, B. Ordinal latent variable models and their application in the study of newly licensed teenage drivers. *Journal of the Royal Statistical Society-Series C, Applied Statistics*. 62, Part 3.
- Klauer, S.G., Simons-Morton, B.G., Lee, S.E., Ouimet, M.C., Howard, E.H., Dingus, T.A. (2011). Novice drivers' exposure to known risk factors during the first 18 months of licensure: The effect of vehicle ownership. *Traffic Injury Prevention*, 12(2):159-68.
- Klauer, S., Guo, F., Simons-Morton, B.G., Dingus, T. (2013). The effect of Distraction on CNC Among Novice Teen and Adult Drivers. *New England Journal of Medicine*, 370, 54-59.
- Lee, S. E., Simons-Morton, B. G., Klauer, S. G., Ouimet, M. C., and Dingus, T. A. Naturalistic Assessment of Novice Teenage Crash Experience. (2011). *Accident Analysis and Prevention*. 2011; 43(4): 1472-1479.
- Ouimet, M.C., Brown, T.G., Guo, F, Klauer, S.G., Simons-Morton, B.G., Fang, Y., Lee, S.E., Gianoulakis, C., Dingus, T.A. (2014). Higher crash and near-crash rates in teenage drivers with lower cortisol reactivity: an 18-month longitudinal, naturalistic study. *JAMA Pediatrics*.
- Simons-Morton, B.G., Ouimet, M.C., Zhang, Z., Lee, S.L., Klauer, S.E., Wang, J., Chen, R., Albert, P.E., Dingus, T.E. [Crash and Risky Driving Involvement Among Novice Adolescent Drivers and Their Parents](#). *American Journal of Public Health*. 2011; 101 (12): 2362-2367.
- Simons-Morton, B.G., Ouimet, M.C., Zhang, Z., Lee, S.L., Klauer, S.E., Wang, J., Chen, R., Albert, P.E. Dingus, T.E. (2011). The Effect of Passengers and Risk-Taking Friends On Risky Driving And Crashes/Near Crashes Among Novice Teenagers. *Journal of Adolescent Health*. 49(6):587-593
- Simons-Morton, B.G., Zhang, Z., Jackson, J.C., Albert, P.S. (2012). [Do Elevated Gravitational-Force Events While Driving Predict Crashes and Near Crashes?](#) *Am J Epidemiol*, 175(10), 1075-1079.
- Simons-Morton, B.G., Ouimet, M.C., Wang, J., Chen, R., Klauer, S.G., Lee, S.E., Dingus, T. (2012). Peer influence predicts speeding prevalence among teenage drivers. *J Safety Research*. 43(5-6):397-403
- Simons-Morton, B.G., Cheon, K., Guo, F., & Albert, P. (2012). Trajectories of Kinematic Risky Driving Among Novice Teenagers. *Accident Analysis & Prevention*, 51C:27-32.
- Zhang, Z., Albert, P.S., Simons-Morton, B.G., (2012). Marginal Analysis of longitudinal count data in long sequences: methods and application to a driving study. *Annals of Applied Statistics*. 6 (1), 27–54

Thank you!

