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Pedestrian Safety and Social Equity in Oregon

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Portland State University Friday Transportation Seminar

Understanding the Connection
Between Social Equity and
Pedestrian Injuries



Agenda



- **Research Project Objectives**
- **Overview of Inputs to Crash Injury**
- **Research Project Findings**
- **Existing Literature**
- **Recommendations**

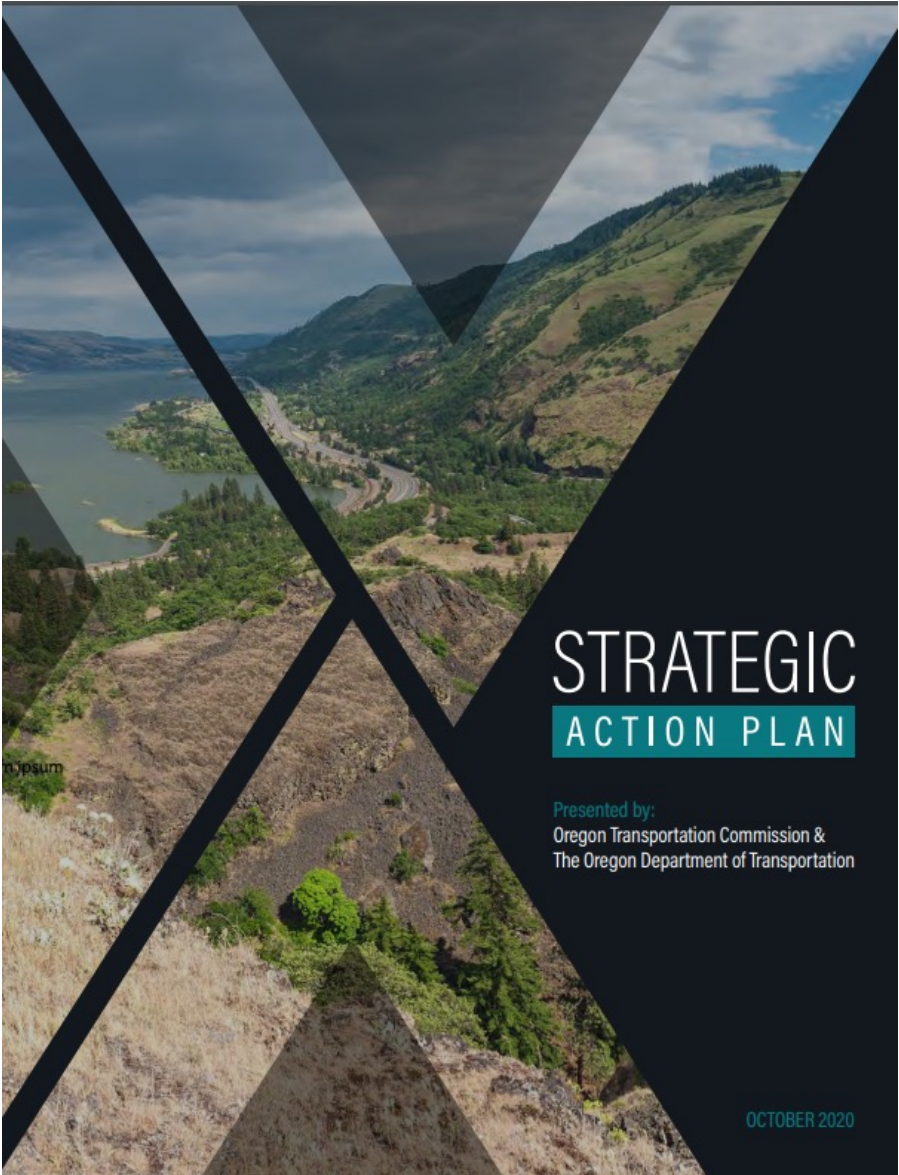
Research Project Objectives

Current Research Unit Project

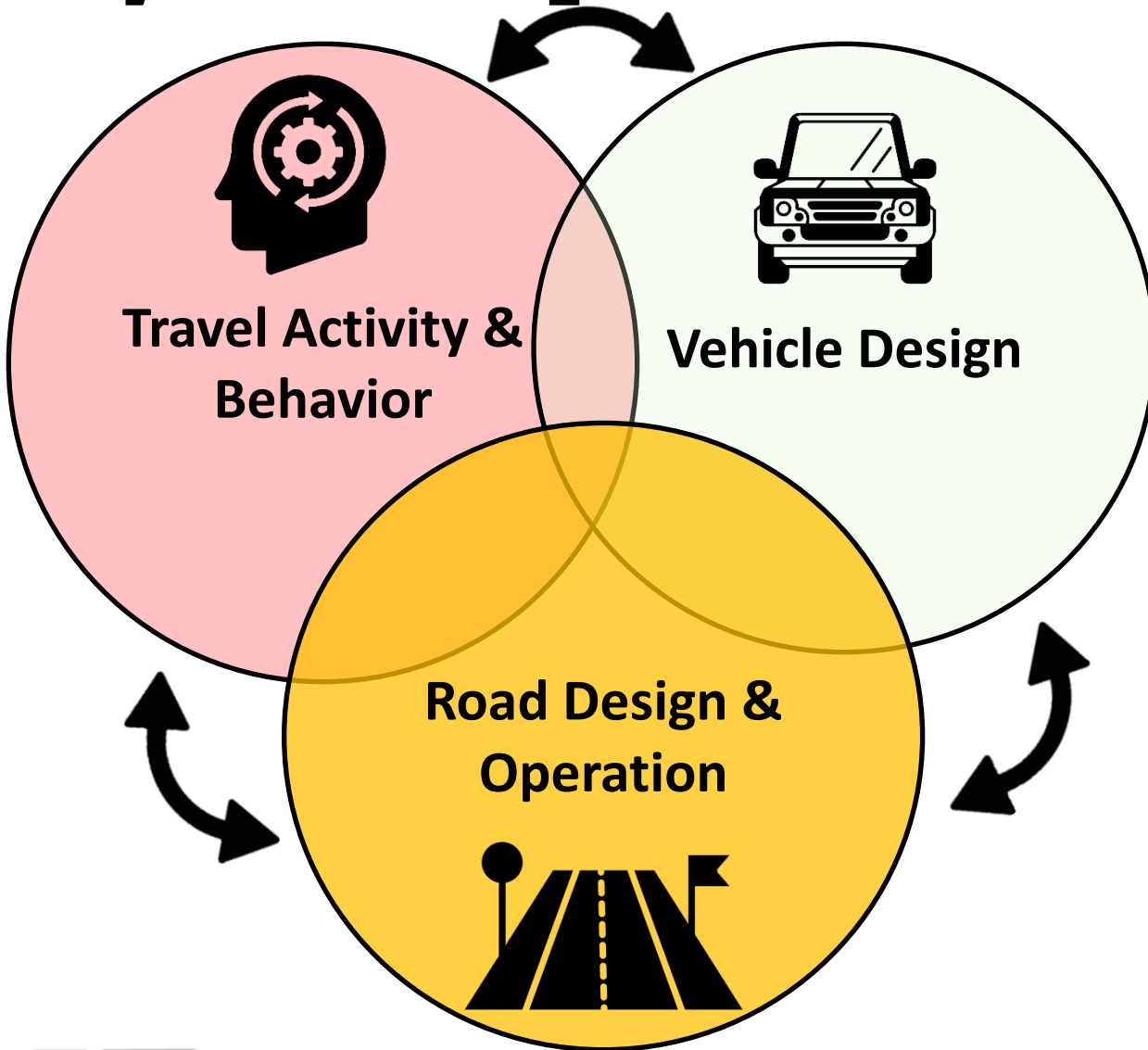
- Director’s office supported effort (& OTSC Support)
- Research Objective 1: Understand disparities in pedestrian injury outcomes across Oregon
- Research Objective 2: Measure how these disparities have changed over time
- Research Objective 3: Inform the ODOT Transportation System Action Plan (TSAP) update

Other ODOT Efforts

- OTC Strategic Action Plan acknowledges disparity of pedestrian injury rates for low income & communities of color
- Active Transportation Unit implementing project selection process using measures of race and income (ATNI)
- Equitable Active Safety Improvements Evaluation (EASIE)



System Inputs to Crash Injury



Travel Activity & Behavior

- More travel increases probability of crash
- Humans make mistakes

Vehicle Design

- Significant improvements in standard/available safety features
- Weight and design becoming a problem for people outside vehicle

