

# Hitting the Streets: Bike Commuting Injuries in PDX

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# Conflict of Interest Disclosure

I and my co-authors have NO financial relationship to disclose.

Biking – everybody, who is anybody, is doing it! And some wear helmets!



# Commuting by bike differs from other types of riding

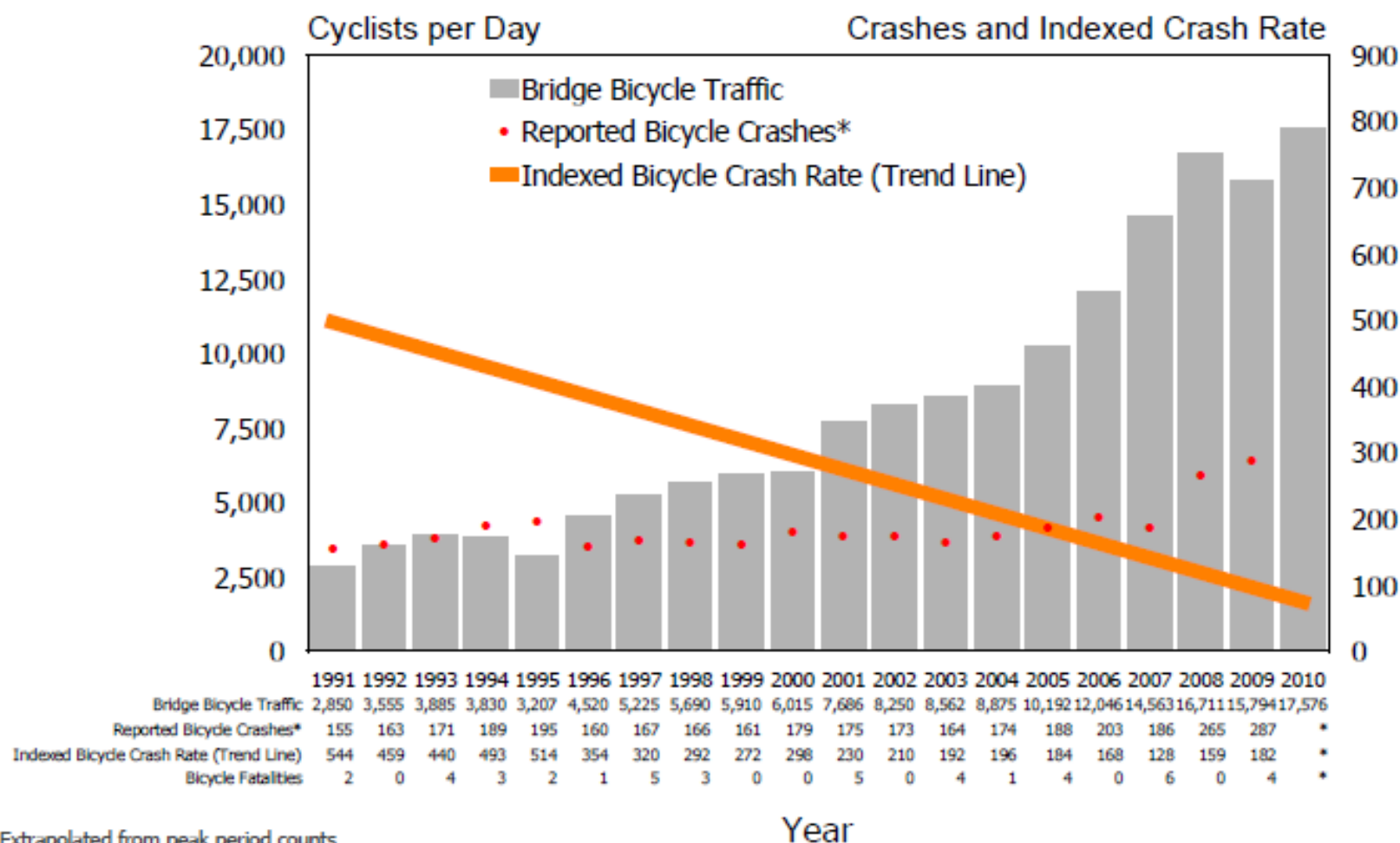


