

Addressing Data Gaps in Pedestrian Safety at Bus Stops: A Review of Datasets and Case Study of Minnesota

Allison Rewalt (arewalt@vols.utk.edu), Amelia Thomson (athomso06@vols.utk.edu), Candace Brakewood (cbrakewo@utk.edu)

Introduction

- Transit passengers are a vulnerable group of pedestrians
- Research in the US that utilizes crash data to identify safety concerns of transit passengers during the pedestrian stages of their trips remains limited [1]
- Research Question:** What types of data are currently available in the United States to analyze pedestrian safety at bus stops?

Study Method

1. Review of Transit Bus Stop-Related Safety Databases

- Crash typing frameworks
- Crash databases and additional databases not primarily focused on crashes
- National, state, and local level data

2. Case Study: “Going to or from Public Transit” Pedestrian Crashes in Minnesota

- n = 38 pedestrian crashes (2016-2023)
- Full injury severity range (KABCO)
- Descriptive analysis
- Analysis of crash narratives (crash categorization based on language used in the crash narrative)

Review of Transit Bus Stop-Related Safety Databases

Crash typing frameworks

Pedestrian and Bicyclist Crash Analysis Tool (PBCAT) [2,3]

Version 2.0 “**Commercial bus-related**”

Version 3.0 “**Transit-related**”

- transitObstructedView:** Non-motorist struck crossing in front of a bus stopped at a bus stop.
- transitOther:** Non-motorist struck while going to, from, or waiting at a bus stop.
- transitBusPullover:** Non-motorist struck by a transit bus pulling into/away from the curb or loading area

Model Minimum Uniform Crash Criteria (MMUCC) [4,5]

“**Related to a bus stop**”: crash related to the use of a location set aside for, or customarily used for, boarding and disembarking passengers onto or from a **bus of any kind** (not exclusive to transit)

National databases

1. Fatality Analysis Reporting System (FARS) (2014-2023)

- NHTSA; census of fatalities in the US; utilizes adapted PBCAT 2.0 def’n. “transit bus stop-related”; n = 216

2. Crash Report Sampling System (CRSS) (2016-2023)

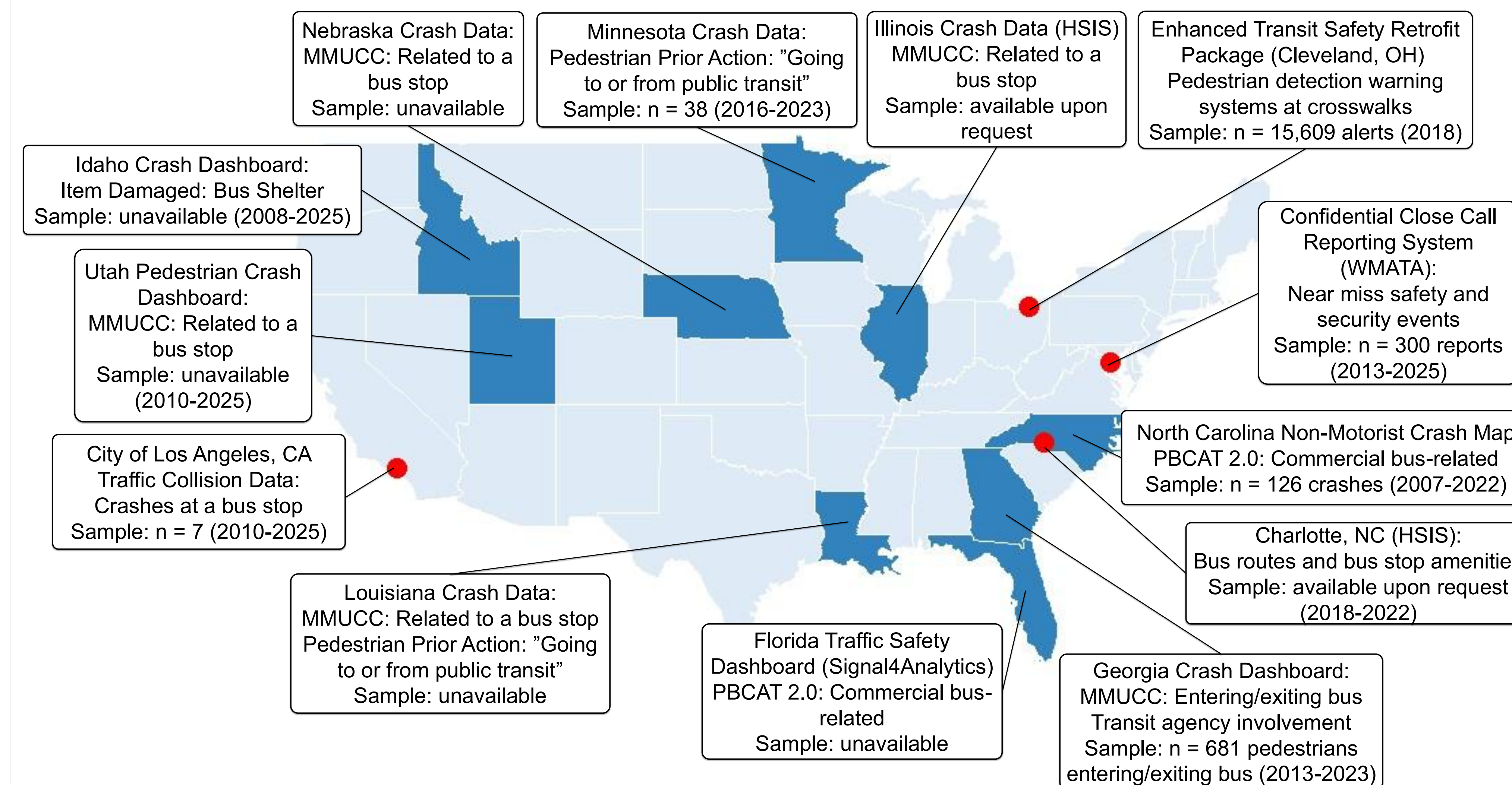
- NHTSA; survey weighted sample of crashes in the US; utilizes adapted PBCAT 2.0 def’n. “transit bus stop-related”; n = 95 (unweighted)