Road Design and Operation

- Influences human behavior
- Design & operation can alter crash risk



Moving Toward Systemic Approach



Crash Modification Factors (CMFs)

- Science based estimates of crash reduction potential

Safety Performance Functions (SPFs)

- Mathematical equations that relate the number of crashes of different types to site characteristics (operations and geometry)

Before



After

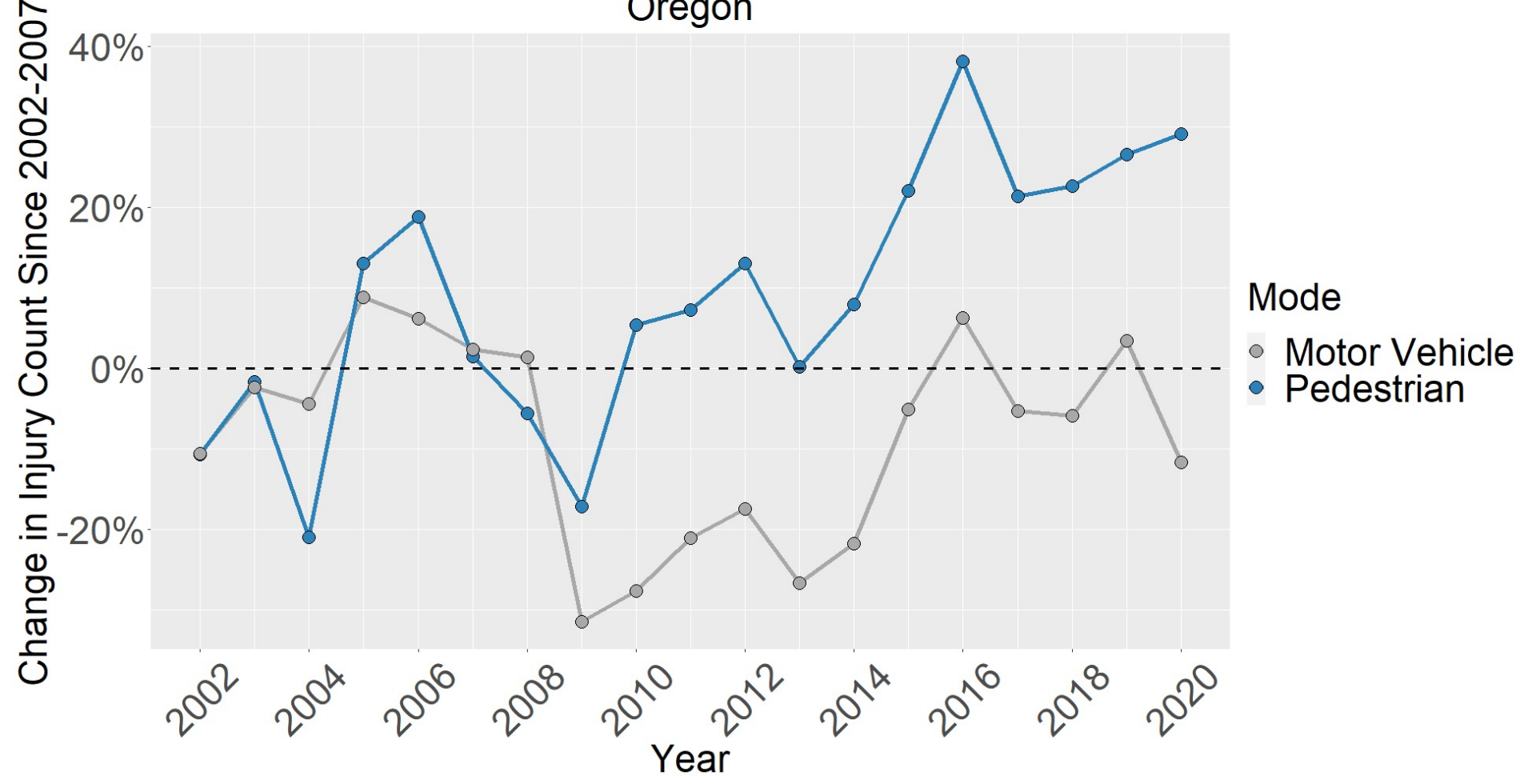


Rising Pedestrian Injuries

Oregon

- Pedestrian Injuries increasing overall (150 per year now 200)
- Increasing faster than motor vehicle injury
- Pedestrian injuries up ~30% while motor vehicle injuries flat

Pedestrian Fatal & Severe Injuries Increasing Faster than Motorized Vehicle Injuries Oregon



Injury Disparity by Mode of Travel

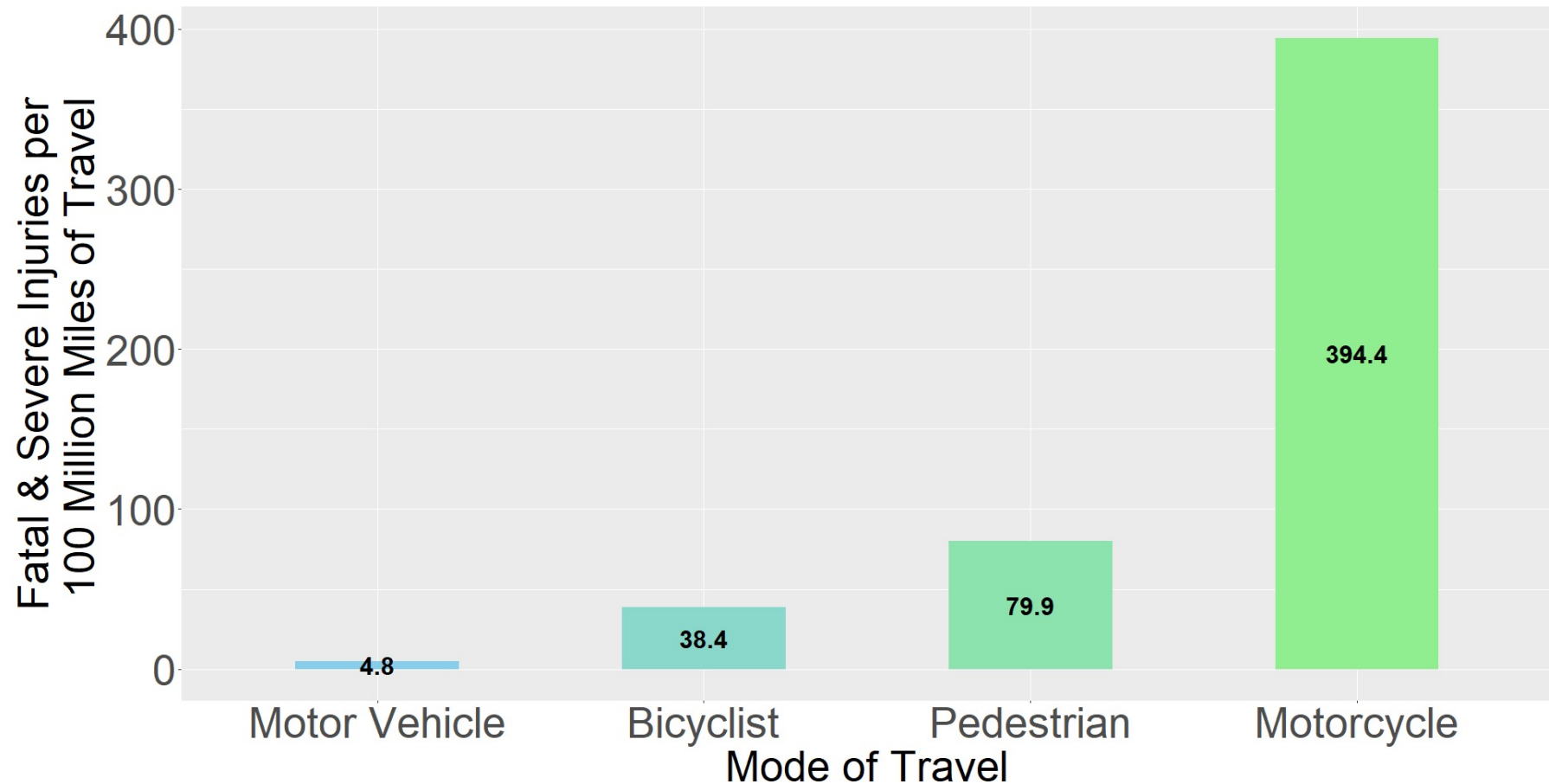
Oregon

- Pedestrians 30 times more at risk

Past Research

- Studies in British Columbia, Wisconsin, and U.S. suggests pedestrians 1.5 to 12 times more at risk