Cities across the country are investing millions in infrastructure and upkeep





# Combined Bicycle Traffic over Four Main Portland Bicycle Bridges Juxtaposed with Bicycle Crashes

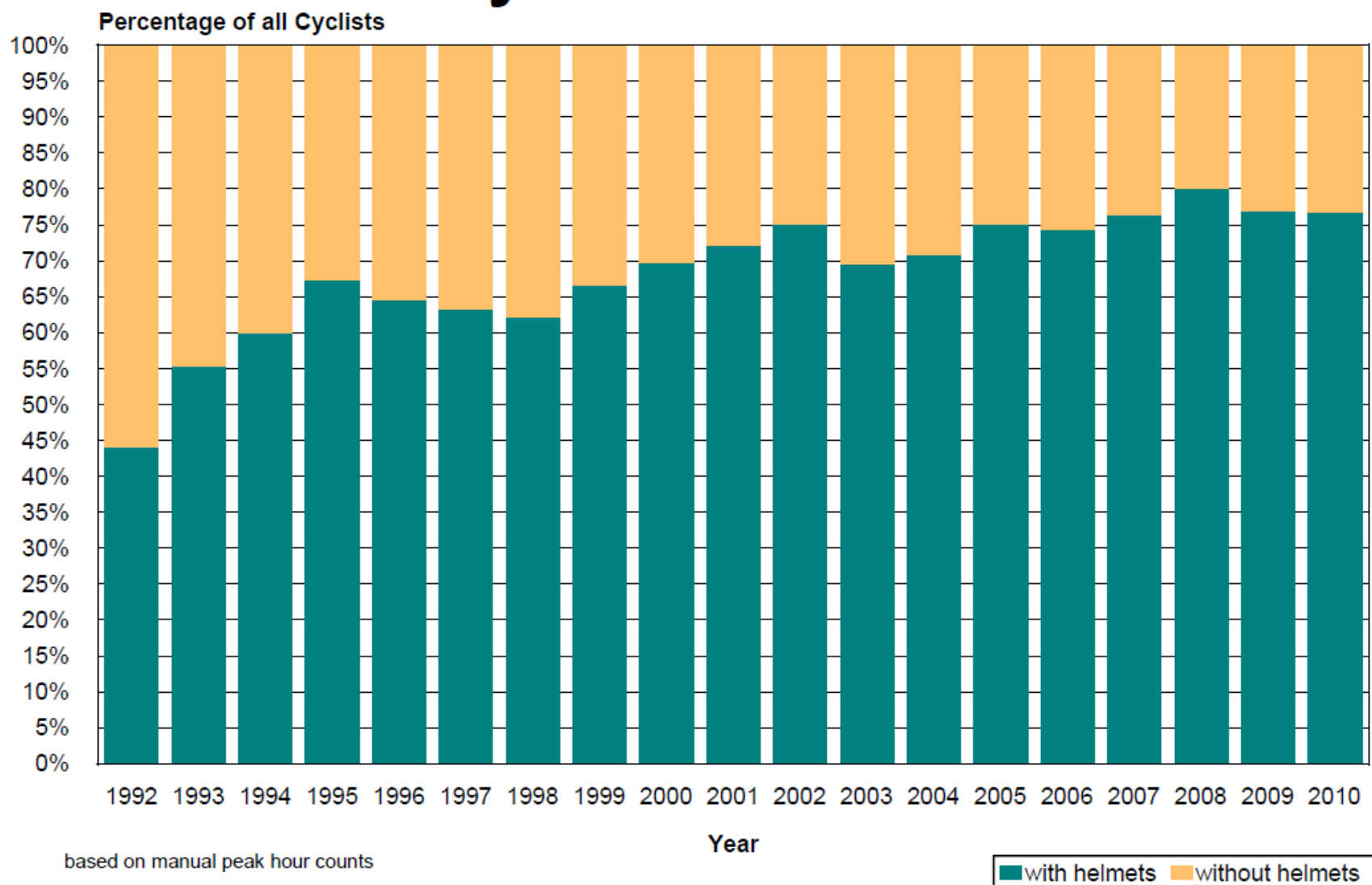


Extrapolated from peak period counts

\*Crash Rate" represents an indexing of annual reported crashes to daily bicycle trips across the four main bicycle bridges.

