

RESEARCH PROTOCOL

Title: Using Linked Police-Hospital Data for Systemic Pedestrian Safety Analysis

by

Louisville Metro Public Works

A Research Protocol

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Investigator(s) and Affiliate(s)

Name: Weijing Wang

Title: Transportation Planner II

Affiliate: Louisville Metro Public Works

Phone: 502-574-3197

E-mail: Weijing.Wang@louisvilleky.gov

Address: 444 South 5th Street, Suite 400, Louisville, KY 40202

Name: Amanda C. Deatherage, AICP

Title: Transportation Planning & Programming Supervisor

Affiliate: Louisville Metro Public Works

Phone: 502-574-6447

E-mail: Amanda.Deatherage@louisvilleky.gov

Address: 444 South 5th Street, Suite 400, Louisville, KY 40202

Title

Using Linked Police-Hospital Data for Systemic Pedestrian Safety Analysis

Abstract

Every year, nearly 40,000 people in the U.S. are killed in traffic crashes, and many more are seriously injured. Among these who lost their lives in traffic crashes, nearly 20 percent are pedestrians. Even though nationwide traffic fatalities have seen a decreasing trend in the past few years, the size and share of traffic fatalities in Kentucky (KY), particularly Louisville (i.e., Jefferson County), continue to rise. From 2018 to 2019, the number of traffic fatalities in Louisville increased by more than 20 percent from 75 to 91. More strikingly, over the last decade, the number of pedestrian fatalities in Louisville increased by more than 75 percent from 17 in 2011 to 30 in 2019. The increasing share and number of traffic fatalities in Louisville suggest immediate interventions from elected officials, decision-makers, and transportation professionals.

To address traffic safety and equity issues in Louisville, one primary step is to understand where and who experience mobility and safety challenges and are in most need of policy and funding interventions. The purposes of the current study include 1) using linked police-hospital data to identify the targeted places and/or populations at high risk for traffic fatalities/injuries and provide suggestions for developing countermeasures to reduce, eventually eliminate, the occurrence of traffic fatalities and serious injuries in Louisville, and 2) incorporating a data-driven approach to facilitate the implementation of the Vision Zero Louisville safety program and further assist elected officials, stakeholders, and transportation professionals with their decision-making in addressing Louisville's traffic safety and equity issues.

Keywords

Equity; Traffic Crashes; Vision Zero; Pedestrian Safety; Vulnerable Road Users; Linked Police-Hospital Data; Systemic Safety Analysis

Background

Transportation safety continually remains as one of the most concerning issues in the U.S. Every year, nearly 40,000 people are killed in traffic crashes, and much more are injured (FARS, NHTSA; Vision Zero Network). This traffic safety issue has been even more concerning in the state of Kentucky (KY). In the past few years, even though national traffic fatalities have seen a decrease at a constant rate of 2 percent (i.e., 37,473 in 2017, 36,835 in 2018, 36,096 in 2019), the traffic fatalities in Kentucky have increased from 724 in 2018 to 732 in 2019 (FARS, NHTSA). This increasing trend in traffic fatalities is even more striking in Louisville, the most populated and urbanized city in Kentucky. The fatality numbers in Louisville have increased by more than 20 percent from 75 in 2018 to 91 in 2019 (Kentucky State Police, <http://crashinformationky.org/>). This increasing size and share of traffic fatalities in Kentucky, particularly within Louisville, calls immediate attention to addressing local traffic safety concerns.

In the efforts of addressing traffic safety concerns, many studies suggest that vulnerable road users and/or disadvantaged populations experience a disproportionately high rate of traffic fatalities/serious injuries. Indeed, among these who lost their lives in traffic crashes, nearly 20 percent were pedestrians (FARS, NHTSA). Over the last decade, the number of pedestrian fatalities in the U.S. increased by nearly 40 percent from 4,457 in 2011 to 6,114 in 2019 (FARS, NHTSA). At the state level, in 2019, Kentucky experienced 87 pedestrian fatalities, accounting for a nearly 50 percent increase from 59 in 2011. Nearly 35 percent of pedestrian fatalities in

Kentucky (i.e., 30 out of 87) occurred in Louisville (Kentucky State Police). More strikingly, in the last few years, Louisville has seen a significant increase (more than 75 percent) in pedestrian fatalities, from 17 in 2011 to 30 in 2019 (Kentucky State Police). The increases in the share and size of vulnerable road users in traffic fatalities suggest severe equity issues that are in need of immediate attention from local agencies and transportation professionals.