3. National Transit Database (NTD) – Safety & Security (2014-2024)

- FTA; agency-reported safety events occurring within transit systems, (i.e., those involving transit vehicles, facilities, or within right-of-way; n = 5,270 pedestrian-involved safety events

State and Local Databases with Transit Bus Stop -Related Information

Obtained from crash databases, data dictionaries, and crash dashboards publicly available on the internet



Case Study: Minnesota

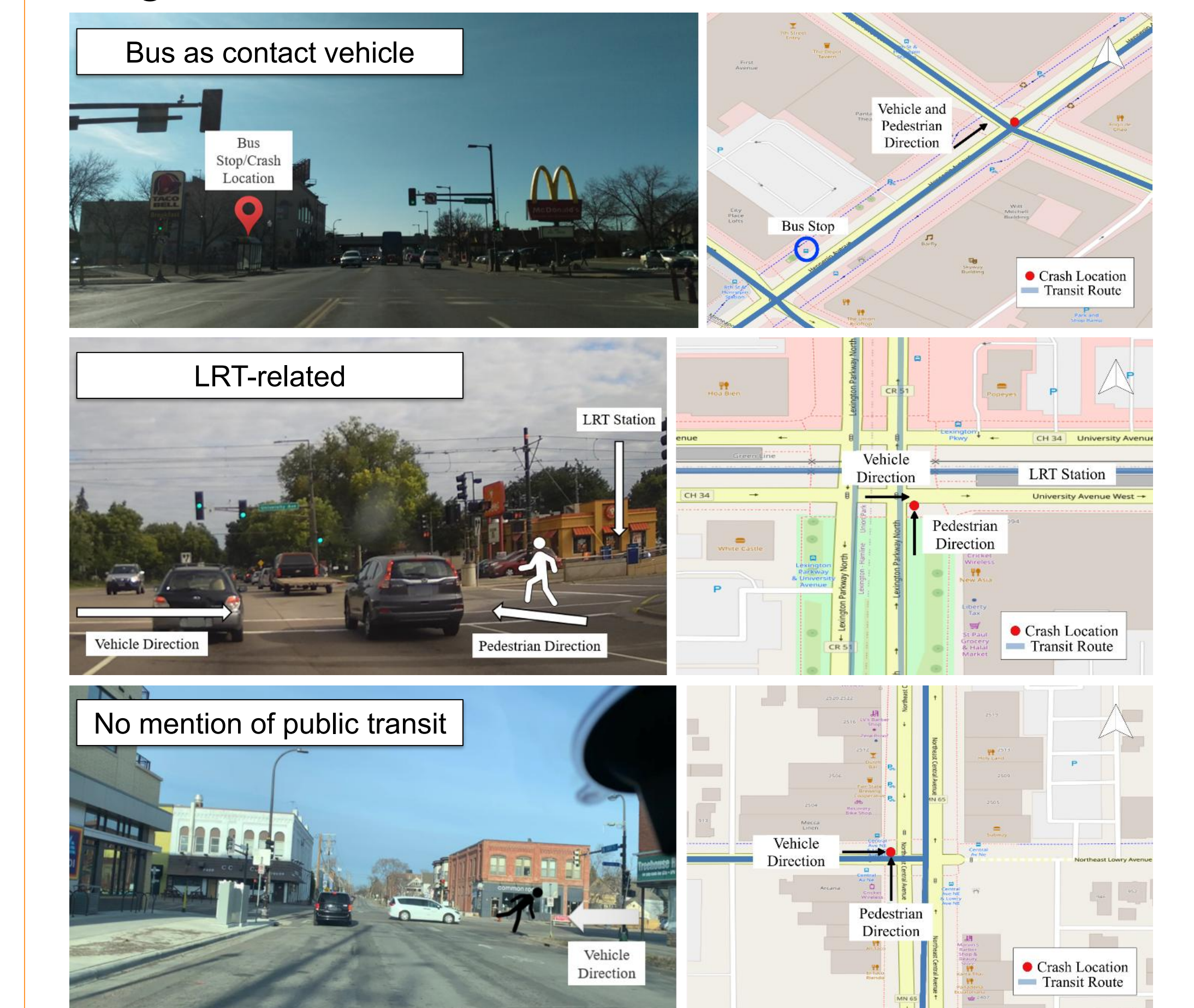
“Going to or from public transit” pedestrian crash characteristics (n = 38) [6]:

- Most crashes involved non-incapacitating (39%) and serious (29%) injuries
- Most occurred on 30-39 mph roadways (58%) and at intersections (55%)
- Darting/dashing into the roadway was the leading pedestrian circumstance (18%)

Analysis of crash narratives:

Pedestrian Accessing/Egressing from Public Transit	16 (43%)
Bus as Contact Vehicle	4 (11%)
LRT-Related	3 (8%)
Pedestrian Waiting at Bus Stop	2 (5%)
Bus Driver Witness	1 (3%)
No Mention of Public Transit	11 (30%)

Images obtained from KartaView and QGIS:



Conclusion

- Most prior research assumes correlation between pedestrian crashes near bus stops