\*2008, 2009 Reported Bicycle Crashes data reflects increased crash reporting requirements.

# City of Portland Bicycle Counts by Year By Helmet Use



# Specific Aims

1. Determine the incidence of injury events
2. Define bike commuter (rider) characteristics associated with injury events
3. Characterize the environmental factors associated with injury events



# Outcomes

**Injury Event =**

any cycling event leading to injury

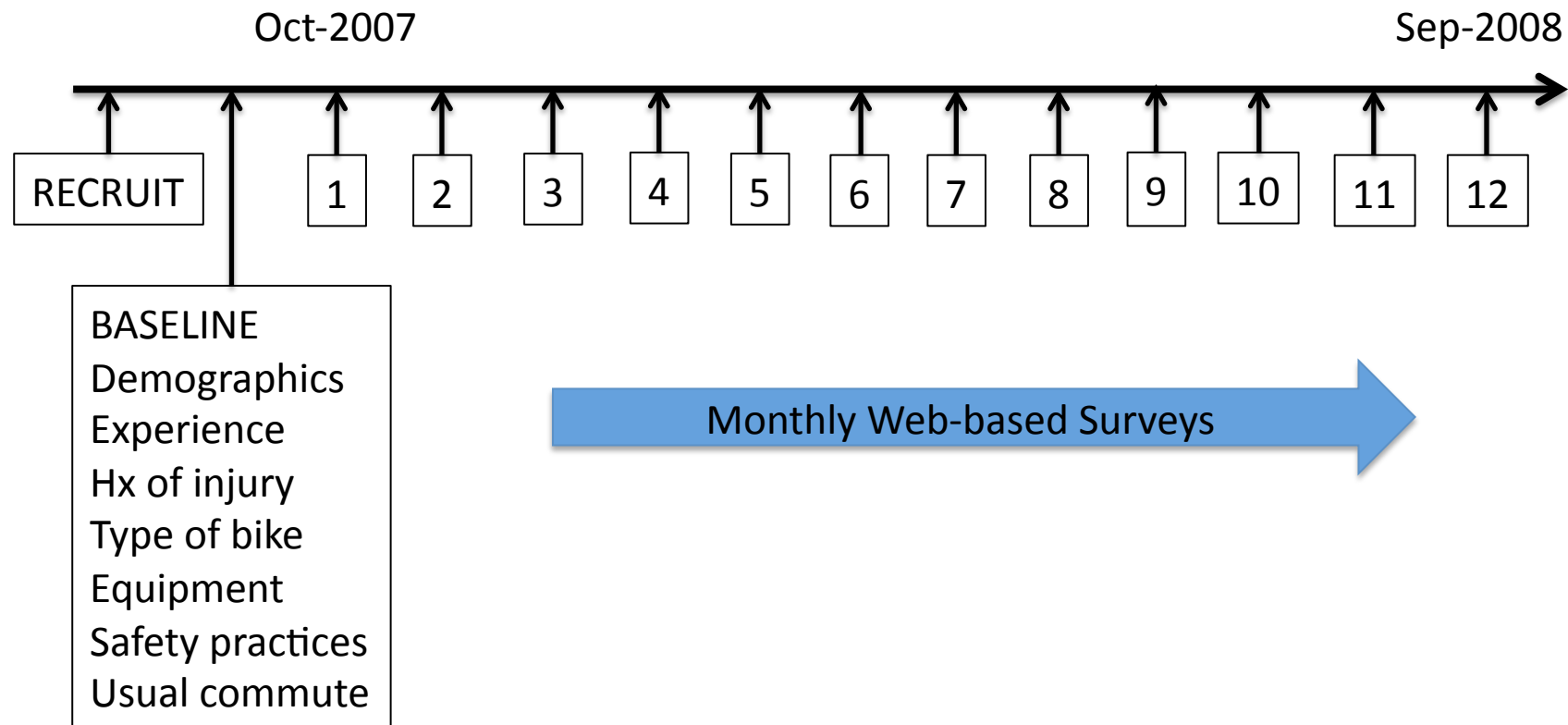
**Serious Injury Event =**

an injury event requiring medical attention

# Recruitment of Riders

- **Advertising and invitation**
  - BTA Bike Commute Challenge – Aug-Sept 2007
  - websites, e.g., [bikeportland.org](http://bikeportland.org)
- **Inclusion criteria**
  - At least 18 yrs old
  - Self identify as a bike commuter
  - Commute to work or school within PDX city limits
  - Access to the Internet
  - Accessible via email
  - Ability to complete surveys written in English
- **Human Subjects Protection**
  - Approved by OHSU IRB
  - On-line consent