Fatal & Severe Injury Rates by Mode in Oregon
2008-2012

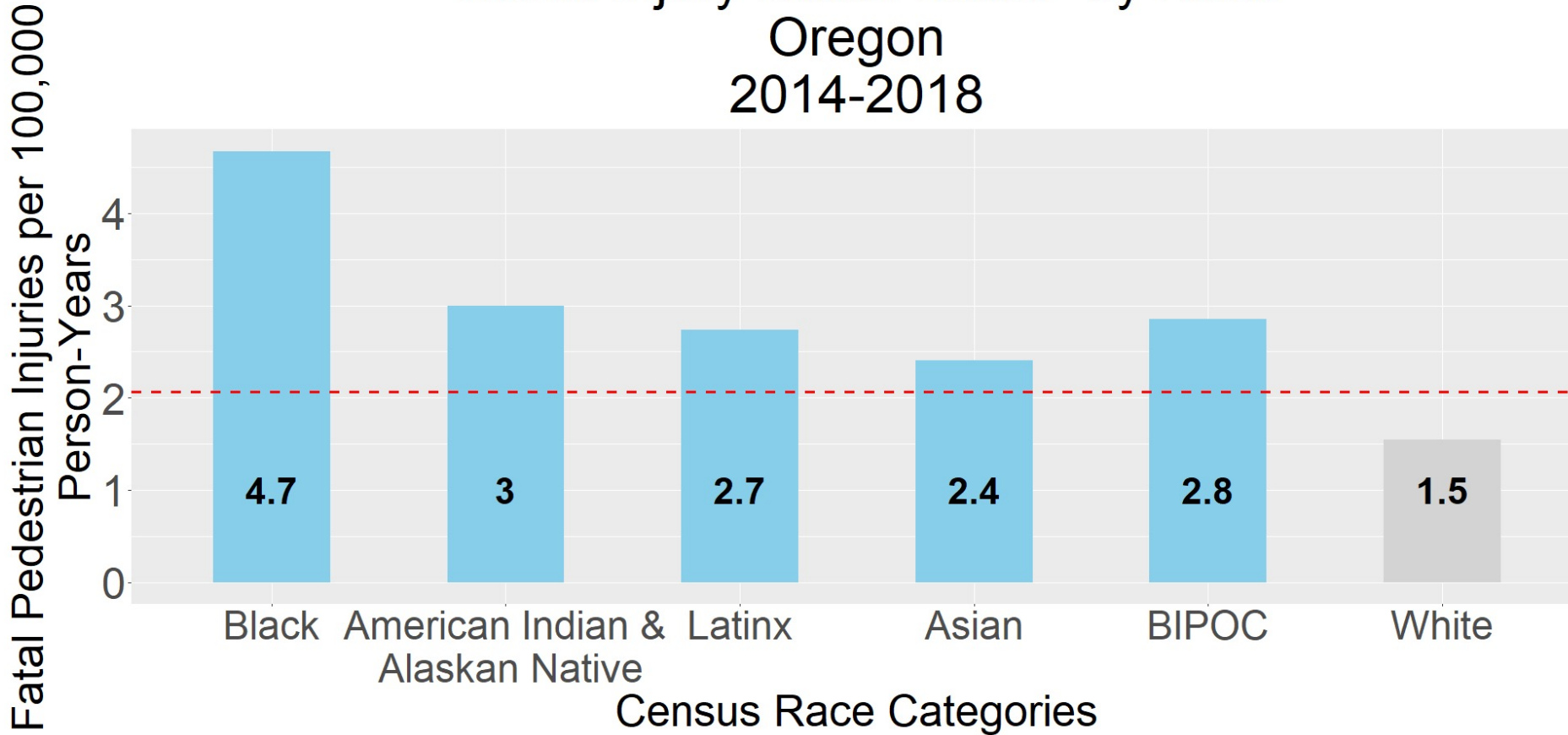


Source: ODOT Crash Data System & Oregon Household Activity Survey (OHAS)



Pedestrian Injury Disparities by Race

Pedestrian
Traffic Injury Death Rates* by Race
Oregon
2014-2018



**State
Average
Pedestrian
Injury Rate
2.1**

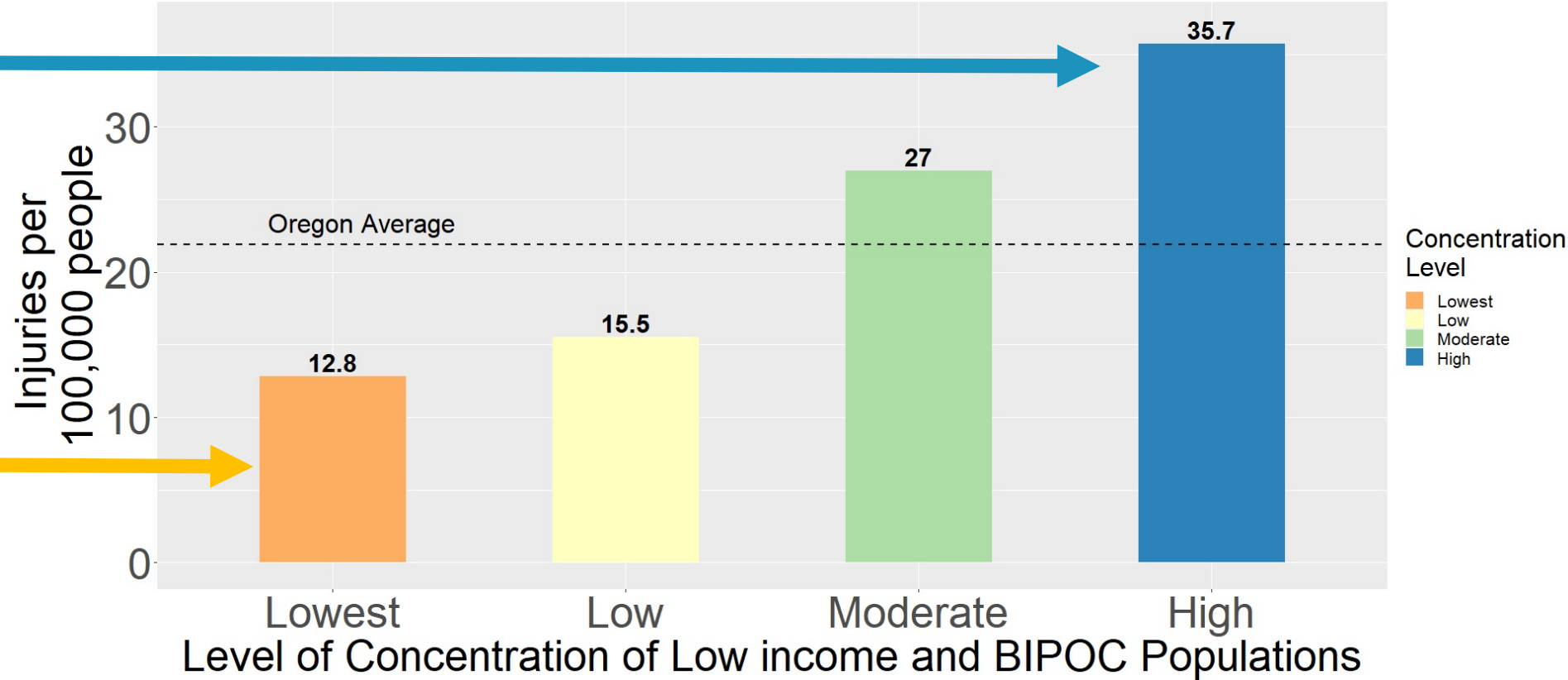
Source: FARS & Census
*Age-adjusted Rates



