Event-triggered video recorders in naturalistic driving

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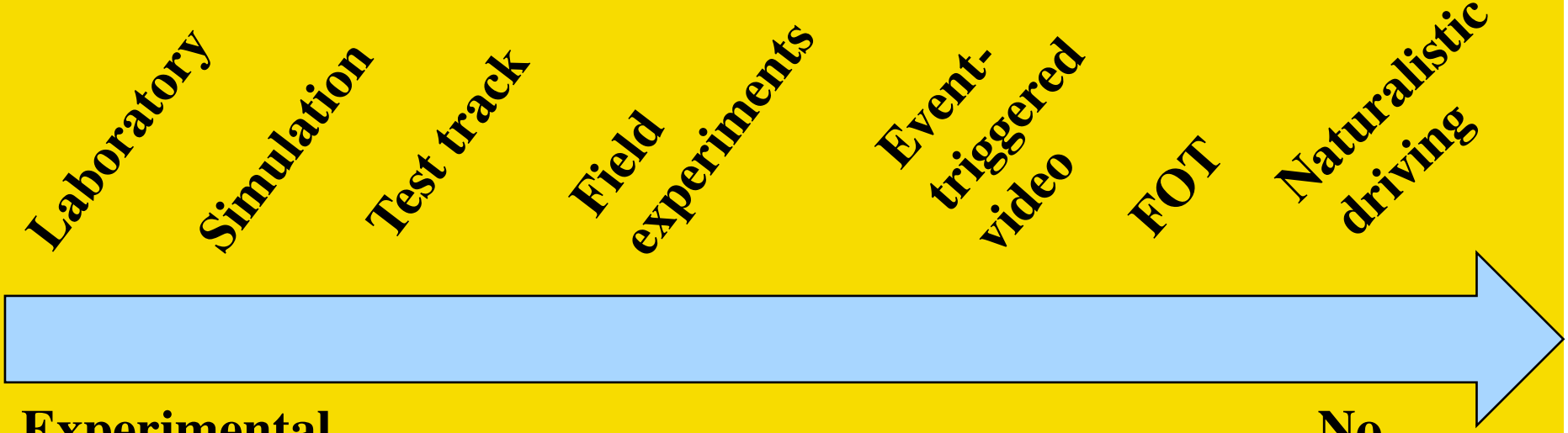
Naturalistic Driving Methods and Analyses Symposium
VTTI
August 26, 2008

The University of Iowa

Outline of talk

- Naturalistic driving thoughts relative to event-triggered video recorders
- First look at suburban teen driving study data
- Future of ETVRs

Range of driver behavior, design, test and evaluation tools



Naturalistic driving

- Definition evolves as we get more sophisticated sensing and recording
- What we considered ND 15 years ago may get more scrutiny today
- 15 years from now what we record today may be seen as overkill
  - Less is more?

Naturalistic Driving

- Goal is to get the driver closest to reality so their behavior is the most true
  - Everything passed a field experiment
- In general, ND data should provide some *context*-based information so that driving behavior and performance can be understood relative to *exposure*

Event-triggered video recorders

- First generation systems designed strictly as an interventional tool
  - Byproducts of intervention reveal interesting window into driver behavior
  - Imperfect as a tool for naturalistic driving
  - Exposure metrics *currently* lacking

Event-Triggered Video Recorders

- Video/audio buffer
- Triggers on exceedances
- Records 10-30 seconds before/after an event
- Wi Fi or cellular download

Event-triggered video as an intervention tool

- Provides the driver and parent or supervisor the *context* of safety relevant events
- First studies indicate success in changing driver behavior so they drive under threshold
  - Assumes that in the aggregate, driving under trigger threshold will reduce crashes

Summary review of urban teen driving study

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Funded by: Iowa DOT, MnDOT, and General Motors

Event-triggered video: DriveCam

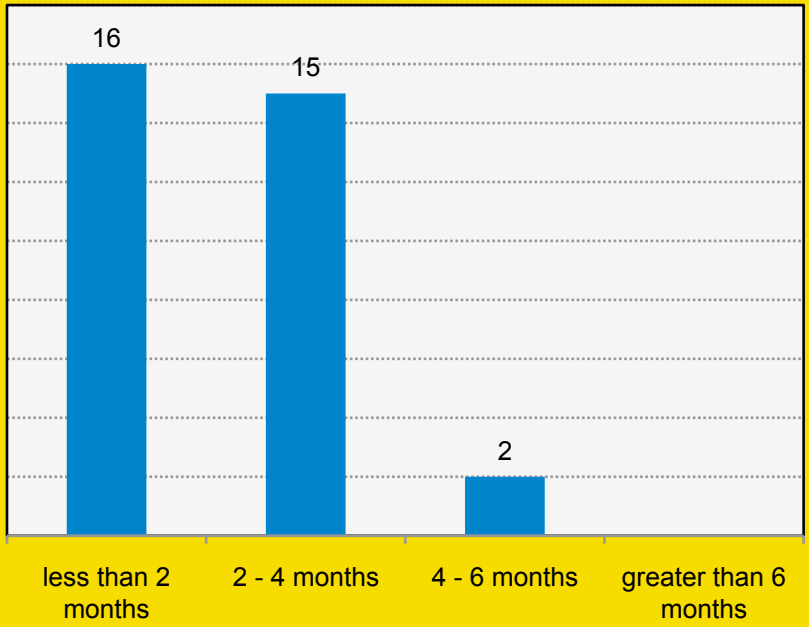
- Looks at road ahead & interior
- Always ‘on’ but *only* records if there is abrupt braking or steering (0.5 g)
- Blinking light indicates that the device is recording
- Records 10 seconds before and 10 seconds after event