# Prospective Cohort Design



# Prospective Data Collection

## Monthly Questionnaire

- Sent on first day of each month
- Survey Monkey open for 8 days
- Reminder emails on 5<sup>th</sup> and 8<sup>th</sup> days
- Previous month's commute
  - Frequency, distance, changes in route
- If injury event, then circumstances and outcome
  - Type and extent of injuries, hospital admission, length of stay, time lost from work/school
  - Light, weather, surface, vehicles

# The Cohort

- Online recruitment and consent obtained = 1034
- 980 completed the Initial Questionnaire (95%)
- Only 18 did not respond to any of the monthly questionnaires (excluded from analysis)
- 42% provided 12 months of data
- 72% provided at least 10 months of data
- 9,492 person months (average 9.9 per commuter)

# Cohort Characteristics

- 48% Female
- Age 36.7 years
- BMI 24.1
- Bike commuting experience
  - Beginner 23%
  - Intermediate 27%
  - Experienced 50%





# Safety Practices

- Helmet 95%
- Lights in dark 96%
- Reflecting clothes 60%
- Mirrors 19%
- Prior injury event 44%



# The Average Commute



- Distance, roundtrip 11.2 miles
- Time on current route 42 months
- 91% use bike lanes
- 54% use residential streets
- 94% encounter a major street

# Risk of Injury

**Injury events = 192 (164 riders (18%))**

15.0 per 100,000 miles (95% CI 13.2 – 17.5)

**Serious injury events = 50 (49 riders (5%))**

3.9 per 100,000 miles (95% CI 2.9 – 5.1)