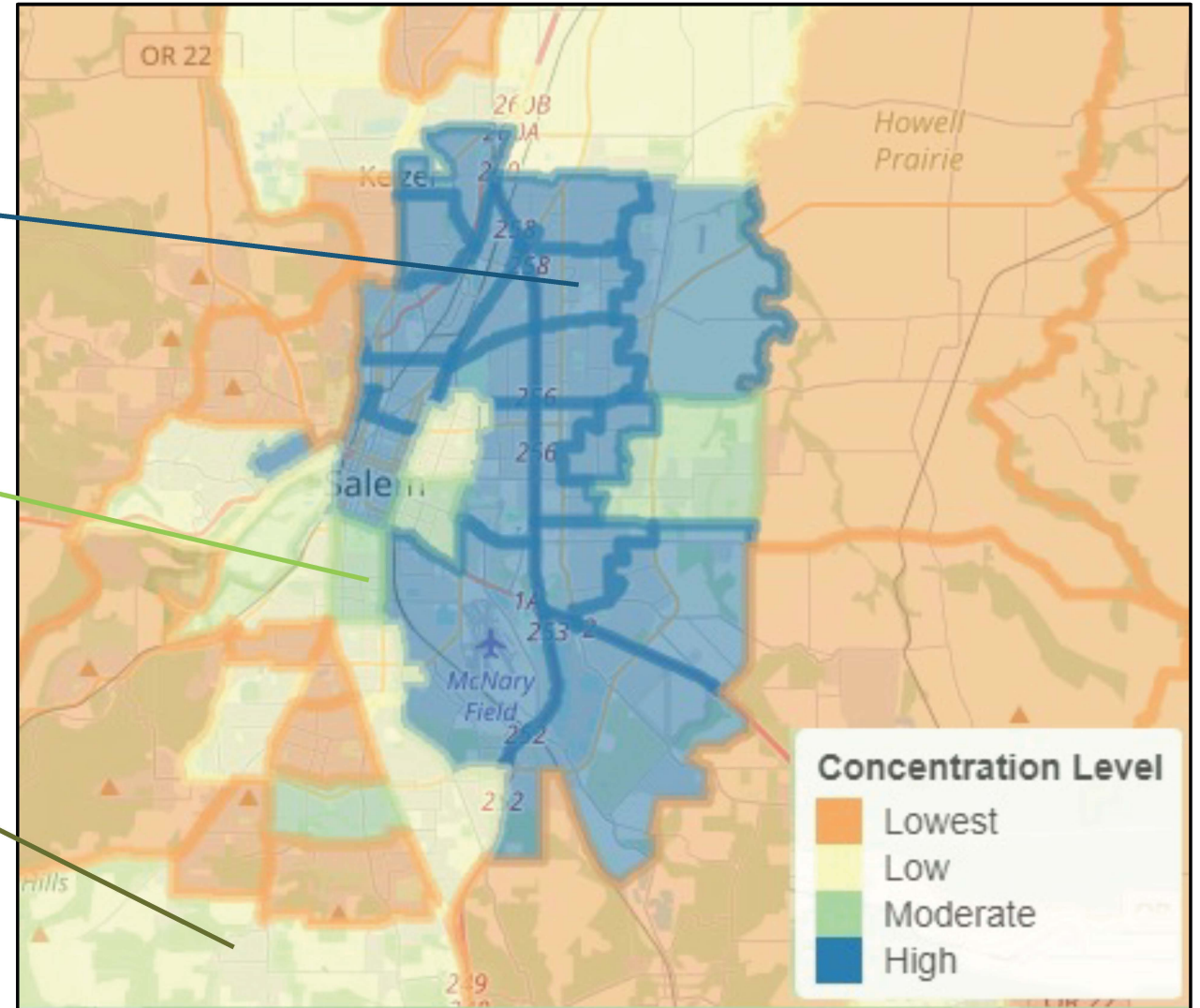
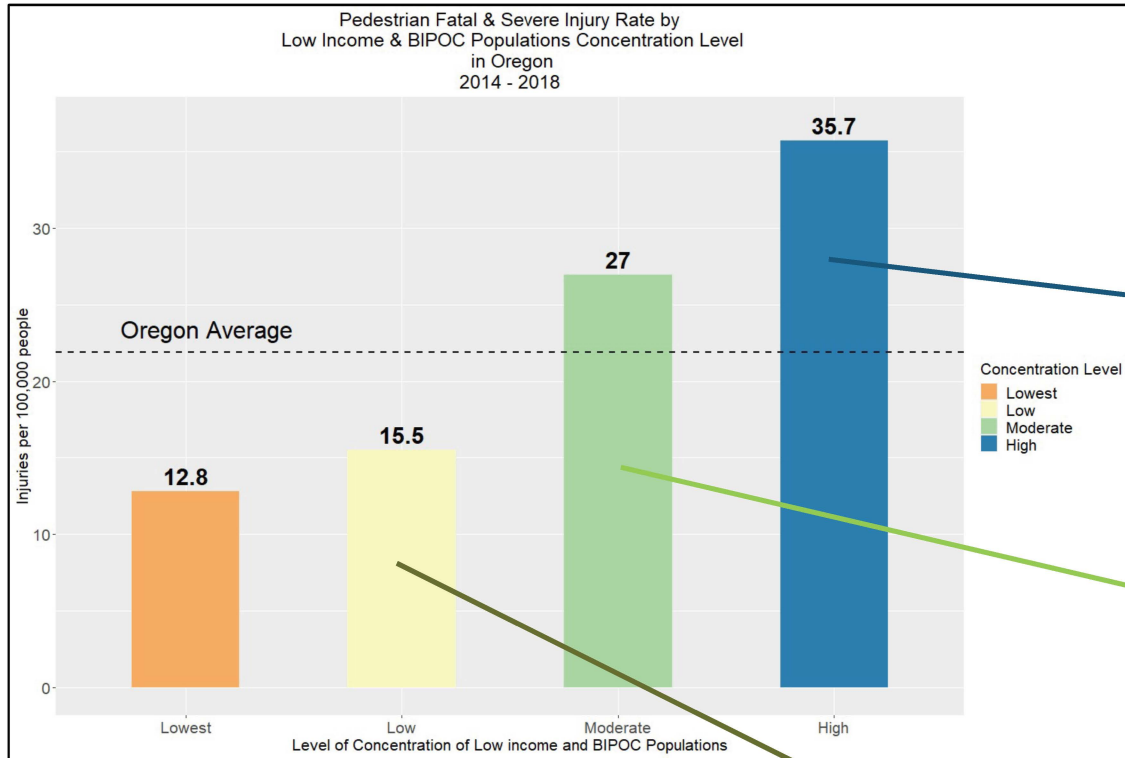
Pedestrian Fatal & Severe Injury Rate by Low Income & BIPOC Populations Concentration Level in Oregon 2014 - 2018

- 1 million Oregonians
- 195 tracts
- 25% of population
- 40% of fatal and severe pedestrian injuries
- 23% live in poverty
- 33% BIPOC

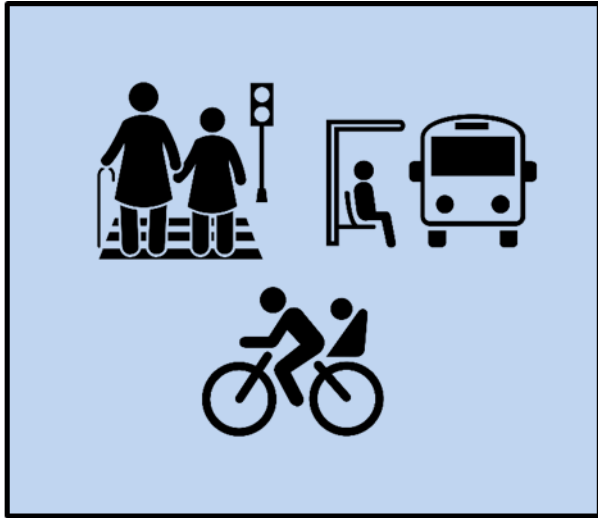
- 1.2 million Oregonians
- 240 tracts
- 28% of population
- 16% of fatal and severe pedestrian injuries
- 8% live in poverty
- 10% BIPOC