Urban study summary

- 57 weeks data collected
  - **6 weeks of baseline**
  - **40 weeks of feedback**
  - **6 weeks second baseline**
- 23 drivers for 12 months
  - 18 were the primary
- Minneapolis suburb-Eagan

Study of New Drivers

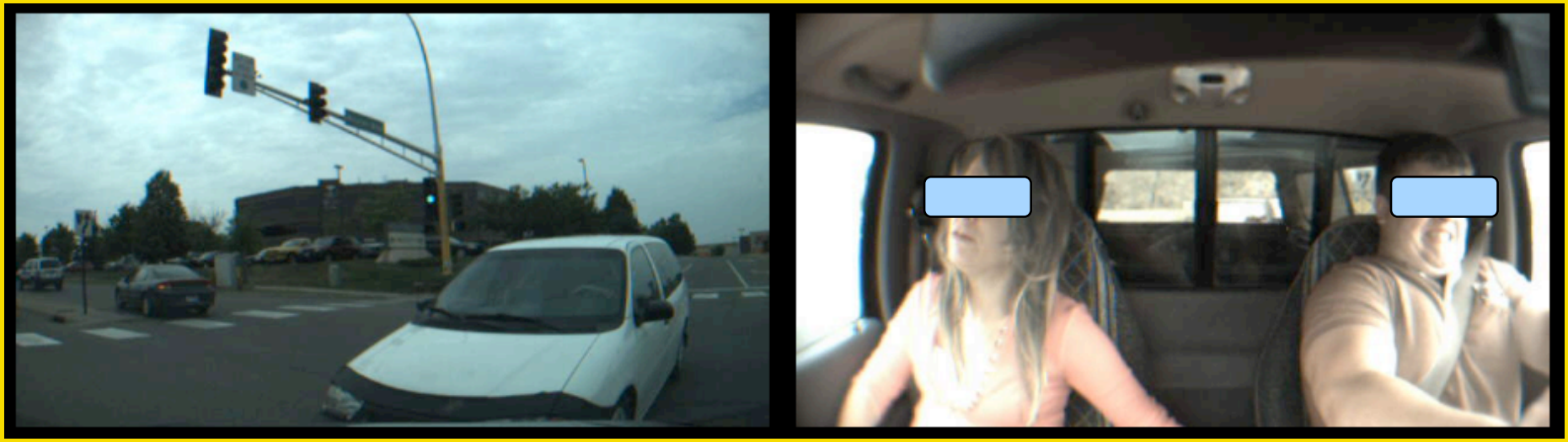
- Nearly all drivers received their license within four months of enrolling in the study



