



Passenger Effects on Teen Driving Safety

Contemporary Social Issues Seminar

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Who is the Safer Driver – Teen Boy or Mature Woman?

- Fatal crash involvement rate per 10 million miles
 - Women 35+ 0.23 crashes
 - Males ≤ 20 0.07 crashes

Passenger is a 35+ Female

Teen male crash rate only 1/3 that of mature females!

OOPS! Forgot to mention one thing:

- Women 35+ 0.08 crashes
- Males ≤ 20 6.40 crashes

Passenger is a 16-20 Male

Teen male crash rate **80 times** that of mature females!



Incorporating Teen Passenger Concerns into Safety Programs

- Passenger presence and type is very important element in teen driving safety
- GDL programs typically have a passenger provision
 - 44 states and DC have some restriction on non-family member passengers in intermediate stage
 - Nature of that restriction varies quite a bit
- How can we study the passenger effect? How should we use the findings?



TWO RESEARCH STUDIES ON PASSENGER EFFECTS

- Observational study
 - Risky driving by teens with and without passengers
- Statistical analysis of teen driver fatal crash rates
 - Deals with difficult issue of exposure
- Funded by National Institute of Child Health and Human Development
 - Dr. Bruce Simons-Morton, Chief Prevention Research Branch

TEEN DRIVER FIELD OBSERVATIONAL STUDY



DETERMINING TEEN OCCUPANTS

Observer 1 at school exit notes occupants:

- Teen or adult; gender; seat position, vehicle type



Observer 2 videotapes exiting vehicles, including license plate

Observer 1's narration recorded on the videotape via wireless microphone

MEANWHILE.....

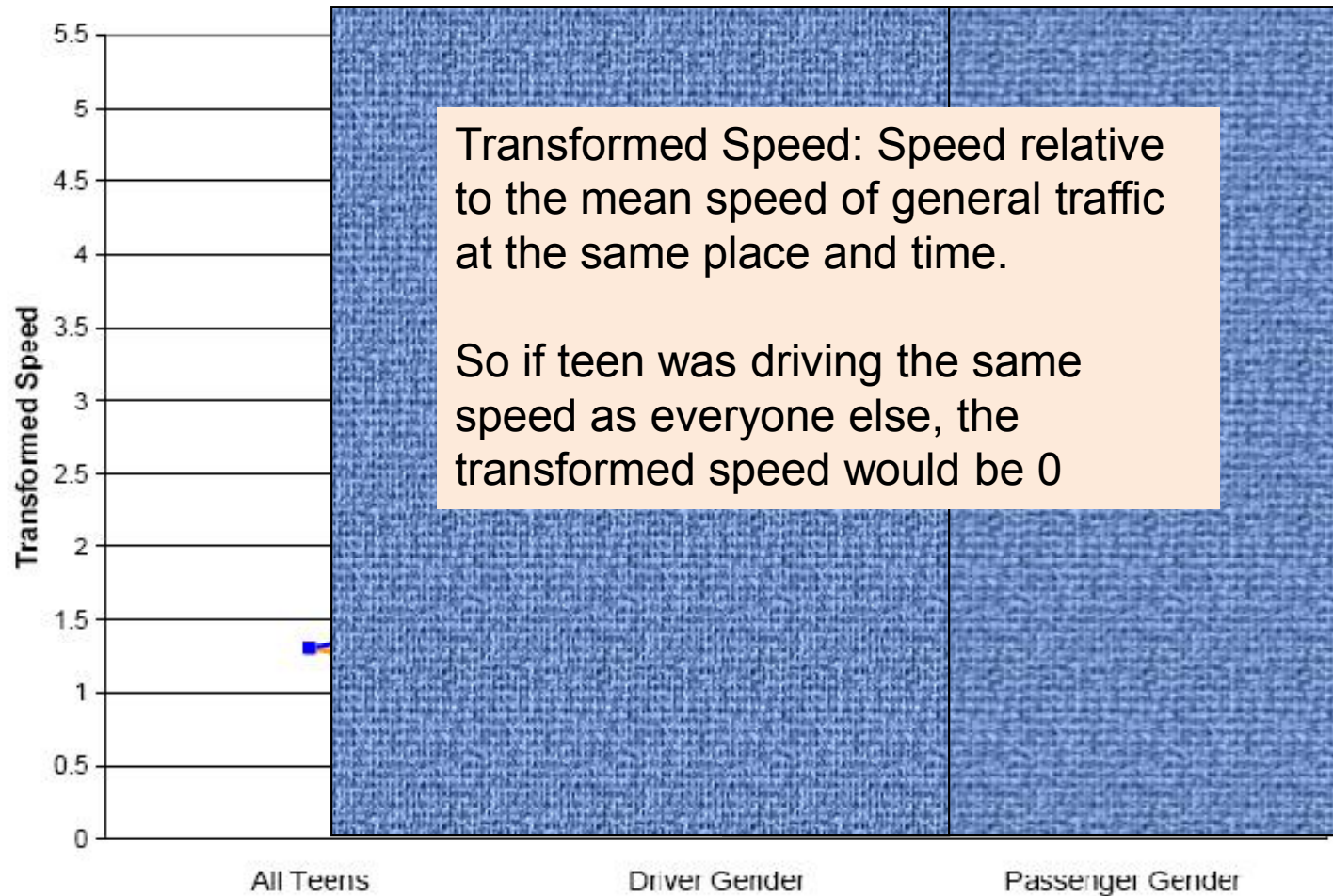
Observer 3 is about $\frac{1}{4}$ to $\frac{3}{4}$ miles away