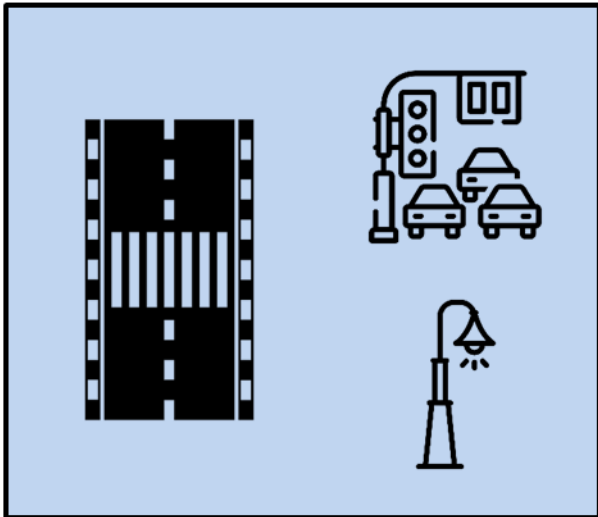
Spatial Representation of Concentration Index



Pathways to Pedestrian Injury Disparity



- **Pathway 1: More walking and transit use** in tracts with higher concentrations of low income people and Black, Indigenous, and People of Color

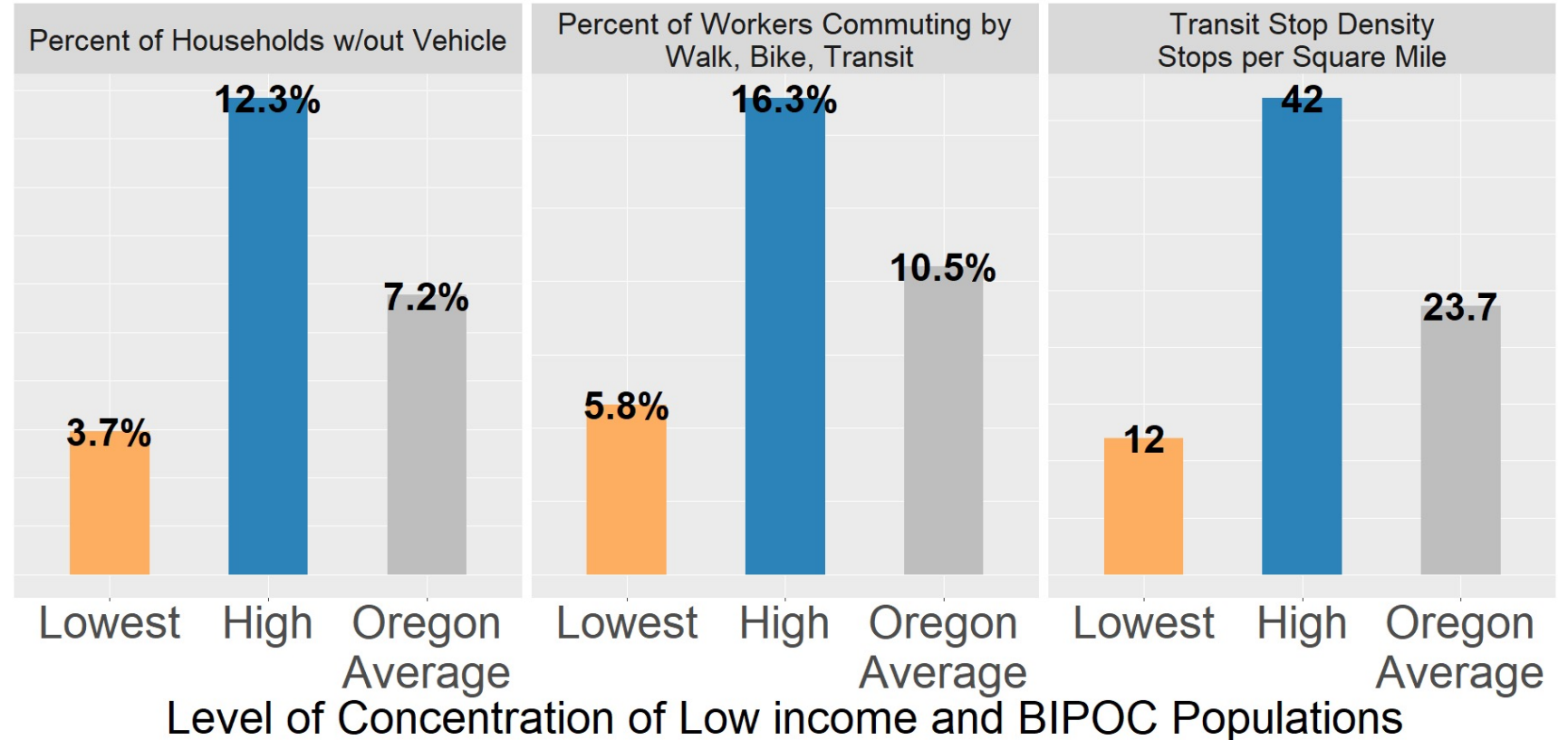
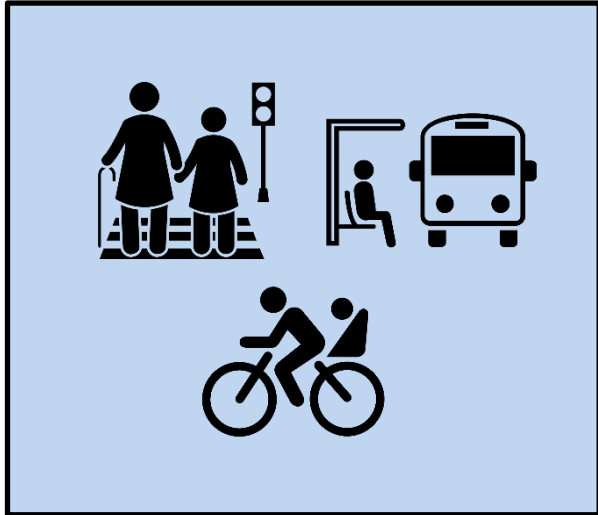


- **Pathway 2: A less hospitable environment for walking and taking transit** in tracts with higher concentrations of low income people and Black, Indigenous, and People of Color

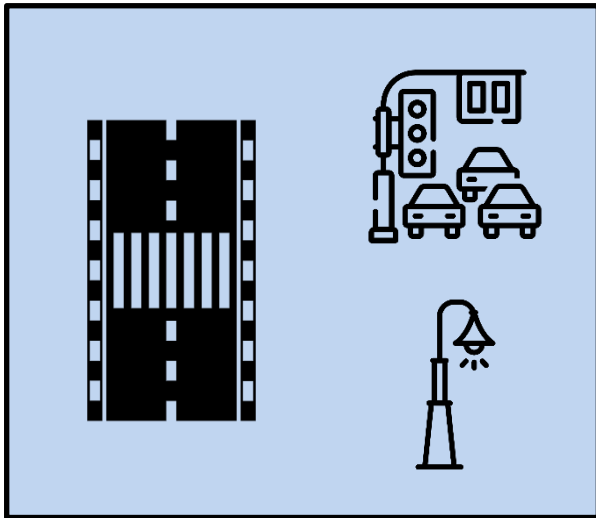


Pathway 1: More walking and transit use

use in tracts with higher concentrations of low income people and Black, Indigenous, and People of Color



Pathway 2: A less hospitable environment for walking and taking transit in tracts with higher concentrations of low income people and Black, Indigenous, and People of Color



Oregon

- Arterial vehicle volume in High Poverty & BIPOC tracts 68% higher than state average
- Density of high speed roads in High poverty & BIPOC tracts 49% than state average




Past Research

- 89% of the streets in high-income areas had completed sidewalks while only 49% of streets had complete sidewalks in lower-income neighborhoods
- 75% of streets in high-income areas have street or sidewalk lighting compared to 54% in low income neighborhoods
- 13% of streets in high income areas have marked crosswalks whereas only 7% of streets had this feature in low income areas (Gibbs et al. 2012) ¹³





Factors Associated with Pedestrian Injury









Socio Demographics

Decrease Median Income	
Black, Indigenous, People of Color (BIPOC) %	
Disabled Population %	

