

A Decade of Micromobility Injuries in Europe: Demographic and Temporal Trends

Koliou Paraskevi*, Eleni Maria Theodoraki, Armira Kontaxi and George Yannis

National Technical University of Athens, Department of Transportation Planning and Engineering, Athens, Greece

Introduction

Micromobility has emerged as a prominent mode of transport across urban environments in Europe, offering flexibility, sustainability, and affordability. Despite this prominence, the safety implications of increased micromobility use, particularly concerning injury severity and contributing factors, remain under-explored.

This study provides a **descriptive statistical overview** of micromobility-related injuries in Europe spanning the period from 2013 to 2023. The focus is on analyzing annual trends in injury types and the influence of user demographics, environmental conditions, and contextual elements. The ultimate objective is to inform safer urban mobility policies through a better understanding of these injury patterns.

Objectives

- The overarching **objective** of this research is to inform safer urban mobility policies through a better understanding of injury patterns.
- Specific goals of the study include:
- Providing a Descriptive Overview:** The study provides a descriptive statistical overview of micromobility-related injuries across Europe covering the period from 2013 to 2023.
 - Investigating Trends and Influences:** It focuses on annual trends in injury types and investigates the influence of contextual elements, environmental conditions, and user demographics.
 - Supporting Tailored Policy:** The findings support the need for tailored safety policies. The analysis suggests that differentiated strategies may be needed based on usage context, age group, and location, particularly targeting middle-aged, urban, and male users.
 - Future Research Focus:** Objectives for future research involve focusing on predictive models and cross-modal comparisons to further enhance urban mobility safety

Methodology

- Data Source:** The methodology used standardized traffic accident data sourced from a multi-country European database.
- Timeframe:** The data covered an 11-year period, from 2013 to 2023.
- Data Aggregation:** Data were gathered and aggregated from annual Excel files.
- User Filtering:** The data were filtered to include only micromobility users. Specifically, this included pedal cycle and moped users.
- Sample Size:** The annual sample sizes were consistently large, ranging approximately from 59,500 to 69,000, ensuring robust comparability across years.

Injury outcomes were classified into three main categories:

- Fatalities (recorded at 30 days).
- Serious Injuries (as reported).
- Slight Injuries.

Analysis Steps

1. Data Collection and Preparation

- Aggregation and Filtering:** Data was collected from annual Excel files and specifically filtered to include only micromobility users, encompassing pedal cycle and moped users.
- Categorization:** Injury outcomes were strictly categorized into three levels: fatalities (measured at 30 days), serious injuries (as reported), and slight injuries.

2. Primary Statistical Analysis

Descriptive statistics were computed per year to establish a foundational overview of injury severity trends, which involved:

- Calculating the count, mean, and standard deviation (std) for fatally injured, seriously injured, and slightly injured users for each year from 2013 through 2023. Annual sample sizes used for these computations ranged from approximately 59,500 to 69,000.
- Year-on-year percentage changes were also calculated for all three severity types to reveal the volatility in injury trends over time.