Unobtrusive recording using LIDAR, video, PC

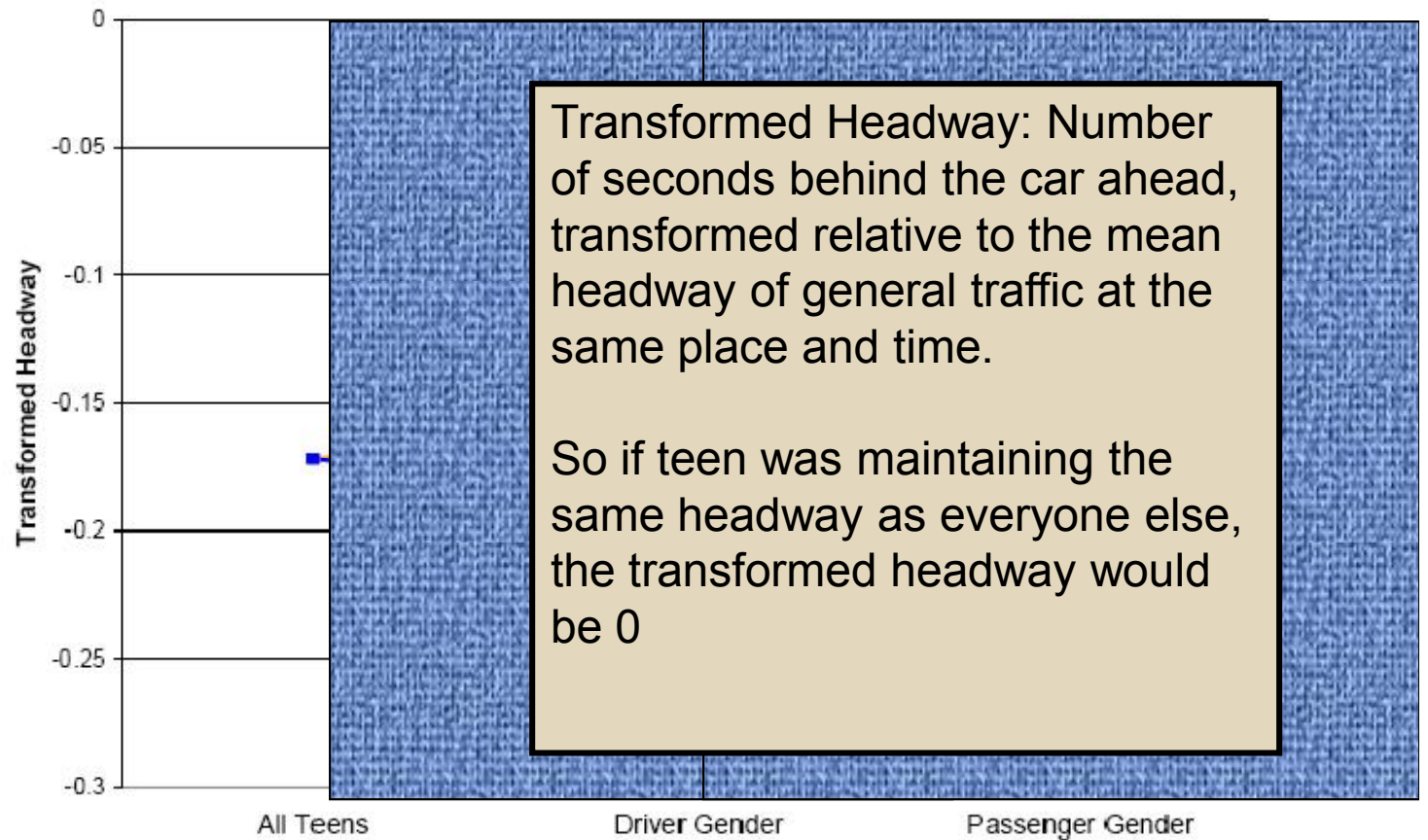
- Time stamp
- Speed
- Distance
- Headway (derived)