# Lay Language

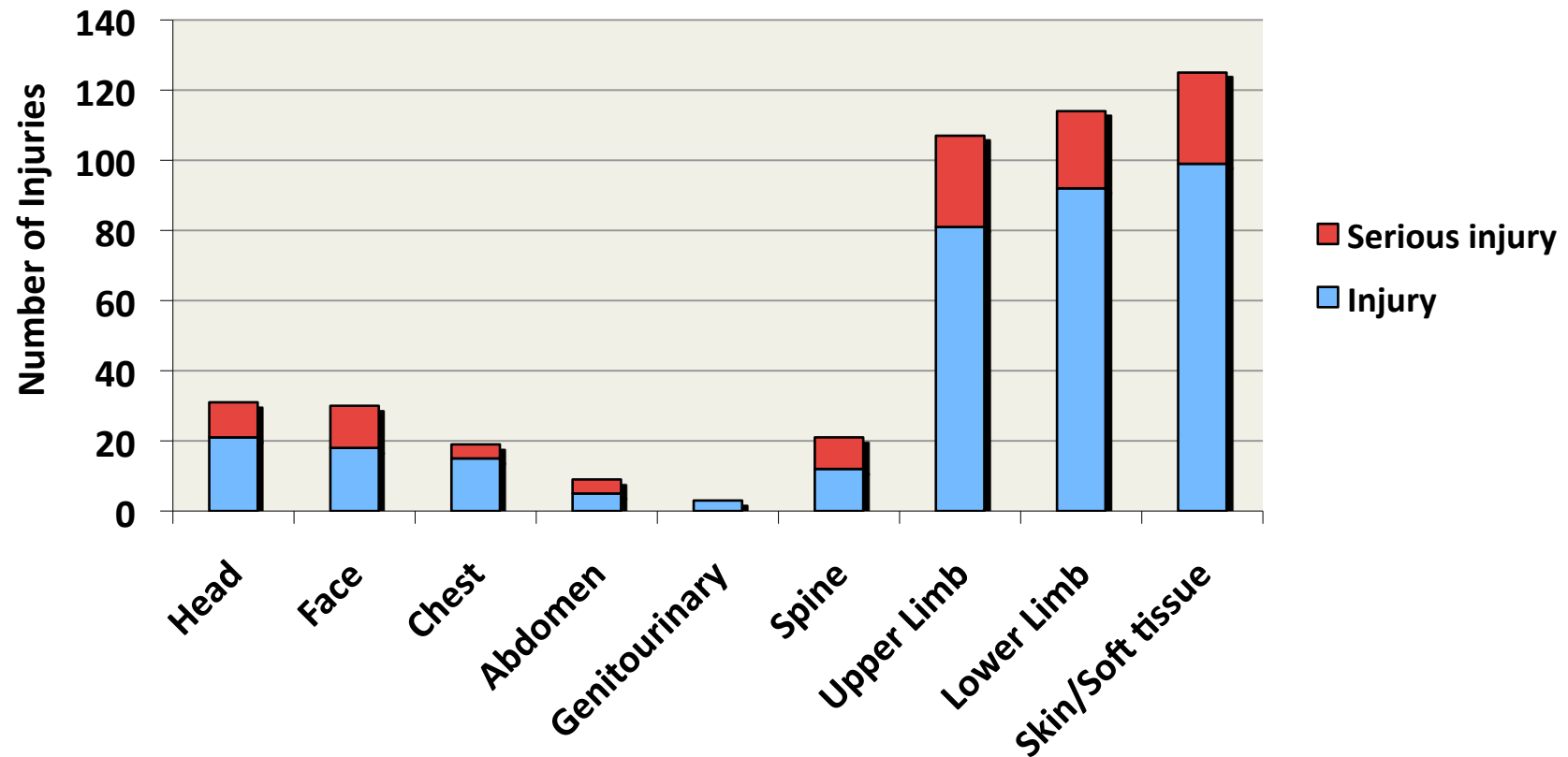


“1 in 5 bike commuters will experience an injury per year”

“the typical bike commuter will have an injury once every 5 years”

“¼ of injuries will require medical attention”

# Types of Injuries



Injury events involving head, face, abdomen, and spine are more likely to be “serious” (  $p \leq 0.05$  )

# Associations

## Injury Events

- NO association
  - Gender
  - Age
  - BMI
  - Prior injury event
  - Routinely wear helmet
  - Reflective clothing
  - Mirror
- Association
  - Longer commute distance  
12.1 v 11.0 miles ( $p = 0.04$ )