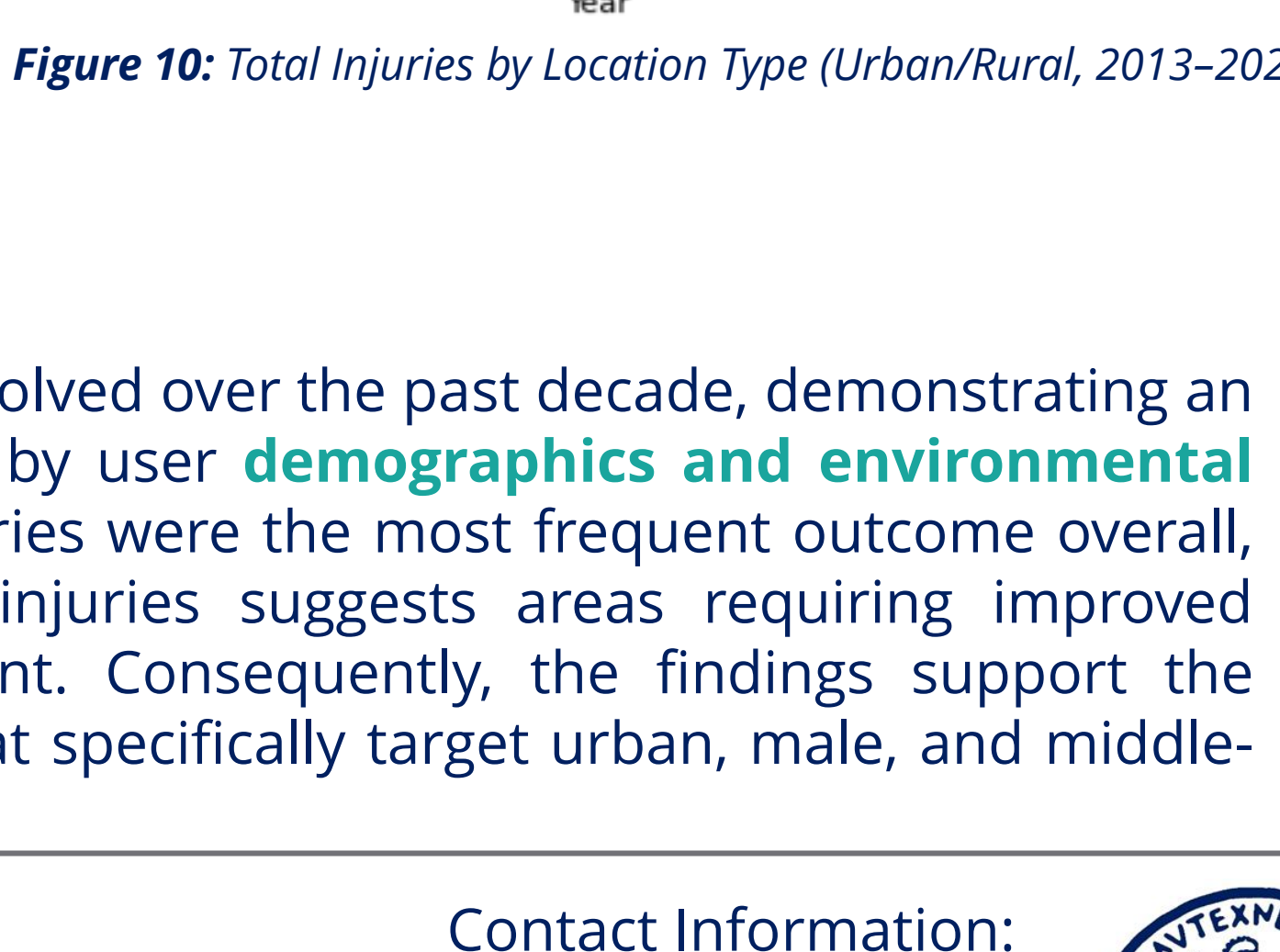
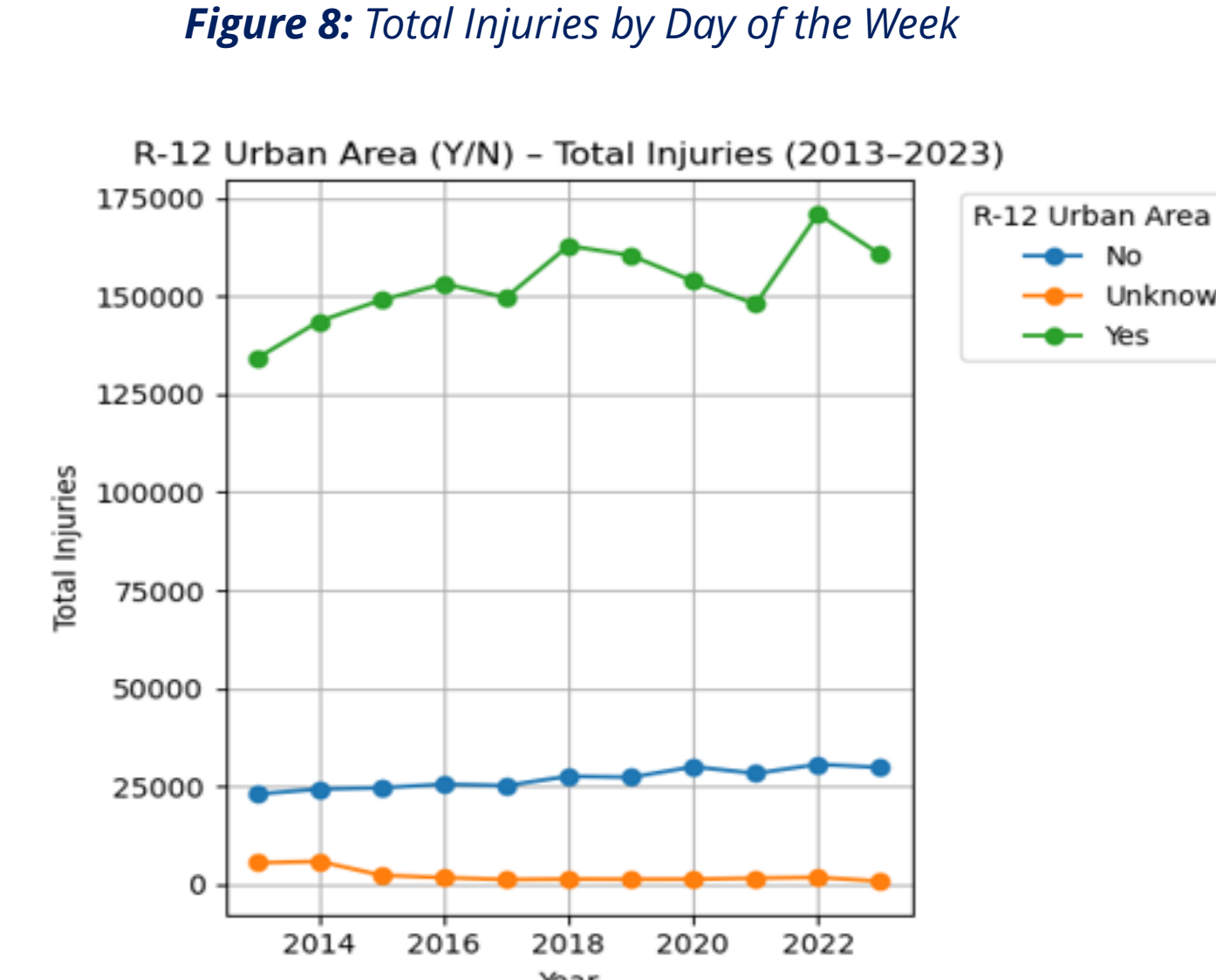
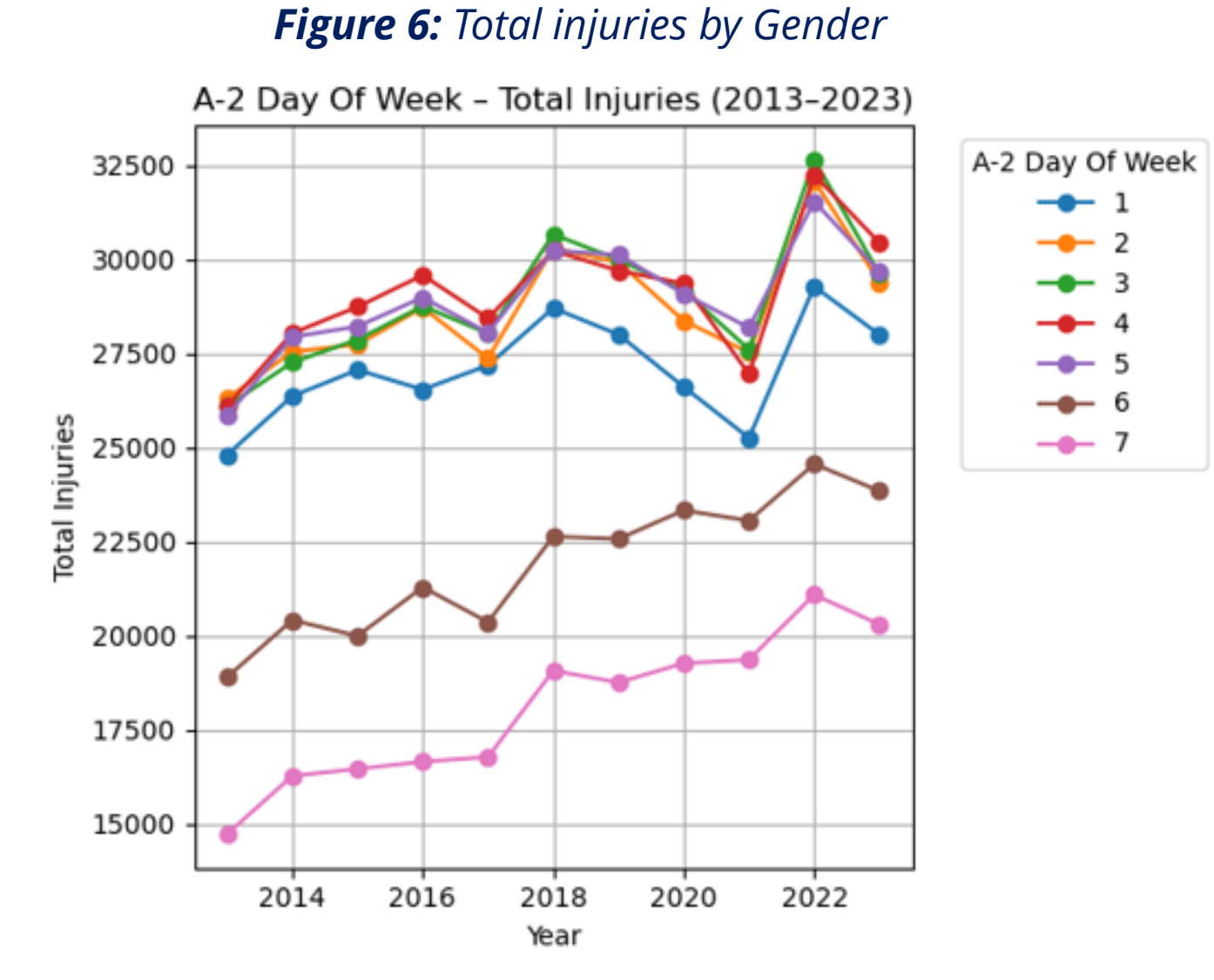
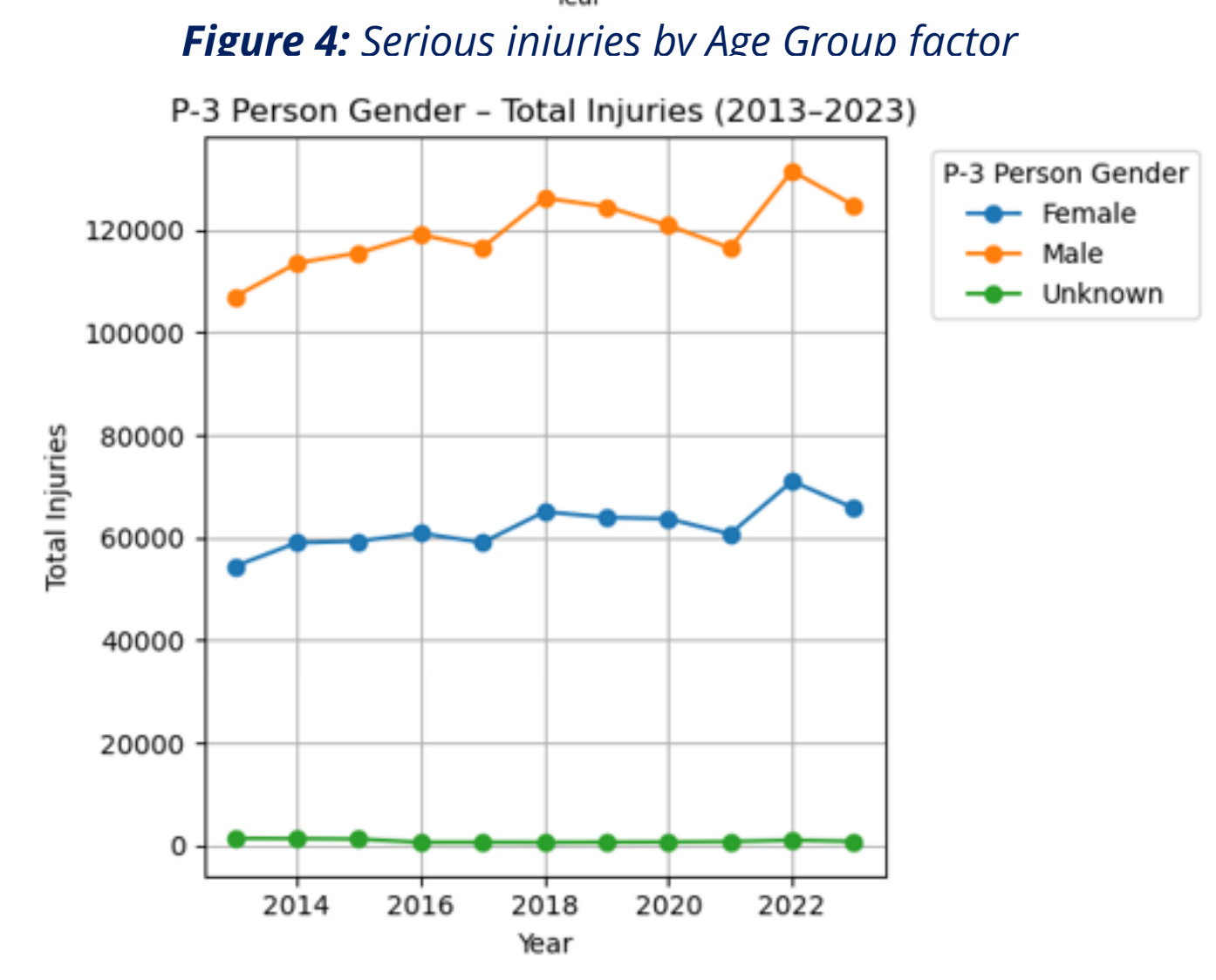
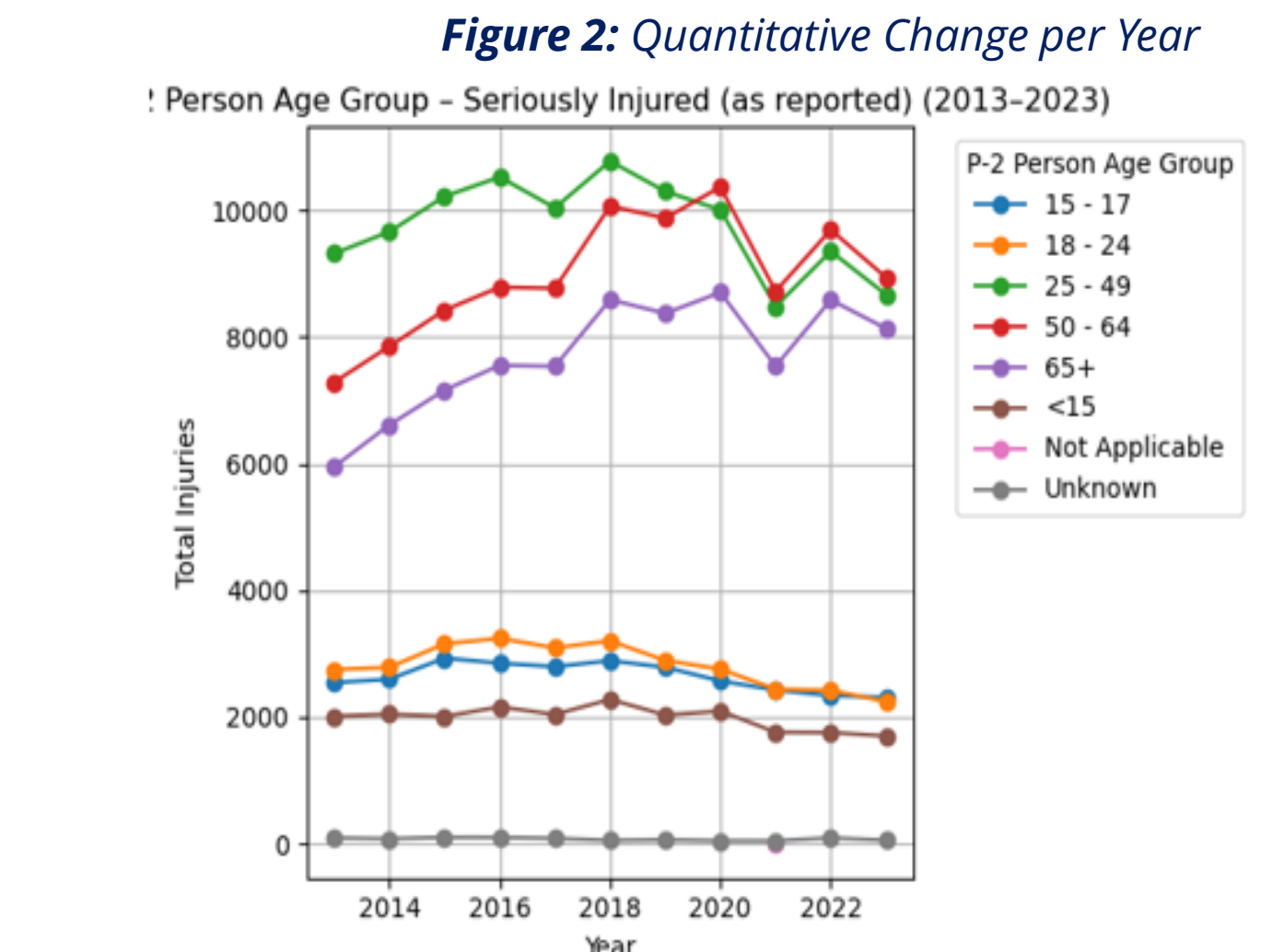
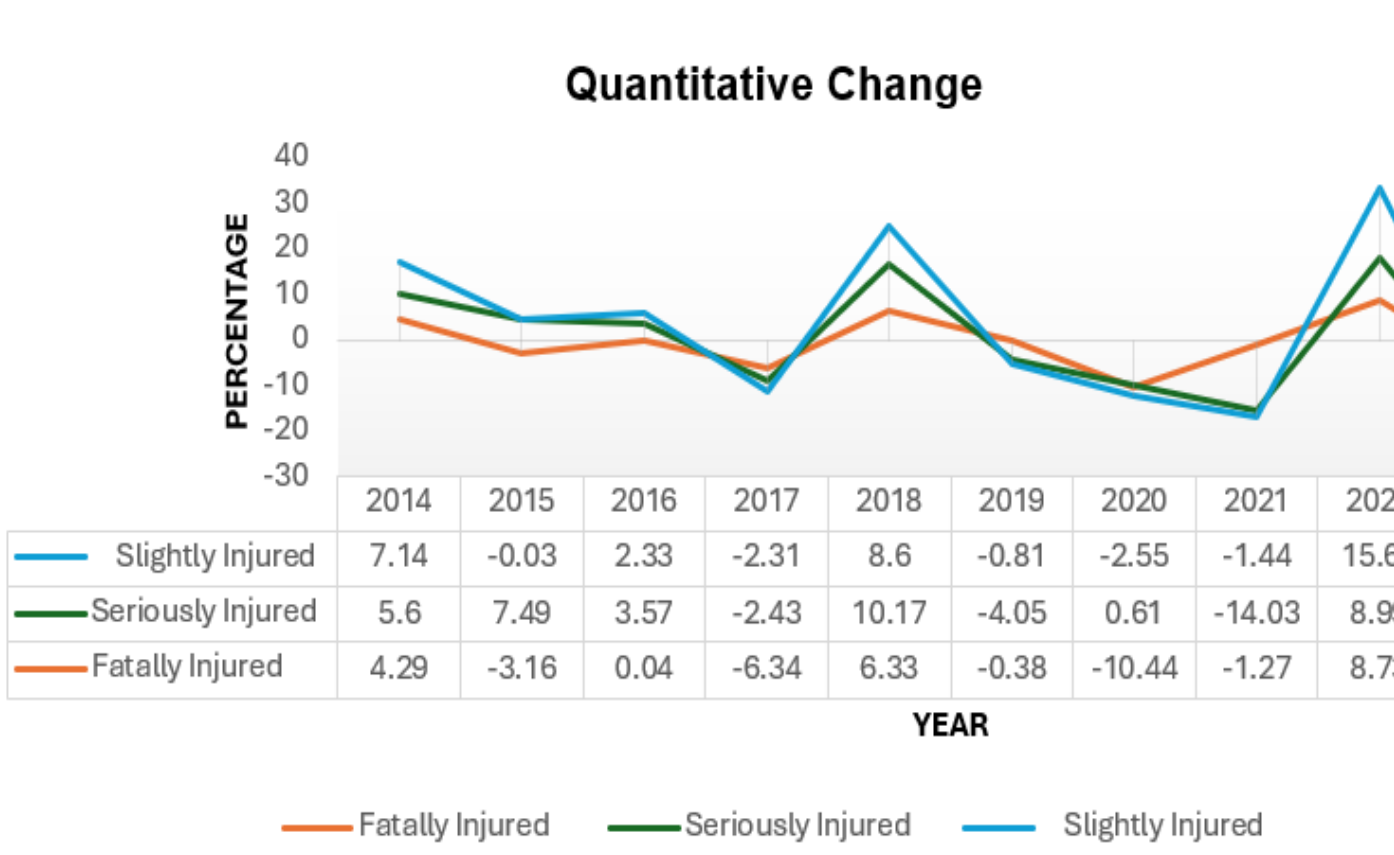
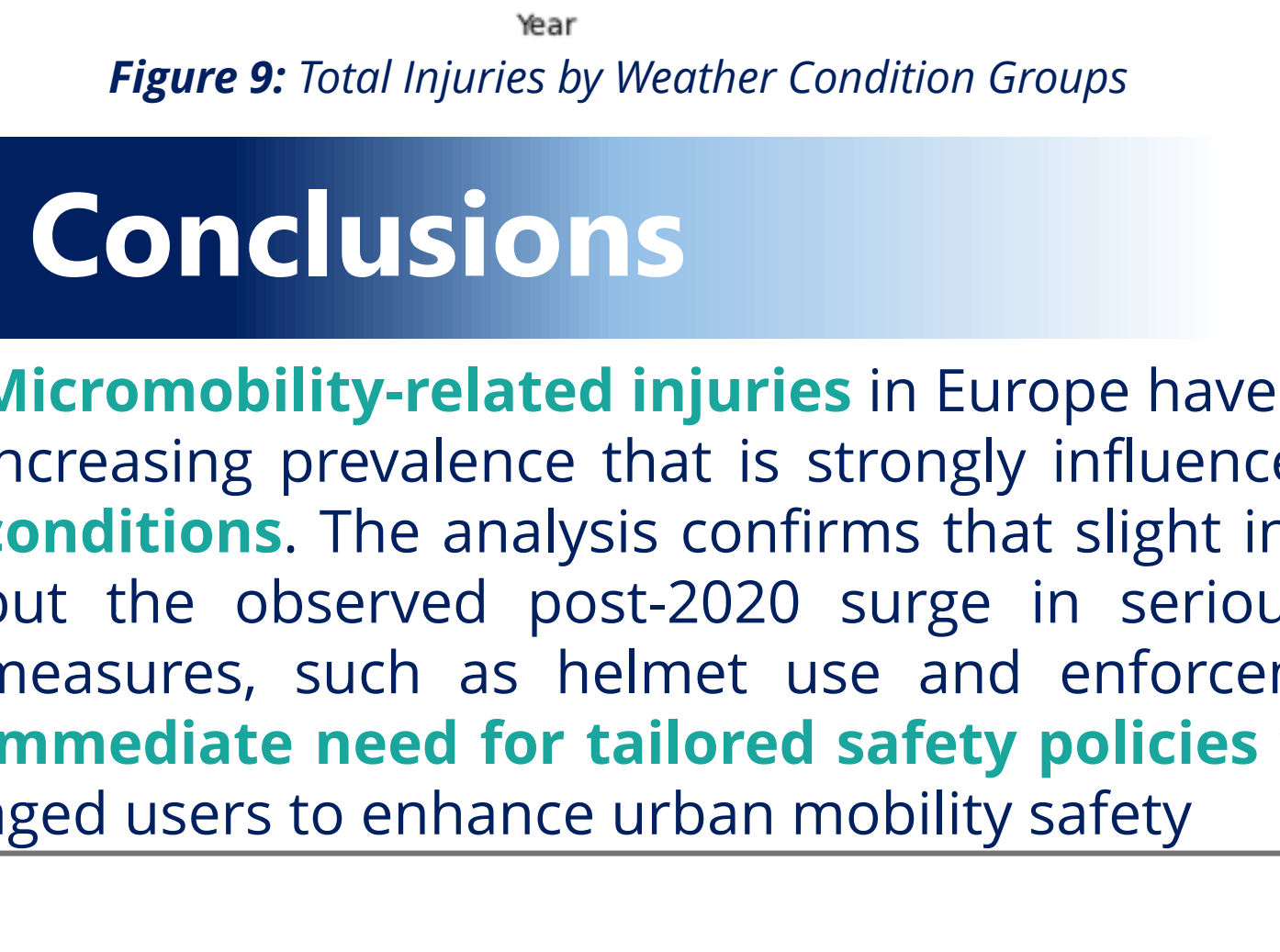