Teen Driver Speeds



Teen Driver Headways





SOME LIMITATIONS TO THE OBSERVATIONAL STUDY

- One geographic area
- One time of day/trip type
- Only two risky behaviors measured
- Unknown link of risky driving behaviors to crash rate, injury, fatality

- Subsequent statistical study of crashes complements the observational study and its limitations

FATAL CRASH RATE PASSENGER STUDY





FATAL CRASH RATE STUDY

- How can we quantify passenger effects on crash involvement rates?
 - Number of crashes with different teen driver/passenger combinations is not a good index
 - Findings could be due to greater risk or greater exposure
 - ✦ e.g. – more male/male crashes than male/female crashes might be because teen males do more of their travel with other teen males
- To determine crash rate we need:
 - A numerator : Number of crashes for given condition
 - A denominator: Amount of travel done for a given condition



FATALITY ANALYSIS REPORTING SYSTEM (FARS)

- On-going census of all fatal roadway crashes in the U.S., compiled by year
- Information is recorded for every occupant of the vehicle
 - Seat position
 - Age, gender
- Therefore we know age/gender of driver and age/gender of all passengers
- 200K crashes 1999-2003 (50K/yr)

NATIONAL HOUSEHOLD TRAVEL SURVEY (NHTS)

- Periodic large representative survey of household travel in U.S. (70K households in 2001 survey)
- Household members provide detail on all trips made on sampled “travel day”
- 2001 survey included 26,038 vehicle trips with one or two occupants
- Age and gender are recorded only for those occupants who were members of the sampled household



How can we handle this?

Statistical Imputation Procedures



IMPUTATION METHODOLOGY

- Age and gender were imputed for non-household passenger by “hot deck” imputation
- “Recipient trip” assigned a “donor trip” from among 2-occupant trips that had a household passenger but non-household driver
- Passenger age/gender taken from donor trip
- Donor trip sampled from subset that has matching trip characteristics