## Serious Injury Events

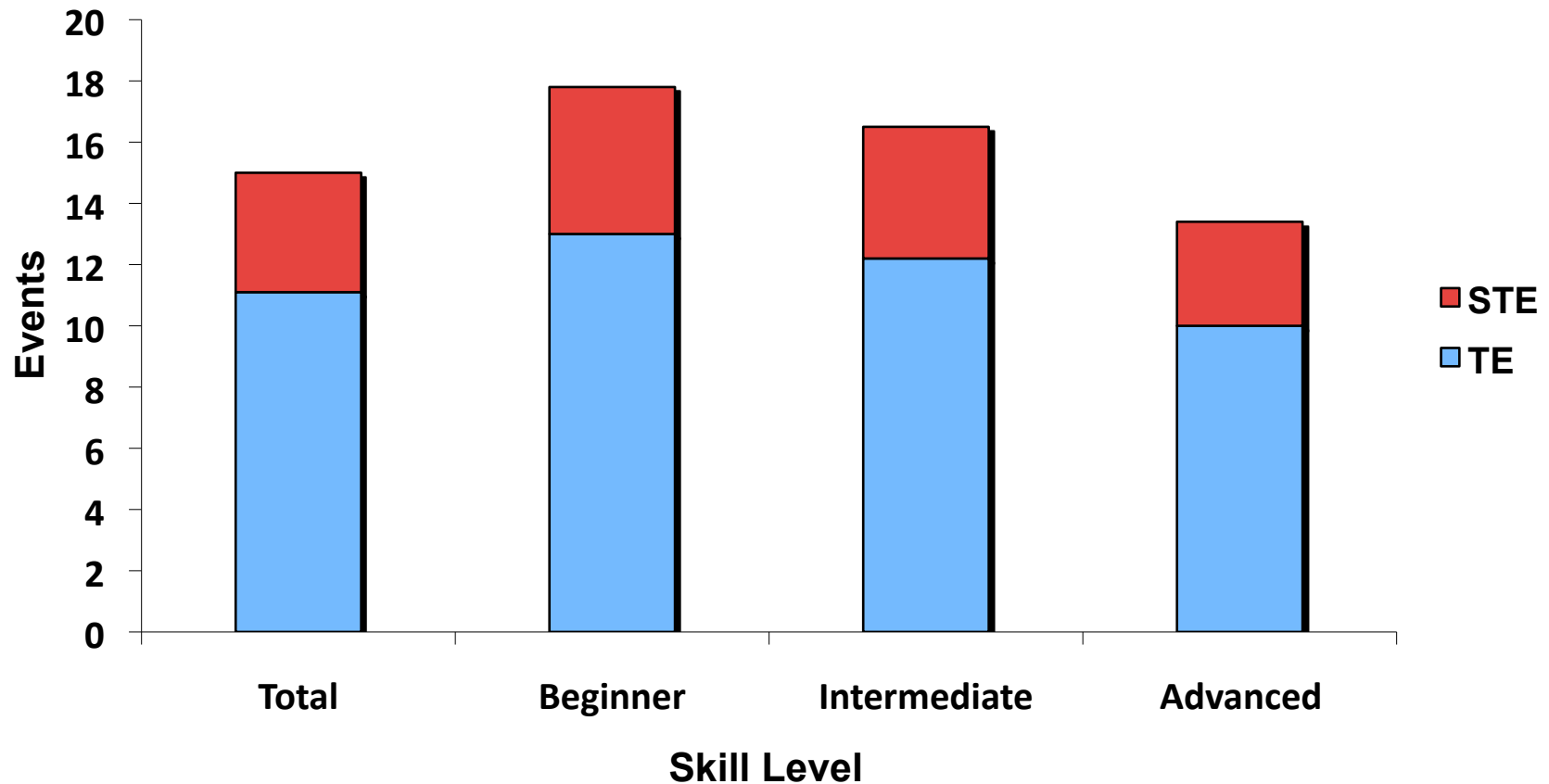
- NO association
  - Gender
  - Age
  - Prior injury event
  - Helmet
  - Reflective clothing
  - Mirror
  - Commute distance
- Associations
  - Routinely wear helmet  
88% v 96% ( $p = 0.01$ )
  - Higher BMI
  - 22.7 v 23.6 ( $p = 0.07$ )