- Limited data exists on transit bus stop-related crashes
- “Going to/from transit” pedestrian crashes in Minnesota provided a unique opportunity to study transit passenger-related crashes
- Unstructured text data, such as narratives, showed strong potential to address gaps in pedestrian safety data at bus stops

ACKNOWLEDGMENT

This research was supported by the Center for Pedestrian and Bicyclist Safety (Award No. 23UTK01) and the Dwight D. Eisenhower Transportation Fellowship Program (Award No. 693JJ32545013).

REFERENCES

- Rewalt, A., Brakewood, C., & Cherry, C. (2025). An analysis of pedestrian safety at bus stops using FARS data. *Journal of Safety Research*, 95, 147-159.
- Harkney, D.L., et al., PBCAT-Pedestrian and Bicycle Crash Analysis Tool Version 2.0. 2006, United States. Federal Highway Administration. Office of Research
- Hamilton, I., PBCAT-Pedestrian and Bicycle Crash Analysis Tool Version 3.0 [techbrief]. 2021, United States. Federal Highway Administration.
- NHTSA, Model Minimum Uniform Crash Criteria–5th Edition. 2017.
- NHTSA, MMUCC guideline: Model minimum uniform crash criteria, 6th edition. 2025.
- Minnesota Department of Transportation, Minnesota Crash Data. 2025.