Subject Characteristics

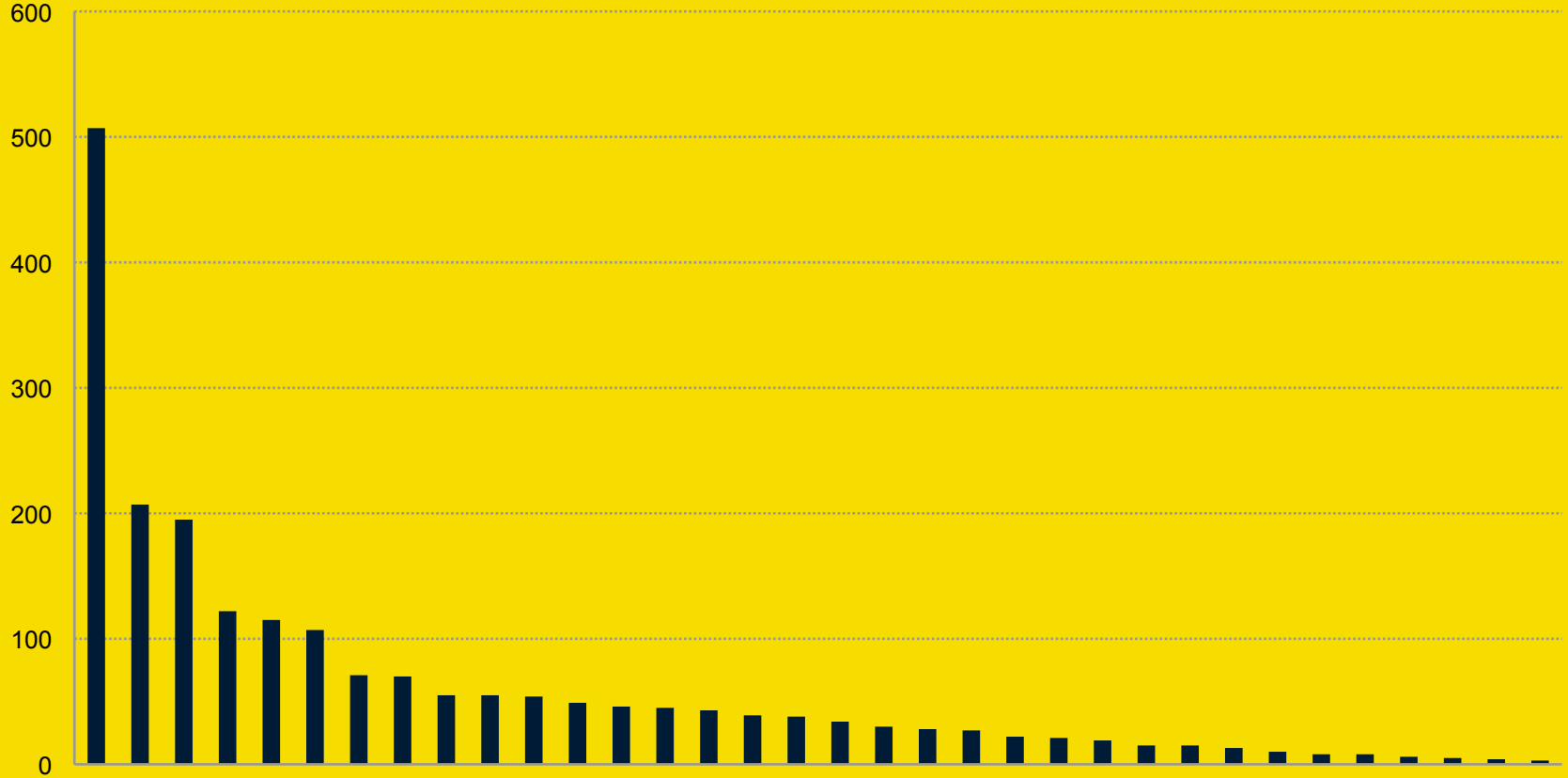
- 33 teens participated in the project
- 23 teens were the primary driver (had 10% or less of their events generated by someone else)
- 18 teens were the primary driver **and** completed the entire year of data collection