# Classification of Commuter Skill Level

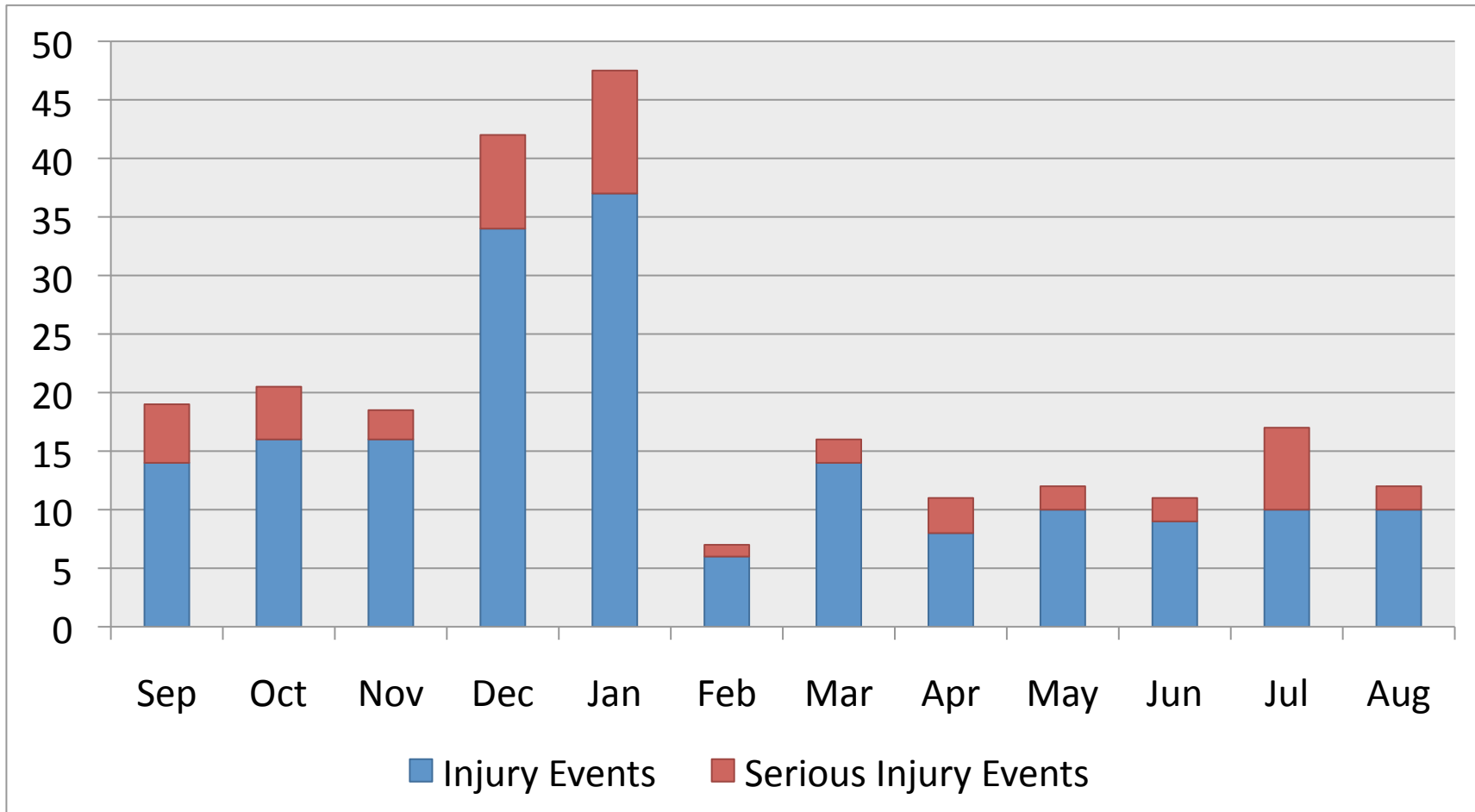
- BEGINNER
  - Less than 9 months, regardless of number of days commuting per week
- INTERMEDIATE
  - $\geq 3$  days per week for more than 9 months during the previous year
- EXPERIENCED
  - $\geq 3$  days per week for more than 9 months per year during the previous 3 years