Striving towards reducing traffic crashes and saving lives, Louisville Metro Public Works has proactively adopted the Vision Zero Louisville safety program (Louisville Metro Government). With the mission of eliminating traffic fatalities and serious injuries, the Vision Zero Louisville safety program 1) incorporates a data-driven approach and a systemic crash analysis process, 2) establishes a multi-agency collaborative partnership, and 3) is dedicated to ensuring a safe and equitable mobility service for every Louisvillian.

Objectives

As demonstrated above, in the past few years, the city of Louisville, KY, has experienced a rising trend in traffic fatalities, and this increase in the size and share of traffic fatalities is disproportionately high among pedestrians. To address traffic safety and equity concerns in Louisville, conducting a comprehensive and systemic crash study, with the purposes of identifying the targeted places and/or populations with a high risk of traffic crashes and the factors that significantly contribute to the occurrence of traffic crashes, is a preliminary step in successfully implementing the Vision Zero program safety in Louisville.

Therefore, the objectives of the current study with a focus on Louisville consist of 1) incorporating hospital data into crash analysis to understand the equity issues in traffic crashes among disadvantaged populations and/or vulnerable road users, 2) identifying the gaps of relying solely on police-reported crash data in addressing traffic safety concerns, 3) developing a process to generate linked police and hospital data to more precisely understand traffic safety and equity issues, and 4) facilitating the development of collaborative relationships between Louisville Metro Government and University of Louisville Health, to effectively and/or efficiently address Louisville's traffic safety and equity issues.

Literature Review

Increasing numbers of research and practices suggest the concerns of relying solely on police-reported crash data in traffic safety analyses and the needs of improving the quality and reliability of police-reported crash data (Noland et al., 2017; Sandt et al., 2020). In a recent study in North Carolina by Sandt et al. (2020), the authors compared three data sources, police-reported crashes, emergency department visits, and death certificates, in the efforts of addressing pedestrian fatalities and/or injuries. The study results suggest that pedestrian crashes are much likely unrepresented by police-reported crash data (Sandt et al., 2020), indicating the urgency and significance of seeking alternative data sources and/or methodologies in appropriately representing traffic safety and equity issues among vulnerable road users.

In previous efforts on the topic, a growing number of researchers/scholars turn to linked police-hospital data to understand the pros and cons of each data source and identify safety and equity issues experienced by disadvantaged populations and/or vulnerable road users (Aryan et al., 2021; Sandt et al., 2020). The research results, in general, suggest that incorporating hospital data in traffic crash analyses provides some insights on whether, and to what extent, disadvantaged populations and/or vulnerable road users are underrepresented in crash analysis outcomes that rely

solely on police-reported crash data. In addition, prior studies using linked police-hospital data also suggest that traffic injuries and associated in-hospital treatments obtained from hospital data (e.g., trauma data) play a role in explaining what factors might contribute to the occurrence of traffic fatalities and/or injuries to a certain degree (Aryan et al., 2021).

Therefore, the current study aims to link police-reported crash data by Kentucky State Police to the hospital data available from University of Louisville Health to understand the main contributors of traffic crashes that occurred in Louisville. The reasons to conduct the current study are expansive. First, compared to relevant research in other areas of the country, the current study focuses on traffic crashes in the city of Louisville (i.e., Jefferson County), and the results will provide direct recommendations to elected officials and stakeholders in Louisville, including Louisville Metro Government, in terms of addressing local traffic safety and equity issues. Second, compared to the study by Aryan et al. (2021) in Jefferson County, Kentucky, the current study aims to use a nine-year study period (from 2011 to 2019¹) instead of a nine-month data in Aryan et al.'s (2021), which will provide a larger dataset to the current study in exploring the patterns of traffic crashes in Louisville.

Methodology

With research background and objectives demonstrated, the current study explores and/or potentially answers the questions of which communities and/or population groups experience a high risk of traffic crashes and what transportation-relevant countermeasures could be developed to reduce, and eventually eliminate, the occurrence of traffic fatalities and serious injuries in Louisville. To do so, building off Sandt et al.'s (2020), the current study aims to first conduct a comparative analysis of pedestrian crashes using police-reported data and hospital data. Also, with the preliminary results on the discrepancies of crash analysis outcomes using different datasets, the current study will assess the feasibility of connecting police-reported data with hospital data to systemically understand the primary contributors of pedestrian crashes and the equity issues in traffic crashes among pedestrians in Louisville, Kentucky. Table 1 in Appendix is a list of the proposed attributes in the hospital data that could facilitate the success of the current study (will be revised as needed).