Events and crashes

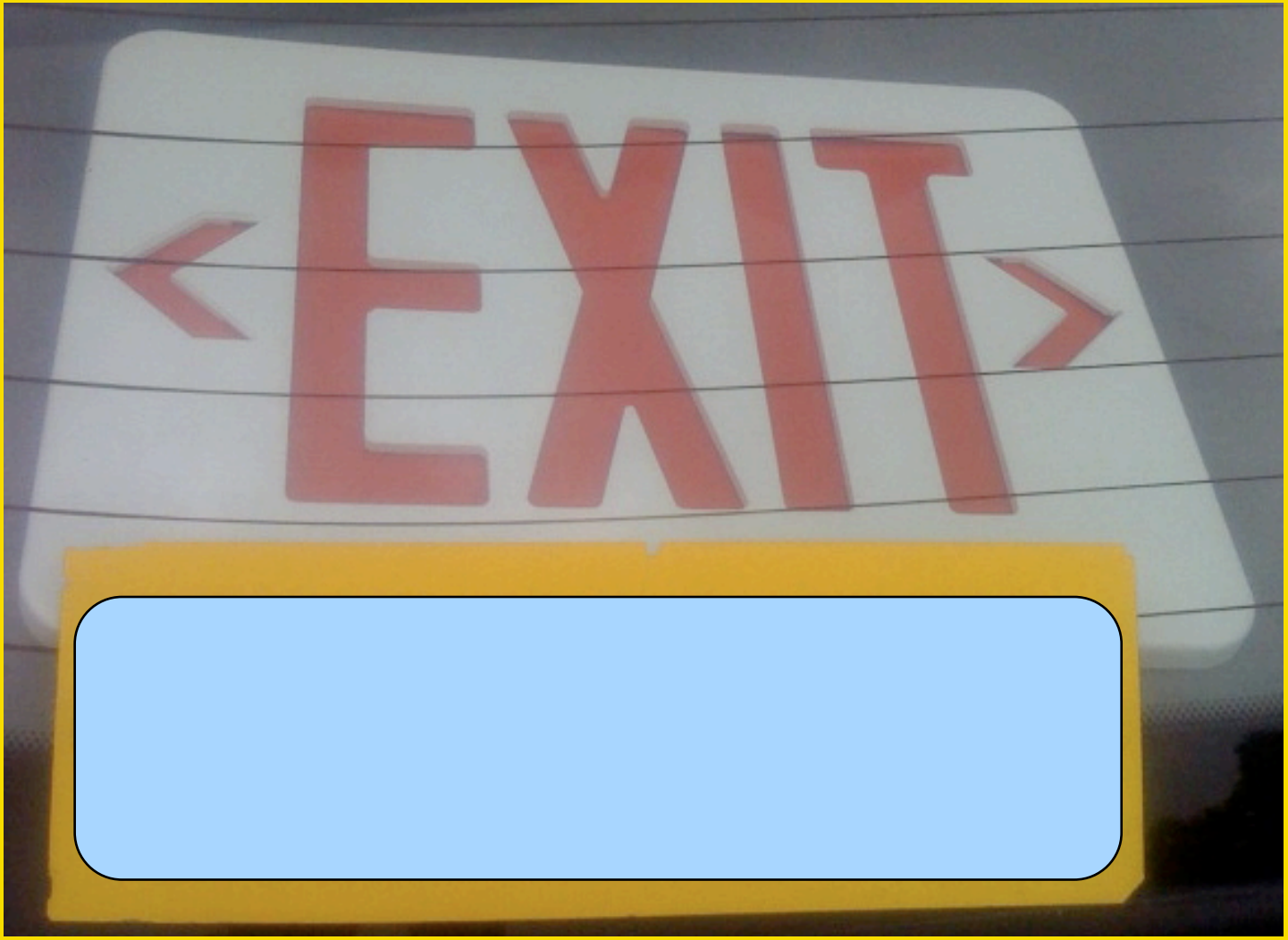


- Over 6,000 events coded
- 15 crashes