Legend

Increase Pedestrian Injury	
Decrease Pedestrian Injury	

Traffic Exposure and Built Environment

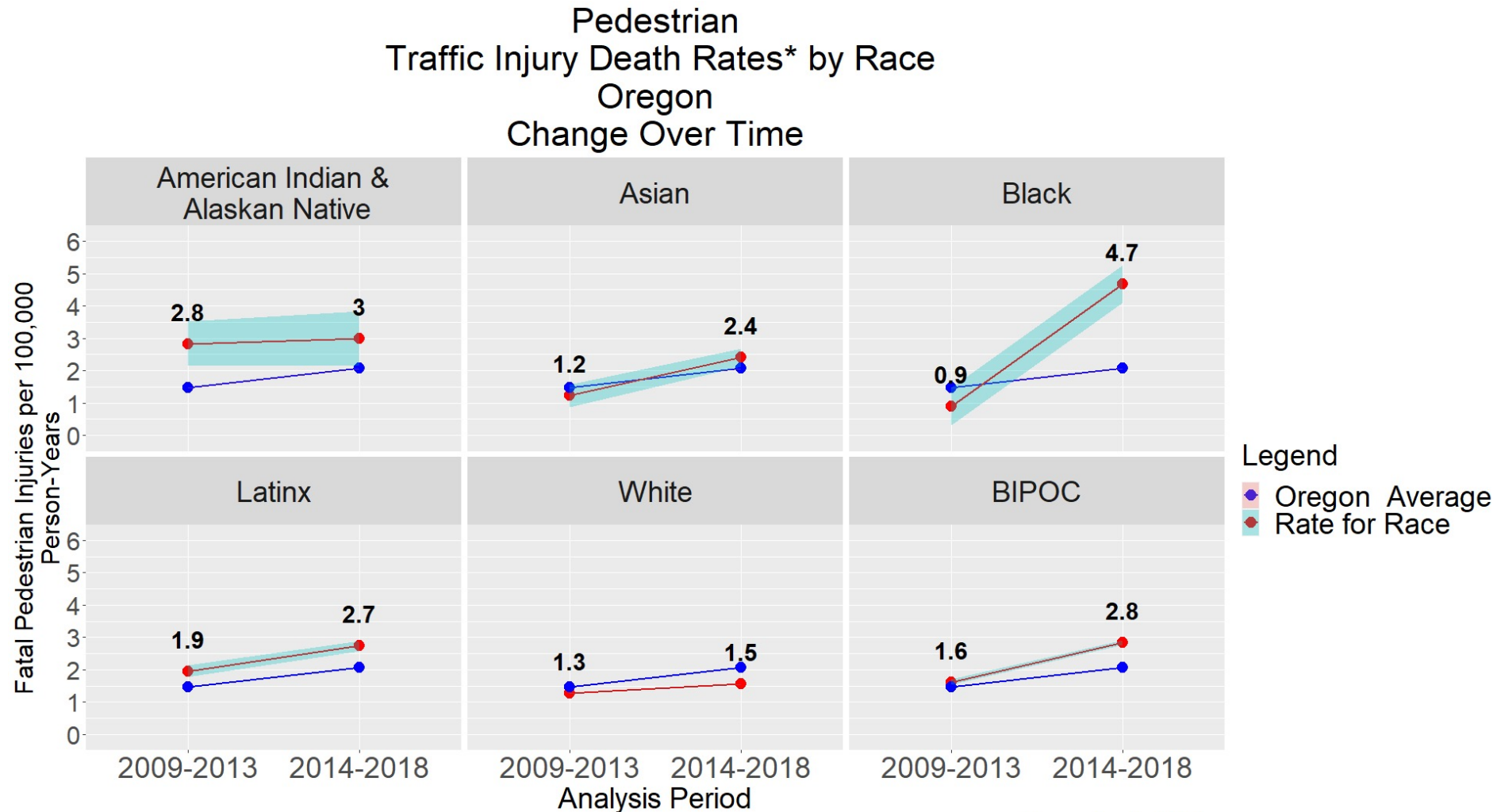
VMT on Major Arterials	
Roads Marked 35 mph	
Roads Marked 45 mph	
Arterial Lane Width	
Transit Stop Density & Workers Comuting by Transit	
Job Density	
Intersection Density	
Alcohol Establishment Density	



Have Disparities Increased or Decreased?

Fatal Injury Rates

- Increasing for everyone
- BIPOC rates grew by double the state average
- Black rates grew 3 times faster than state average



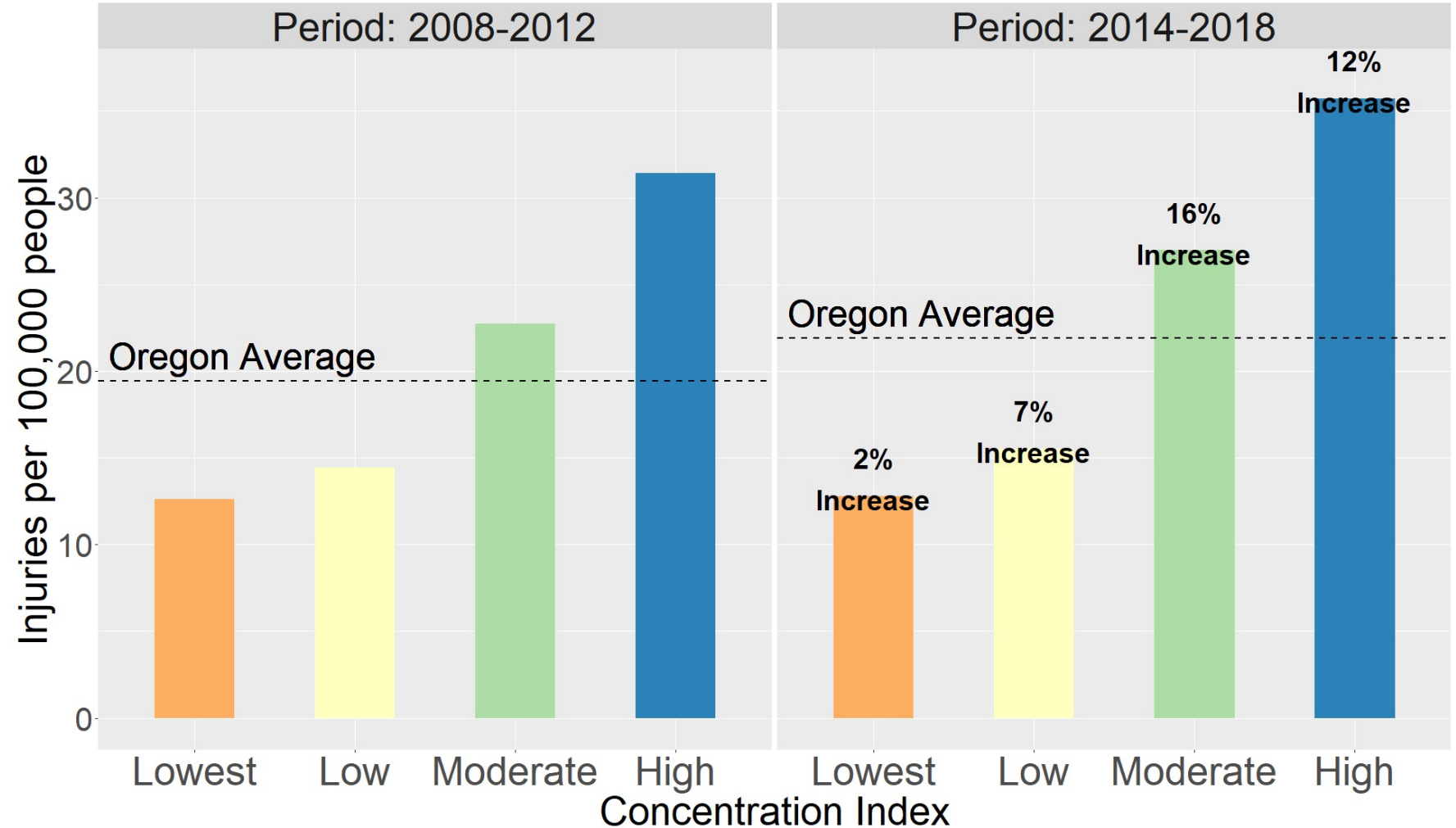
*Age-adjusted Rates
NHPI not shown due to small cell size



Have Disparities Increased or Decreased?