TRIP MATCHING VARIABLES FOR DONOR/RECIPIENT TRIPS

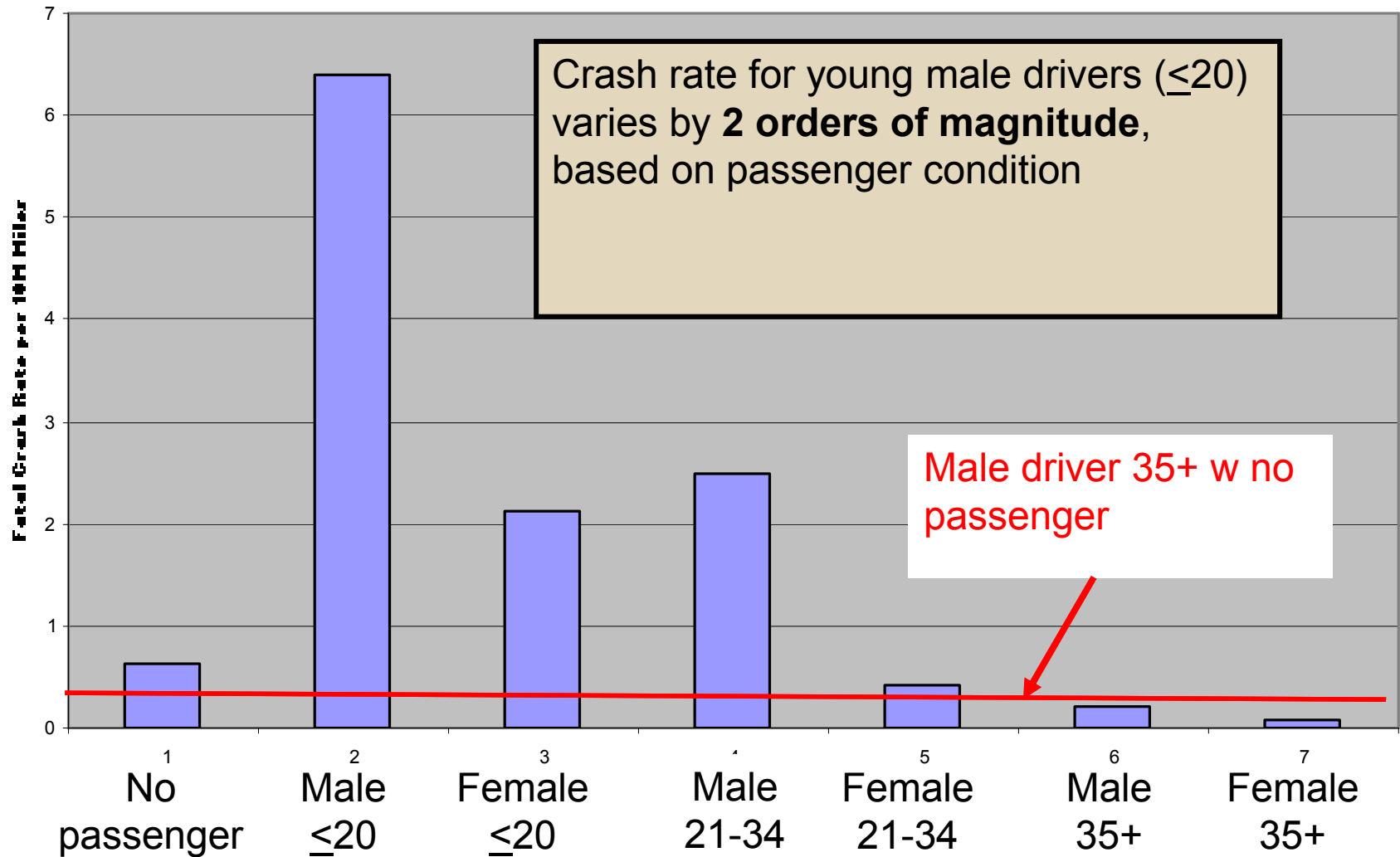
- Hard boundary variables to define imputations cells
 - Trip purpose [11 values]
 - Time of day [4 values]
 - Weekend [2 values]
- Soft boundary variables (within hard boundaries)
 - Trip distance [3 values]
 - Urban/suburban/rural [3 values]
 - Census region [4 values]
 - Season of year [4 values]
 - Average trip speed [3 values]
 - Household income [2 levels]