- 25 near-crashes

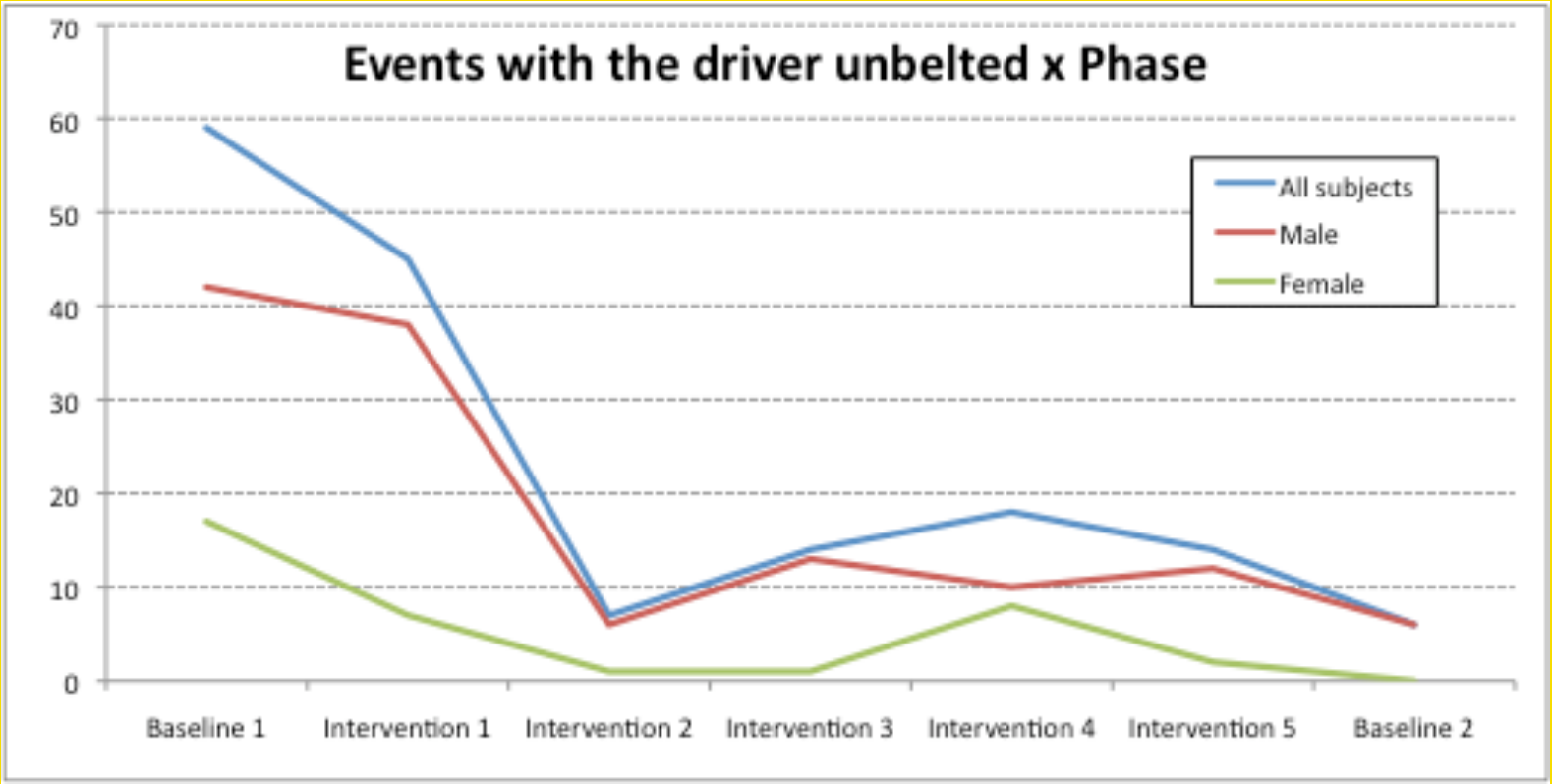
Number of Safety-Relevant Events by participant