# Incidence of injury and serious injury events (per 100,000 miles commuted)



Trauma and Serious Trauma Events per 100,000 miles travelled

# Monthly incidence of injuries



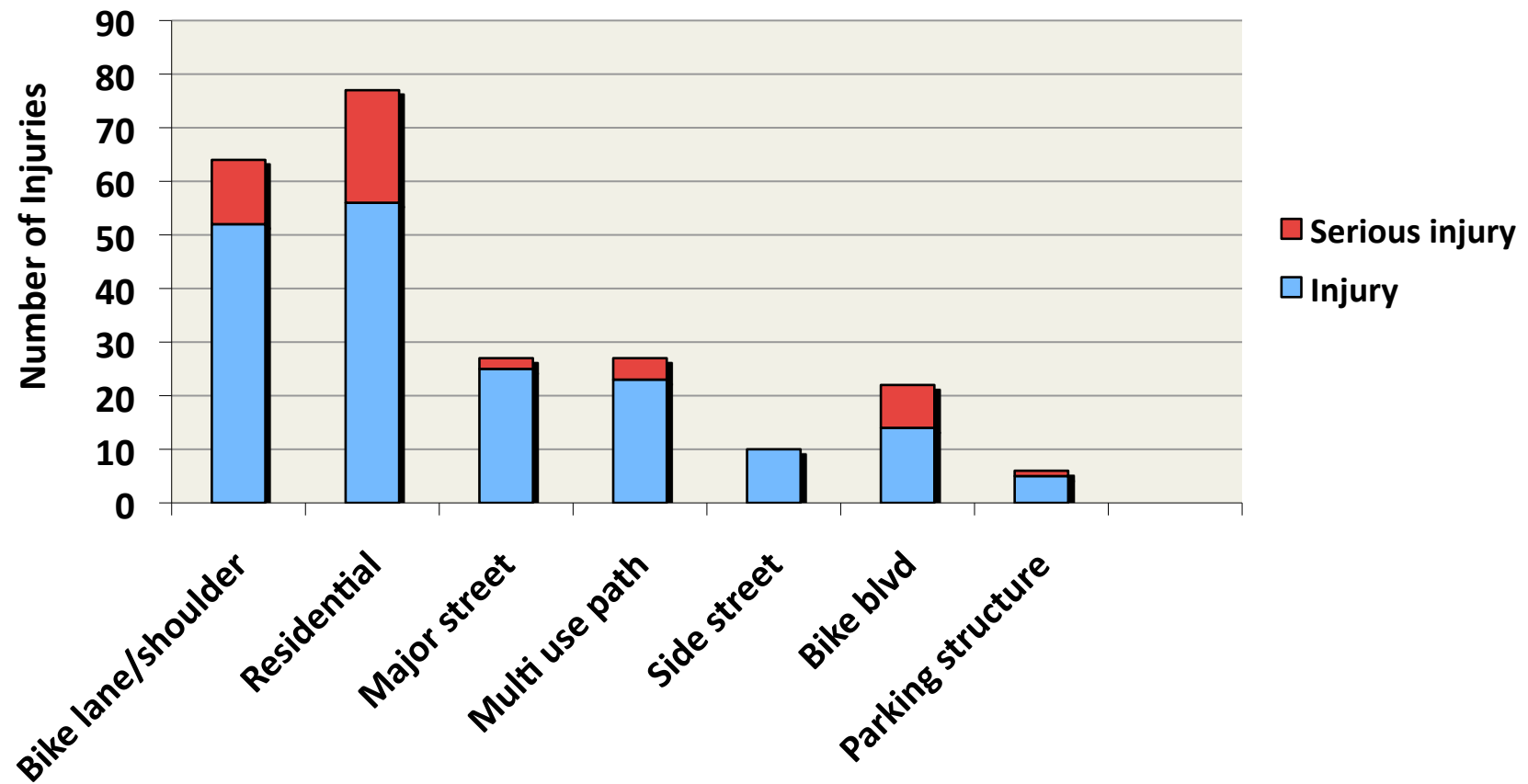
Injury Events per 100,000 miles travelled

# Environmental and Roadway Surface Conditions

- 29% injury and 48% serious injury events involved a motor vehicle
- 20% of injury and serious injury events involved poor roadway surface conditions
  - Steel plates
  - Loose gravel
  - Tracks on road



# Injury events by location type



# Keep wearing your helmet!

- Helmets were associated with a lower risk of serious injury
- Unadjusted OR = 0.32 (95% CI 0.12 – 0.89)
- This 70% reduction is comparable to benefits quantified in previous research





# Limitations

- Generalizability
  - Experienced riders; may not include lower SES; extensive bicycle infrastructure; rainy climate
- Measurement accuracy
  - Riders recalled information
- No comparisons made to circumstances of “injury-free” rides
  - Next study will use “case-crossover” design

# Conclusions

1. Injury rates are low  
(1x every 5 years)
2. Small increased risk of injury for new riders  
(should not be afraid to start)
3. Helmets are highly protective of serious injury  
(70% reduction)

# Acknowledgments

- Bicycle Transportation Alliance
- Portland Bureau of Transportation
- Local bike shops
- Portland bike commuters
- The OHSU Center for Healthy Communities

# Thank you! Questions?

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# Bike and Pedestrian Fatality Trends

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Motorist Fatal	37	31	25	19	14	20	24	24	26	19	18	14	11	9	7
Motorcycle Fatal	4	4	5	3	3	1	5	4	1	4	4	5	4	9	4
Bicyclist Fatal	1	5	3	0	0	5	0	4	1	4	0	6	0	4	0
Pedestrian Fatal	17	9	13	15	10	10	11	15	9	7	6	11	5	11	15
All Fatalities	59	49	46	37	27	36	40	47	37	34	28	36	20	33	26

TRAFFIC FATALITIES IN PORTLAND  
by mode of travel  
1996-2010