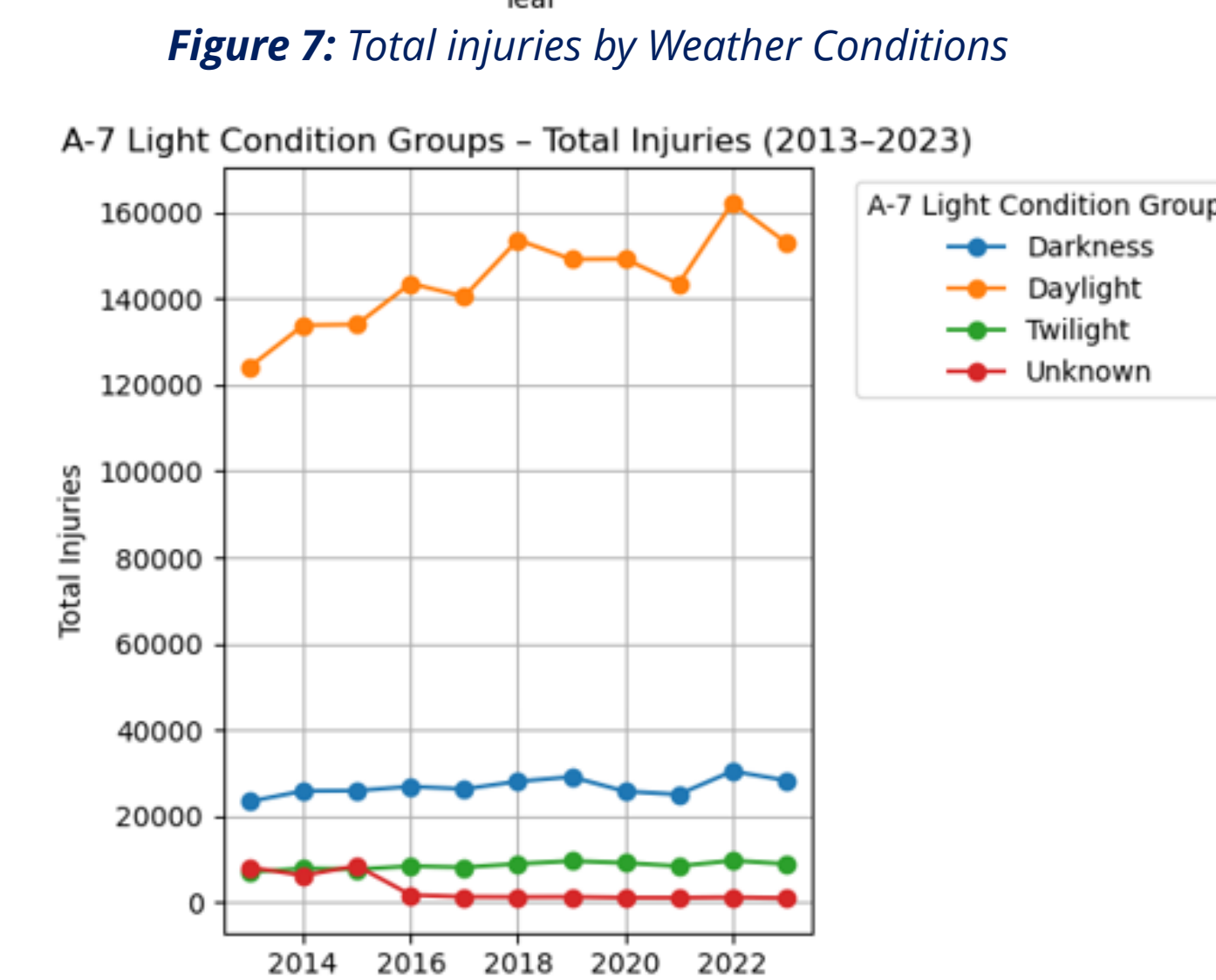
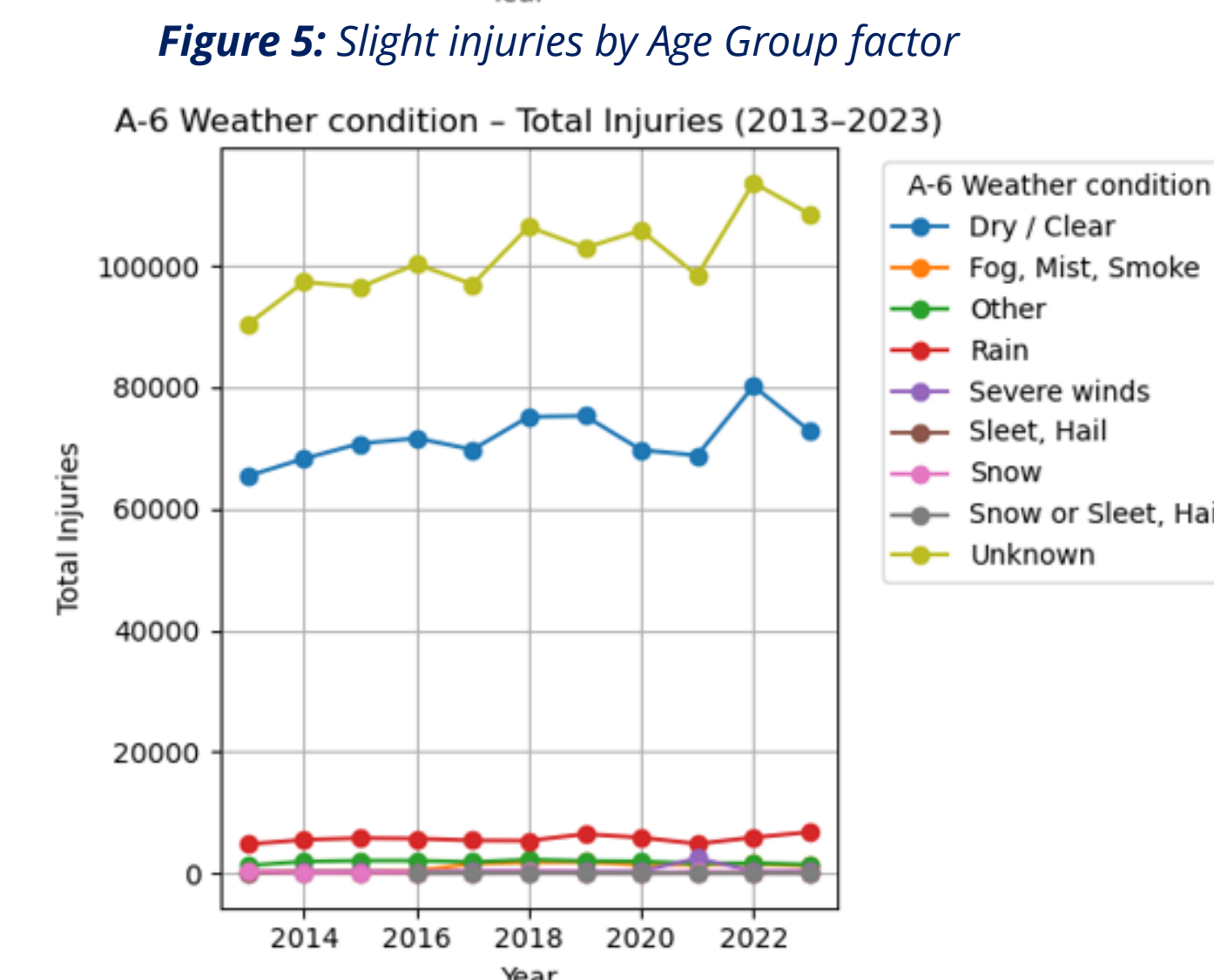
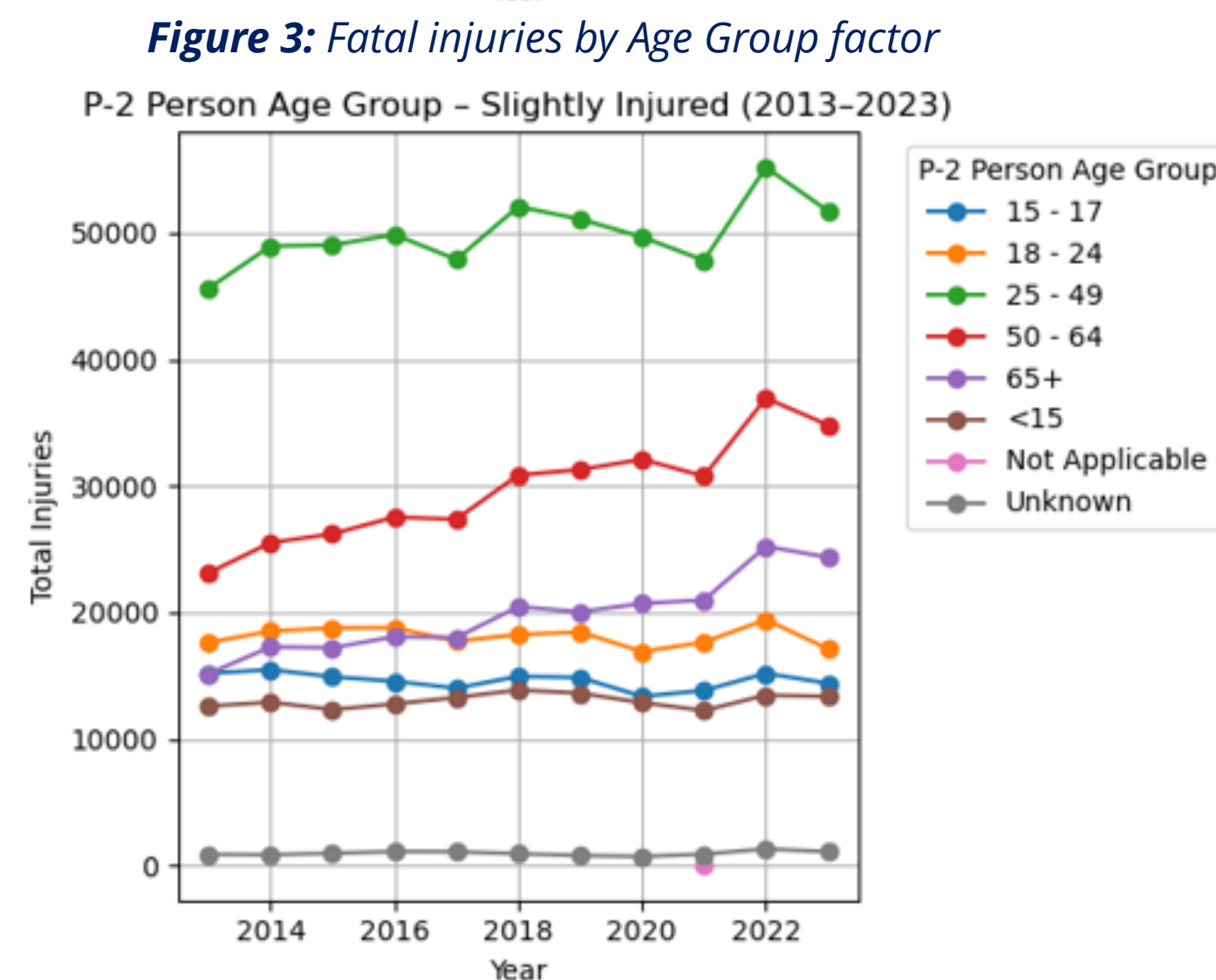
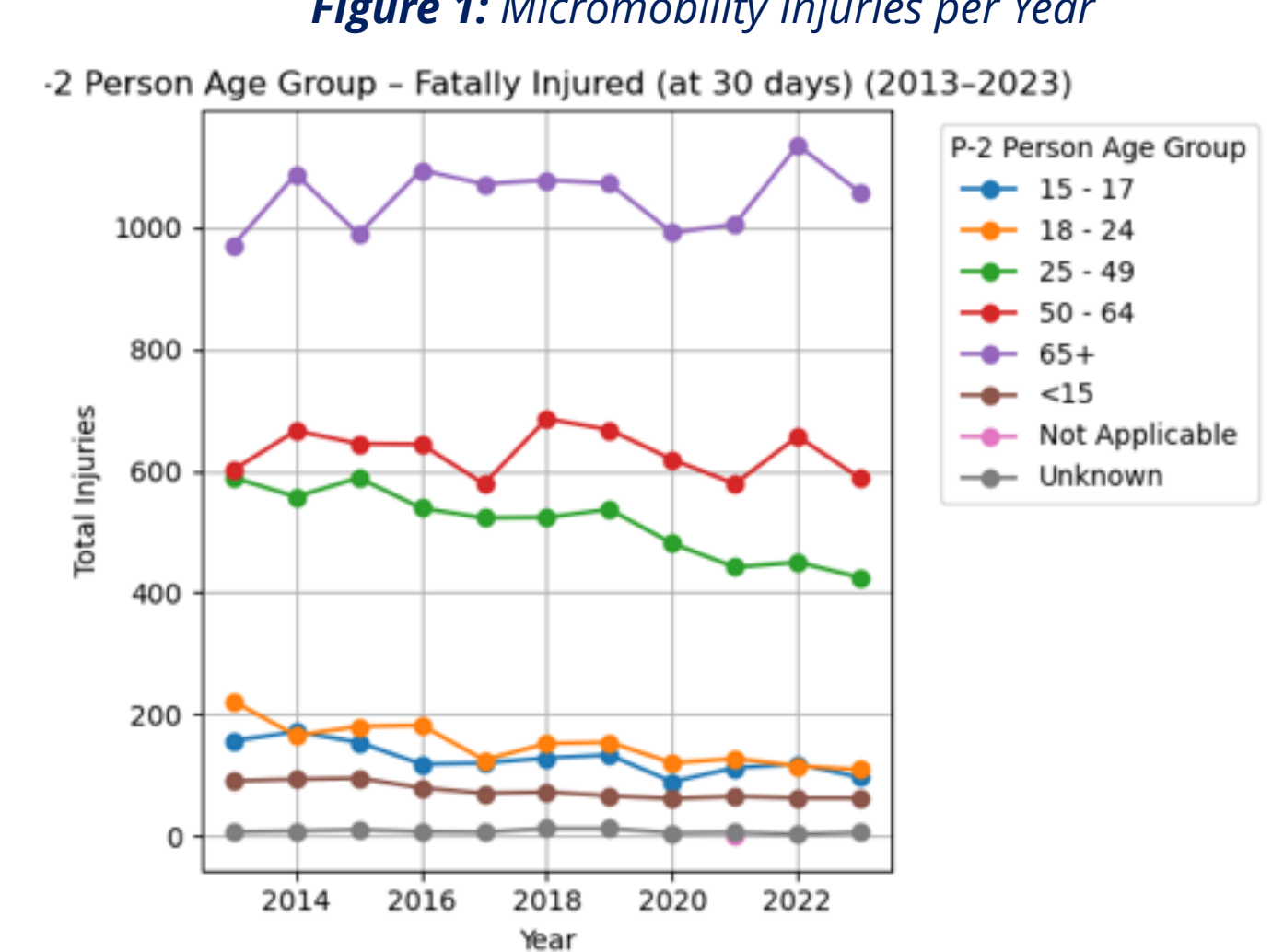
3. Detailed Factor Analysis

To understand the influence of user characteristics and environment, the data was analyzed based on specific factors:

- Age Group Analysis:** The distribution of injuries was analyzed across defined age groups (15–24, 25–49, 50–64, 65+). This analysis was conducted separately for each severity category (fatal, serious, and slight injuries).
- Aggregated Factor Analysis:** For the remaining factors (including Gender, Weather Conditions, Day of the Week, Lighting Conditions, and Location Type), injuries across all severity levels were aggregated. This aggregation approach was used to identify broader patterns of risk exposure related to these contextual elements.

The **overarching objective** of these analytical steps was to leverage a better understanding of the resulting injury patterns to inform safer urban mobility policies.

Results



Conclusions

Micromobility-related injuries in Europe have evolved over the past decade, demonstrating an increasing prevalence that is strongly influenced by user **demographics and environmental conditions**. The analysis confirms that slight injuries were the most frequent outcome overall, but the observed post-2020 surge in serious injuries suggests areas requiring improved measures, such as helmet use and enforcement. Consequently, the findings support the **immediate need for tailored safety policies** that specifically target urban, male, and middle-aged users to enhance urban mobility safety