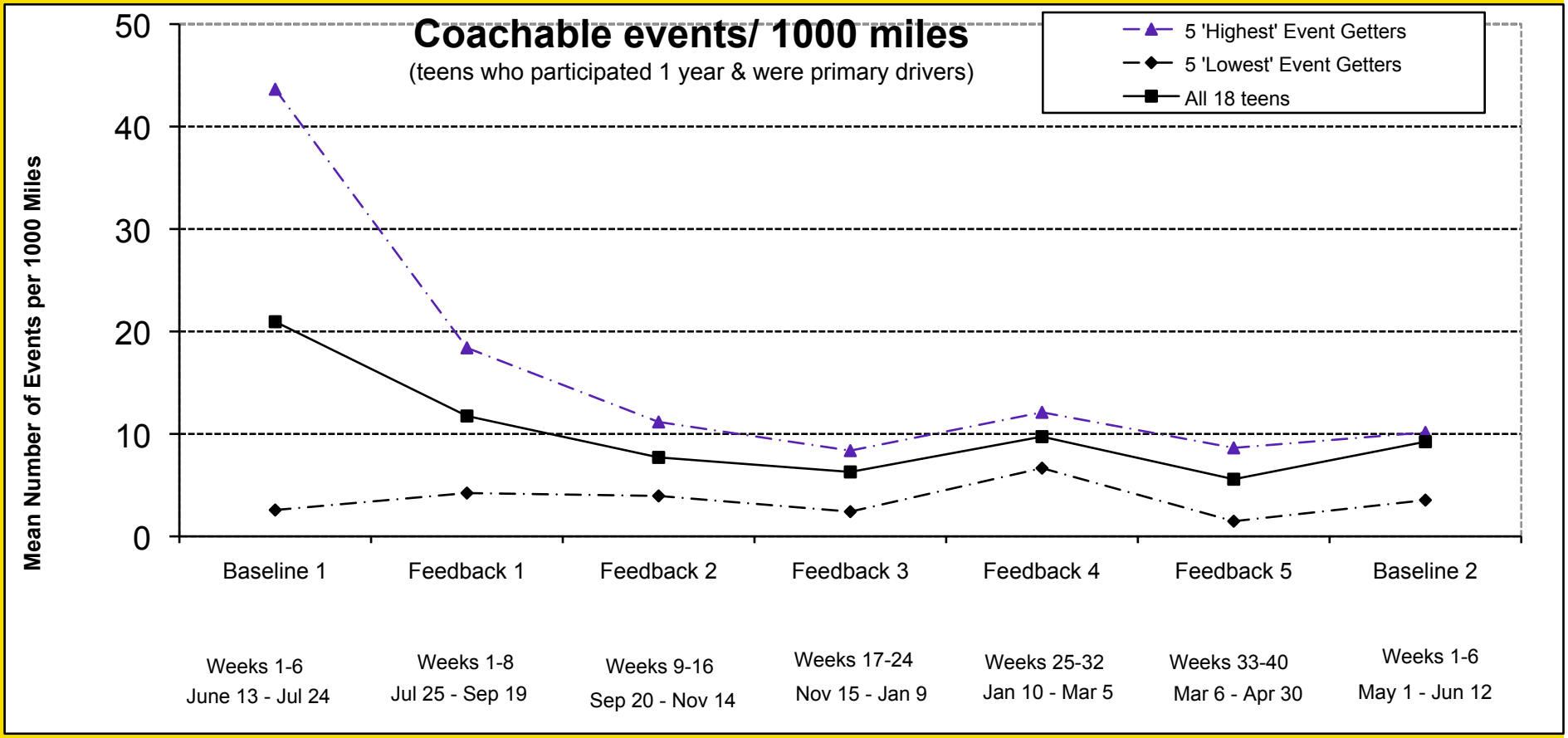


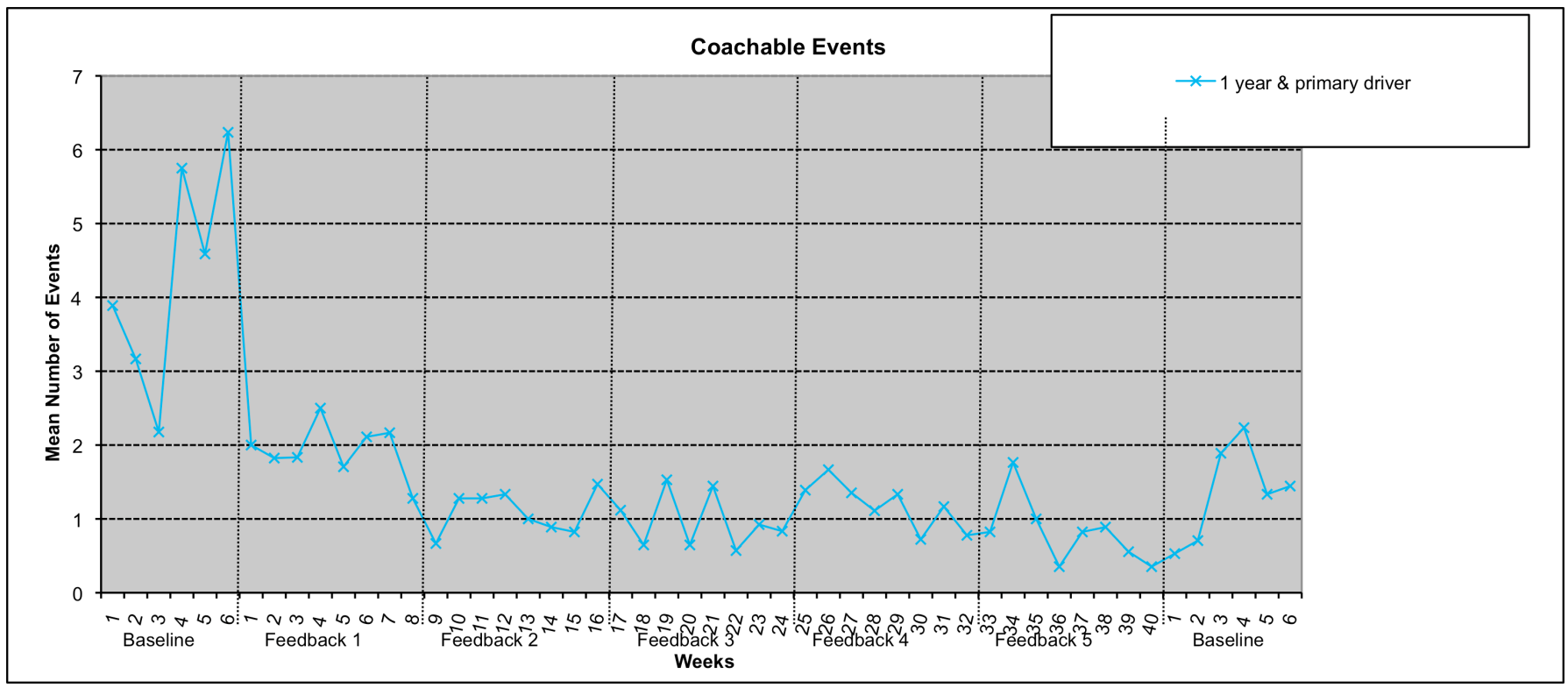
A few drivers responsible for most events