Implications

The implications of the current study are significant and far-reaching. First, with a study area focusing on the city of Louisville, Kentucky, the research outcomes could be directly used to facilitate the implementation of the Vision Zero Louisville safety program and assist elected officials, stakeholders, and transportation professionals in Louisville with their decision-making in addressing local traffic safety and equity concerns. Second, the results on the discrepancies in crash analysis outcomes between police-reported data and hospital data could provide some suggestions on whether and how local police departments and hospital centers could work collaboratively to improve Louisville's crash data quality. Third, as mentioned by Sandt et al.'s (2020), relevant research on using linked police-hospital to understand the traffic safety and equity issues among pedestrians is fairly limited, and the current study could be a leading work in the field. Fourth, with increasing numbers of local agencies that proactively adopt the Vision Zero safety policy in their jurisdictions, the current study could be a promising example for other agencies in terms of incorporating data-driven and data visualization approaches in addressing

¹ This study does not include crash data in 2020 because of the impact of Covid-19 on police-reported crash data.

local traffic safety and equity concerns, particularly among vulnerable road users and/disadvantaged populations.

Appendix

Table 1. Proposed Attributes from Hospital Data.

EMS incident ID	Age	Gender	Race	Ethnicity	Height	Weight	EMS Service
Insurance Type	Arrival Date & Time	Comorbidities	Mechanism of Injury	Admission Date & Time	Length of Stay	ICU Length of Stay	Minutes Spend in Emergency Department
Injury Severity Score	Emergency Department Disposition	Days on Vent	Injury Listing	Protective Devices	Position in Vehicle	1st Scene Glasgow Coma Scale	1st Scene Systolic Blood Pressure
1st Scene Respiratory Rate	Low Scene Glasgow Coma Scale	Low Scene Systolic Blood Pressure	Low Scene Respiratory rate	1st UofL Hospital Glasgow Coma Scale	1st UofL Systolic Blood Pressure	1st UofL Scene Respiratory Rate	Low UofL Hospital Glasgow Coma Scale
Low UofL Systolic Blood Pressure	Low UofL Scene Respiratory Rate	Dispatched Time	On Scene Time	At Patient Time	Depart Scene Time	At Destination Time	Incident Closed Time
Scene Mileage	Destination Mileage	Loaded Mileage	Total Mileage	Type of Response Delay	Type of Scene Delay	Type of Transport Delay	Type of Dispatch Delay
Address	Disposition	Requested By	Transported to Destination	Ethnicity	Primary Impression	Secondary Impression	Chief Complaint
Secondary Complaint	Pregnant	Injury Primary	Injury Detail	Barriers to Care	Alcohol Drug Usage	Protocol Used	Patients Level of Distress
Extrication Required	Estimated Speed (Mph)	Air Bag Deployment Status	Extrication Time	Vehicle Type	Patient Moved from Scene to Ambulance Method	Patient Position During Transport	Patient Moved from Ambulance to Destination Method

Source: University of Louisville

Notes: The attributes in black come from the trauma data; the attributes in orange come from the EMS run/patient care report.

References

Aryan Hosseinzadeh, Abolfazl Karimpour, Robert Kluger, Raymond Orthober (2021). Data Linkage for Crash Outcome Assessment: *Linking police-reported crashes, emergency response data*, and trauma registry records.

Fatality Analysis Reporting System (FARS), National Highway Traffic Safety Administration (NHTSA), United States Department of Transportation.

Kentucky State Police. <http://crashinformationky.org/>

Louisville Metro government. <https://louisvilleky.gov/government/vision-zero-louisville>

Noland, R. B., Sinclair, J. A., Klein, N. J., & Brown, C. (2017). How good is pedestrian fatality data? *Journal of Transport & Health*, 7, 3–9. <https://doi.org/10.1016/j.jth.2017.04.006>

Sandt, L. S., Proescholdbell, S. K., Evenson, K. R., Robinson, W. R., Rodríguez, D. A., Harmon, K. J., & Marshall, S. W. (2020). Comparative analysis of pedestrian Injuries Using police, emergency department, and death certificate data sources in North Carolina, U.S., 2007–2012. *Transportation Research Record: Journal of the Transportation Research Board*, 2674(9), 687-700. doi:10.1177/0361198120931504

Vision Zero Network. <https://visionzeronetwork.org/about/what-is-vision-zero/>