Index Analysis

- Pedestrian injury burden growing for everyone
- High & Moderate poverty tracts injuries grew faster than state average



Data and Methods

Data

- Data from multiple source
- No data source perfect
- All data off the shelf
- Some wrangling required

Dataset	Agency	Data Purpose					Report Chapter
		Index Analysis	Ecological Analysis	Population-based Rates	Home/Crash Location Analysis	Travel Activity	
Crash Data System (CDS)	Oregon DOT	✓	✓				Chapters 3, 6, 7, & 8
Fatal Accident Reporting System (FARS)	NHTSA			✓			Chapter 5
Oregon Emergency Medical Service Information System (OR-EMSIS)	Oregon Health Authority				✓		Chapter 7
Census	Census	✓	✓	✓	✓		Chapters 3, 6, 7, & 8
Built Environment & Traffic Exposure	ODOT; OSM; OLCC	✓	✓		✓		Chapters 3, 6, & 8
Oregon Household Activity Survey	ODOT					✓	Chapter 4



Data and Methods

Methods

- Multiple ways to measure and assess
- From simple to more sophisticated
- Data and methods available on Github

FARS Rates

- Simple
- Easy to interpret
- Employed an age-adjustment methodology common in public health

Z-Scoring Index

- Simple
- Easy to interpret
- Used just two factors in index scoring

Statistical Analysis

- More rigorous
- Harder to interpret
- Can be used to inform intervention strategy



[https://github.com/JoshRoll/
Pedestrian-
Fatal_Injury_Rate](https://github.com/JoshRoll/Pedestrian-Fatal_Injury_Rate)

[https://github.com/JoshRoll/
Pedestrian-Injury-Disparity-
Index-Analysis](https://github.com/JoshRoll/Pedestrian-Injury-Disparity-Index-Analysis)

Coming soon following peer
review



Existing Body of Research

- Past Body of Research

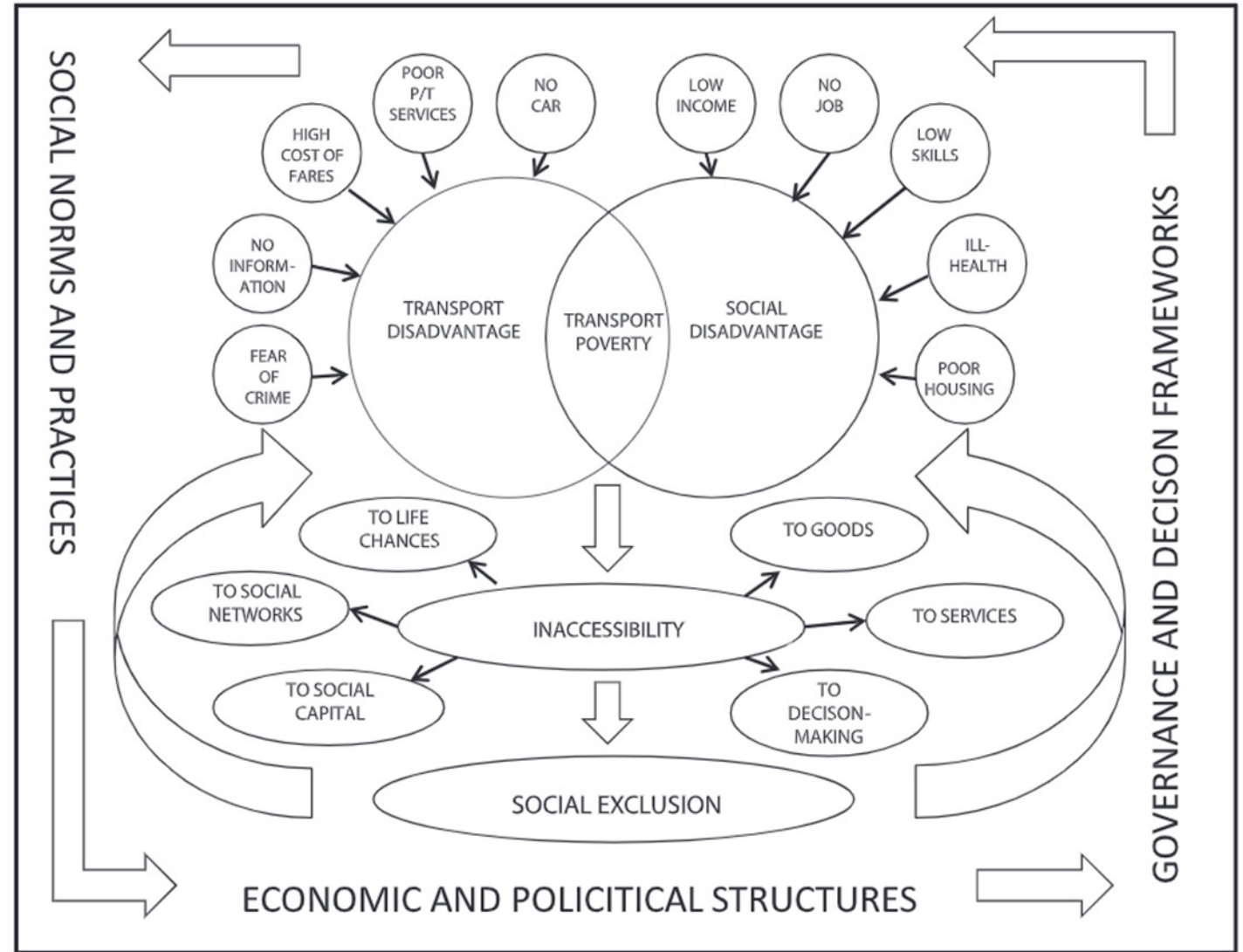
- 22 studies
- Study geographies include national, state and regional
- Unit of analysis included Census block group and tract level

Variable	Measure	Count
Socio-demographic	Higher proportion of BIPOC residents	7
	Lower median income	6
	Lower education level	3
	Non-English speaking residents	3
	Unemployment	1
Activity and Exposure	Population & employment density	8
	Walk & transit commute rates	6
	% of zero-vehicle households	3
Roadway Environment	Count of Transit Stops in area	3
	More arterial road miles	6
	Higher Speeds	5
	Motorized Traffic Volume	7



Existing Body of Research

- Jobs access – 6 to 50 times fewer jobs accessible for those without a car
 - Blumenberg & Manville (2004).
 - Cass et al. (2005).
 - Stoll (2005).
- Food access
 - Dillahunt & Veinot (2018)
 - Walker et al. (2010)
- Healthcare
 - Dillahunt & Veinot (2018).
 - Syed et al. (2013).
- Pollution
 - Adkins et al. (2017)
 - Bullard (2003).
 - Tessum et al. (2019).