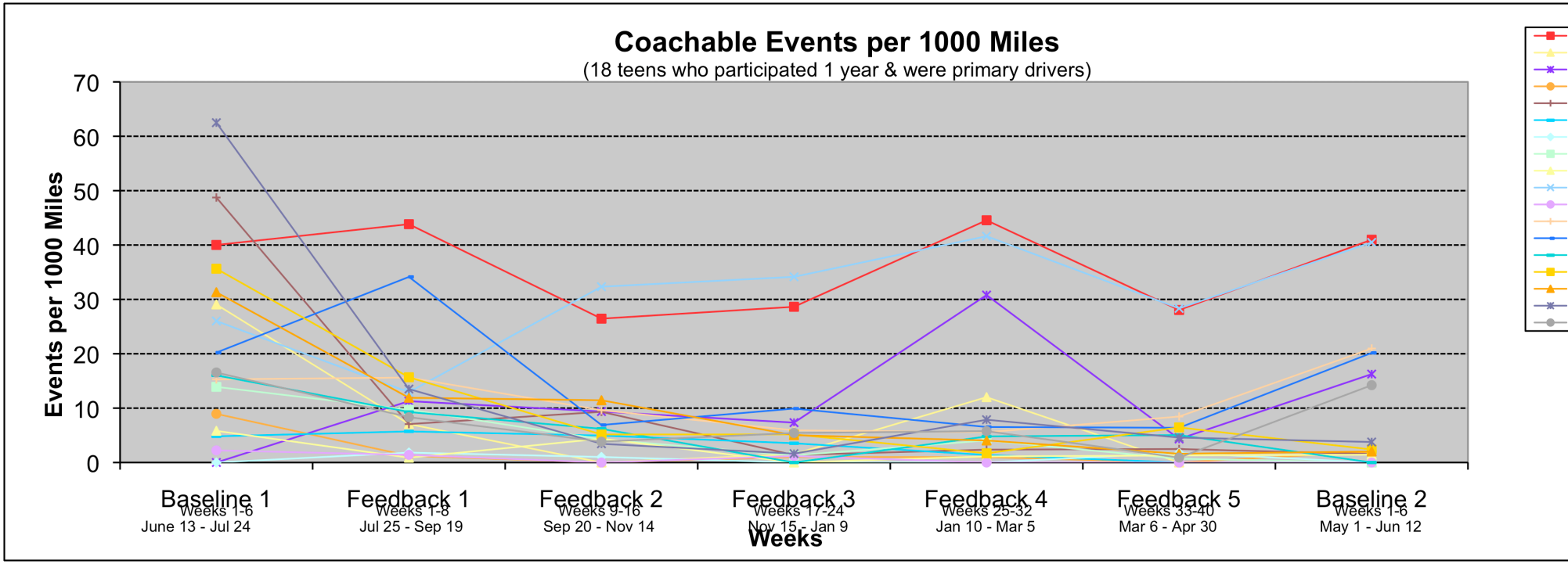

EXIT

Seat-belt data




Coachable events/ 1000 miles
(teens who participated 1 year & were primary drivers)
5 'Highest' Event Getters
5 'Lowest' Event Getters
All 18 teens
Mean Number of Events per 1000 Miles
50
40
30
20
10
0
Baseline 1
Feedback 1
Feedback 2
Feedback 3
Feedback 4
Feedback 5
Baseline 2
Weeks 1-6
June 13 - Jul 24
Weeks 1-8
Jul 25 - Sep 19
Weeks 9-16
Sep 20 - Nov 14
Weeks 17-24
Nov 15 - Jan 9
Weeks 25-32
Jan 10 - Mar 5
Weeks 33-40
Mar 6 - Apr 30
Weeks 1-6
May 1 - Jun 12


Coachable Events
1 year & primary driver
Mean Number of Events
0
1
2
3
4
5
6
7
Baseline
Feedback 1
Feedback 2
Feedback 3
Feedback 4
Feedback 5
Baseline
Weeks