DRIVER AND PASSENGER AGE CATEGORIES FOR ANALYSIS

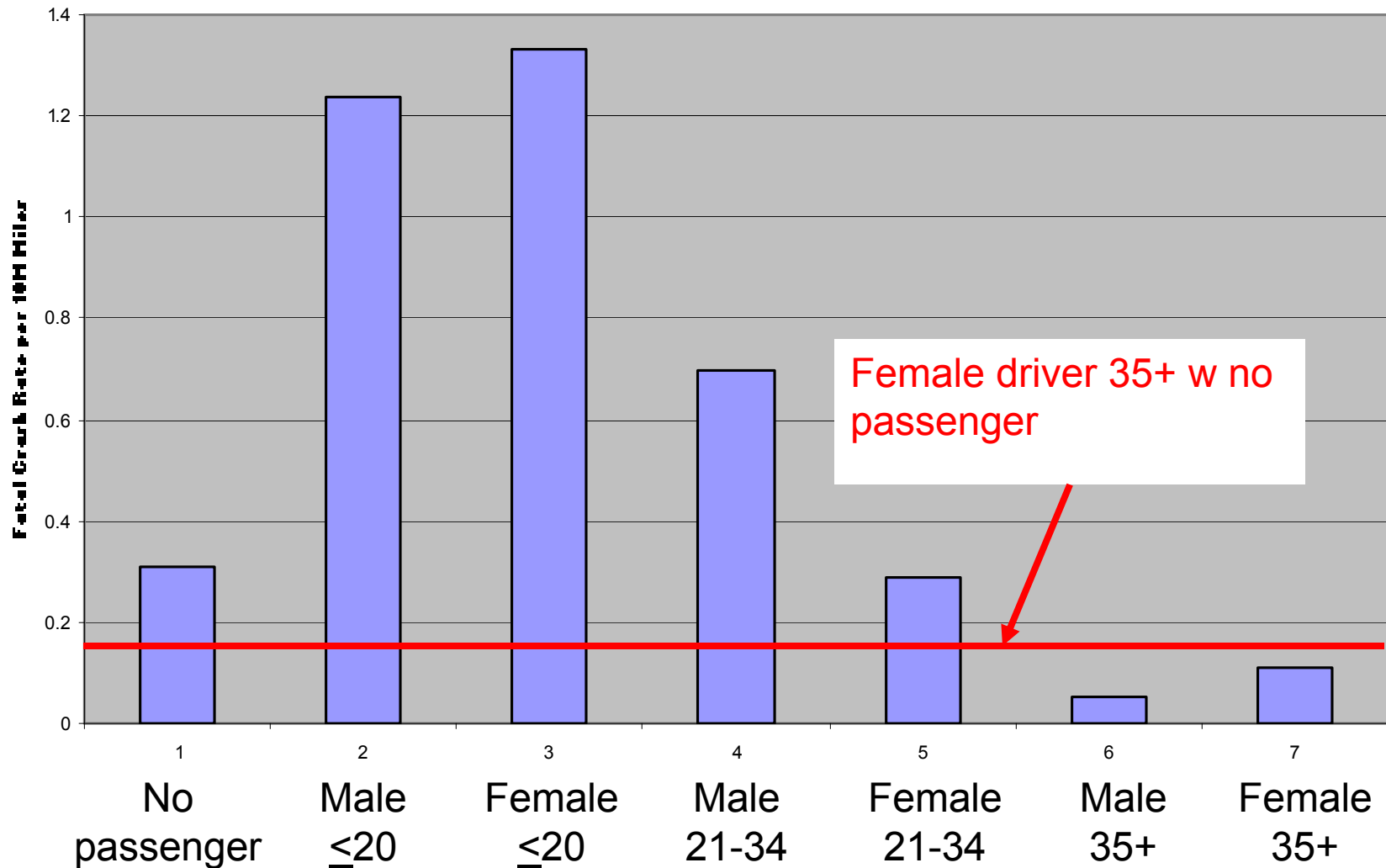
Driver Age \ Passenger Age	≤ 12	13-15	16-20	21-34	≥ 35
≤ 20					
21-34					
≥ 35					

3 driver age groups X 2 driver gender X 5 passenger age groups X 2 passenger gender = 60 dyads

MALE DRIVERS ≤ 20 : FATAL CRASH INVOLVEMENT RATE WITH VARIOUS CATEGORIES OF PASSENGERS



FEMALE DRIVERS ≤ 20 : FATAL CRASH INVOLVEMENT RATE WITH VARIOUS CATEGORIES OF PASSENGERS



IMPLICATIONS FOR TEEN HIGHWAY SAFETY EFFORTS

- GDL restrictions on passengers
- Driver training
- Parental supervision
- Enforcement of driving restrictions
- In-vehicle monitoring technology
 - Passenger sensing is necessary
 - Adjustment of warning algorithms based on occupants
 - Inclusion of passenger status in summary reports

Where We Stand

We know something about:

- Problem magnitude
- Who
- When

We know little about:

- How
- Why