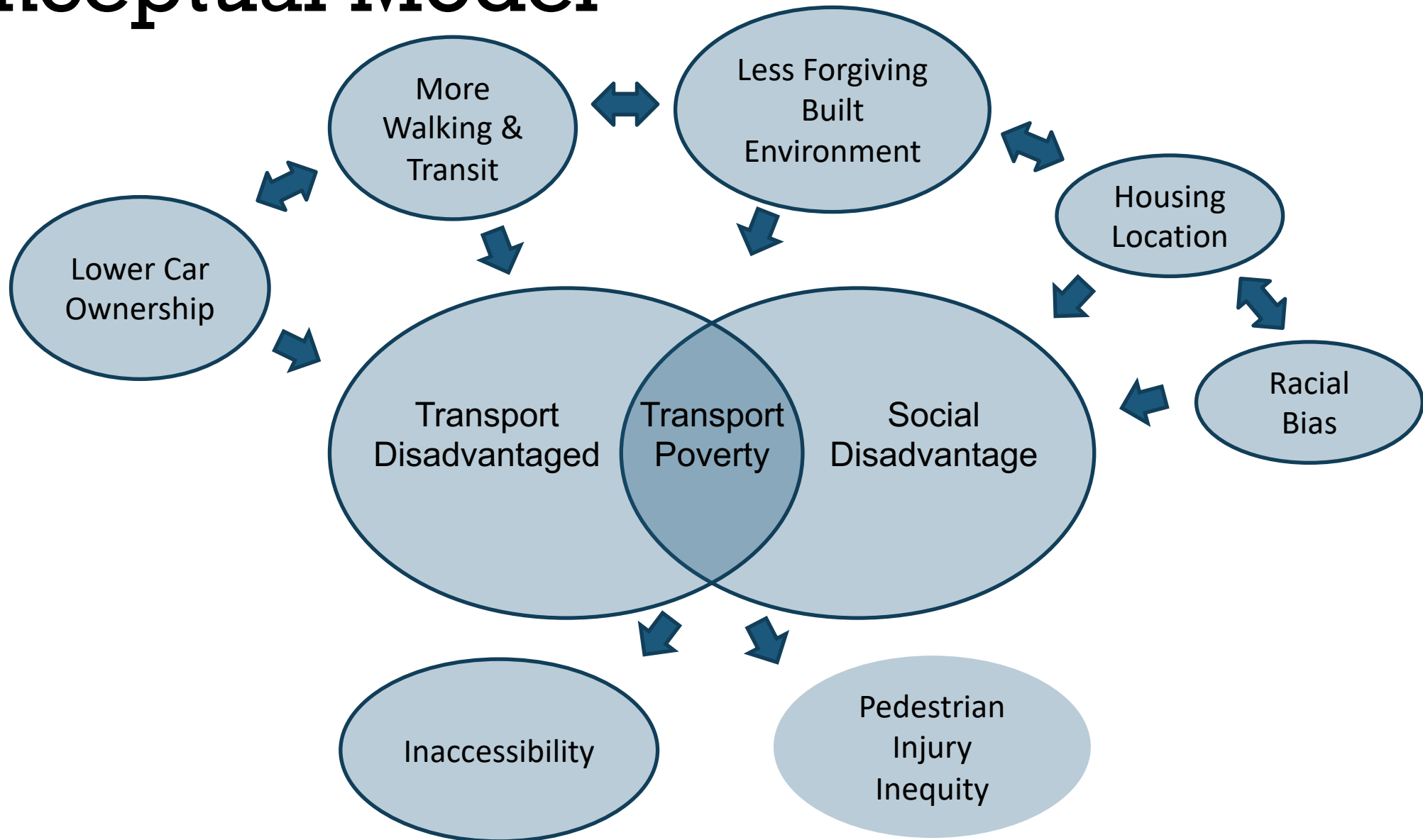


Graphic Source:

Lucas, K. (2012). Transport and social exclusion: Where are we now? *Transport Policy*, 20, 105–113.



Conceptual Model



Recommendations

Systemic Approach Update (Phase 2)

- Include direct observation of walk activity or proxies for activity (e.g. income, poverty, race, disability)

Roadway Data Collection

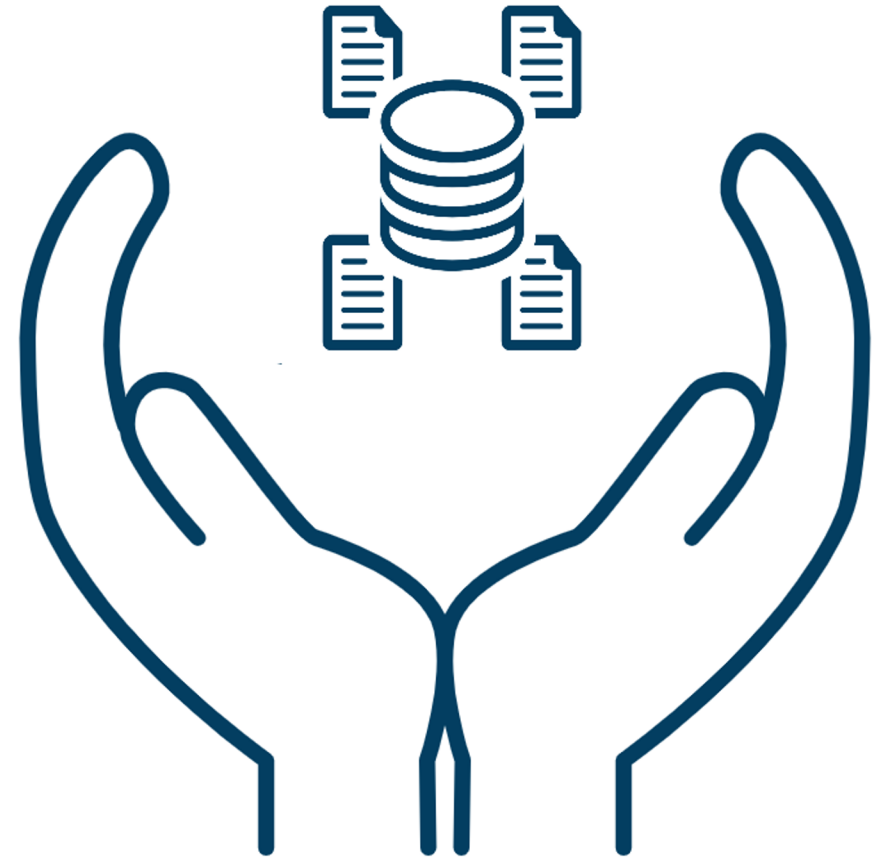
- Implement a statewide database of pedestrian infrastructure (requires a data standard and local agency support/buy-in)

Travel Activity Data Collection

- Pedestrian traffic counts program
- Travel activity survey should ensure proper representation of nonmotorized travel (and safety related data)

Crash Data Elements

- Follow Oregon Health Authority's practice on REALD for severe injuries
- Add vehicle details to vehicle crash record



Phase I Technical Report

Travel Analysis (Chap. 3)

- Compare travel behavior by race and income

Fatal Pedestrian Injury Rate Analysis (Chap. 4)

- Epidemiological evaluation of pedestrian deaths disparities
- Featured element of TSAP Tech memo

Race, Ethnicity, and Income Index (Chap. 5)

- Accessible way to measure disparities including income
- Featured element of TSAP Tech memo

OR-Emergency Medical Service Information System (Chap. 6)

- Home-incident location analysis

Census Tract Statistical Analysis (Chap. 7)

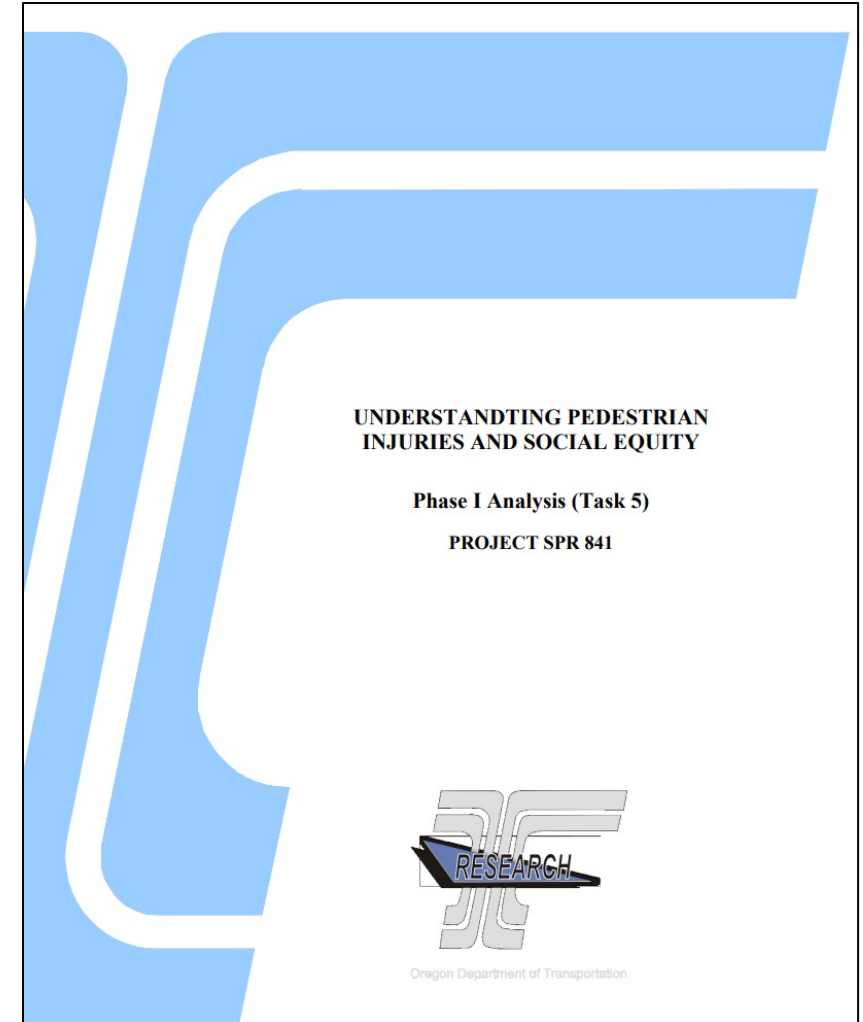
- Multivariate analysis of pedestrian injury risk factors

Report Link:

<https://www.oregon.gov/odot/Programs/ResearchDocuments/SPR%20841Injuries-Equity.pdf>

Literature Review:

<https://www.oregon.gov/ODOT/Programs/ResearchDocuments/SPR841LiteratureReview.pdf>



Questions



Questions?

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