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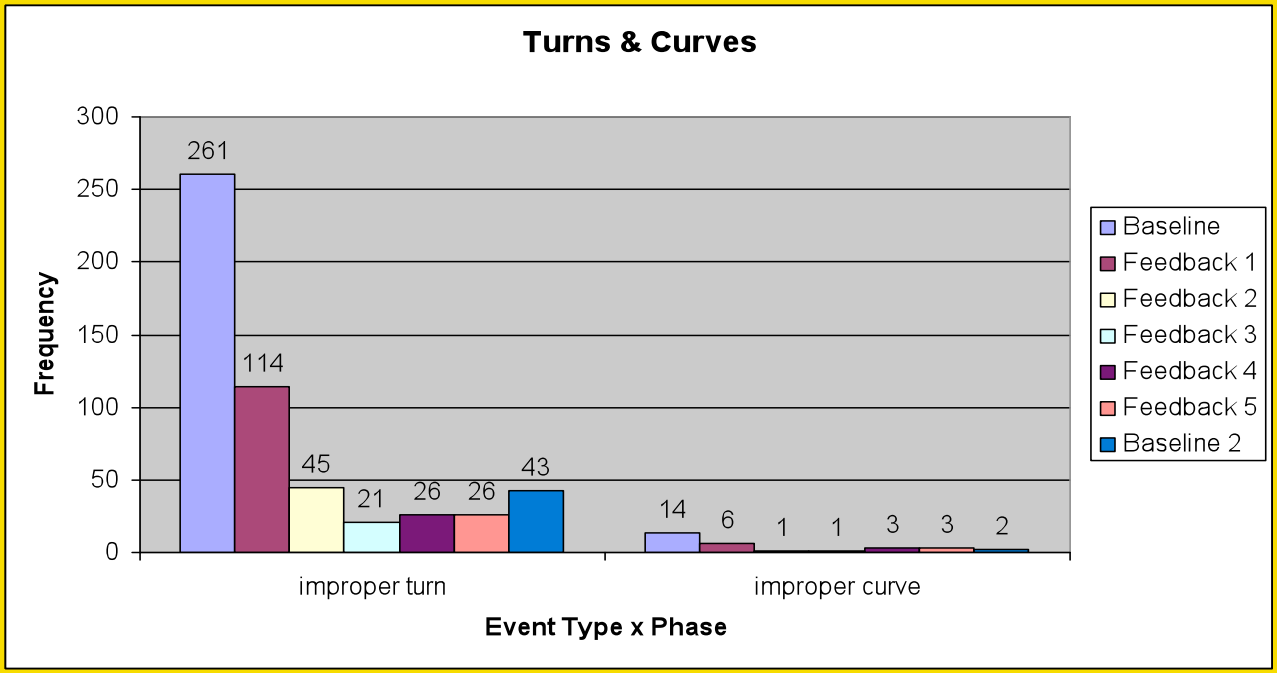
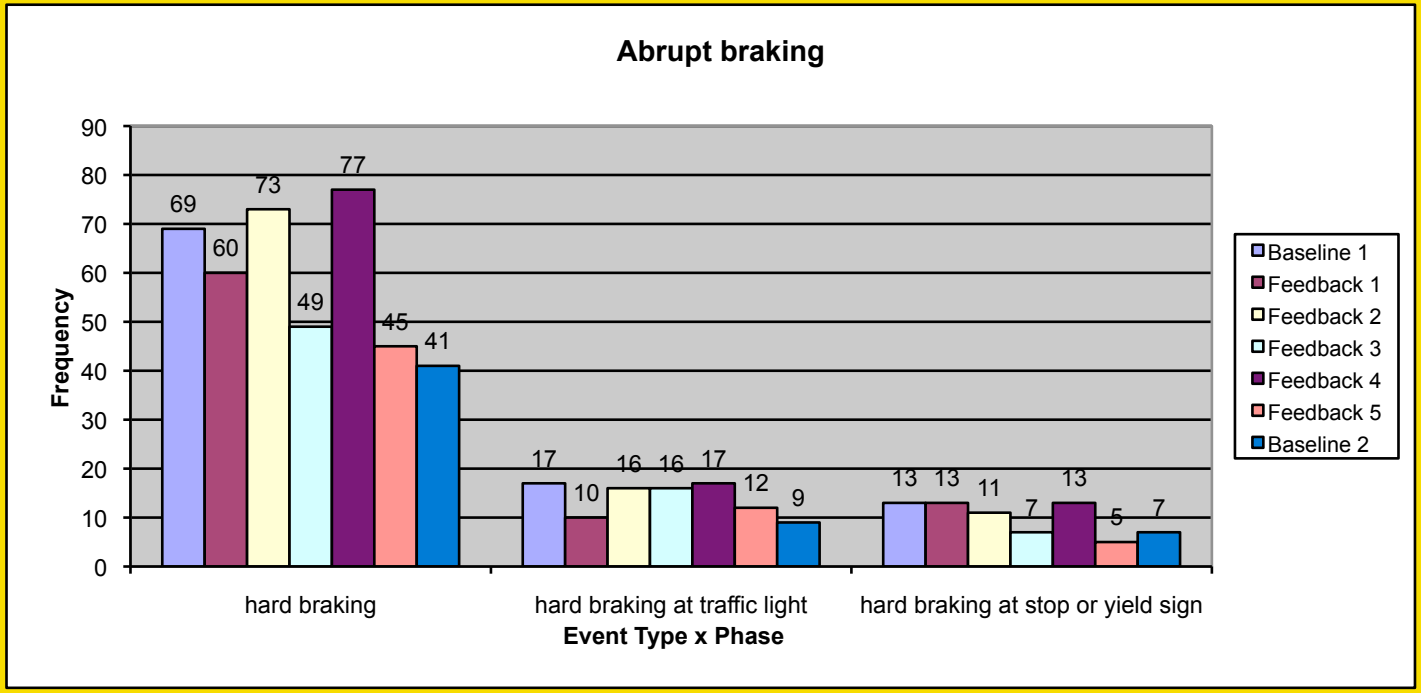
Most Common Safety Error:

Improper Speed for Turns and Curves



Other Common Errors

Abrupt Braking



Note phase 4 winter months (purple)

Conclusions

- Eagan suburban data indicate positive effects of the intervention
- Results were immediate for this group of new young drivers
  - Reductions in the number of coachable events after just the first week of intervention

Limitations

- Small N study
- Need long-term baseline to account for maturation effects
- Assumption: fewer events = fewer crashes

Limitations (cont.)

- Mileage tracking remains a challenge with this generation technology
  - While teens with their own cars were recruited, car sharing occurred (>10%) in a small group (seven subjects)

Next steps

- Four year study of 14 year-old drivers
- Randomized control trial design to account for maturation effects
- Specialty data analyses within rural and suburban teen drivers

Event-triggered video records--future

- New systems will be able to examine exposure so that specific research questions can be addressed in the purest sense
- As automated data reduction becomes more accurate, they will become a more powerful tool in ND

Next generation event-triggered event recorders should

- Capture mileage data
- Trigger on known distraction events
  - Eyes off road
  - Texting and cellular communication
  - Interaction with infotainment systems
  - Telematics device alerts

Thank you

The University of Iowa

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