Micromobility Safety Program

Baseline Data Analysis

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Contents

EXECUTIVE SUMMARY

The Micromobility Safety Program at UCR, led by the Division of Health, Well-being & Safety, aims to enhance the safety and accessibility of micromobility devices on campus. With the growing use of scooters, bikes, and other devices, the program addresses critical issues, including safety risks, theft, collisions, and infrastructure inadequacies. By integrating data collection, education, and policy recommendations, the program strives to create a safer environment for both riders and pedestrians while fostering a culture of compliance and awareness.

A survey conducted in April 2024 gathered responses from 125 participants, of which 108 fully completed the survey. Respondents included undergraduate and graduate students, as well as staff and faculty, with the majority representing first-year (22.7%), second-year (23.6%), and third-year (21.8%) students. The survey assessed micromobility usage patterns, safety concerns, and resource preferences, revealing several key findings:

1. **Device Usage**: E-scooters were the most commonly used micromobility devices, followed by bikes, skateboards, and scooters.

2. **Safety Concerns**: Pedestrian harm, theft, and collisions were the most frequently reported safety issues, with bikes and e-scooters being the most associated with safety concerns.

3. **Infrastructure Needs**: Participants expressed a strong demand for improved resources, such as repair stations, e-scooter charging racks, and designated pathways for micromobility devices.

4. **Accident Awareness**: A significant proportion of respondents had witnessed or heard of micromobility-related accidents, which correlated with heightened safety concerns and resource demands.

Statistical analyses revealed that gender and academic year significantly influenced micromobility device preferences and safety practices, such as helmet usage. However, no significant relationships were found between micromobility usage and compliance with safety mandates for most reasons, except for proximity-related usage, which showed a weak association.

Based on the findings, the program recommends tailored safety interventions, including infrastructure development (e.g., bike lanes, repair stations), rider education campaigns, and the enhancement of data collection systems to monitor accidents and compliance. These measures aim to reduce accidents and foster a safer micromobility environment on campus.

Background

The Micromobility Safety Program at UCR is an initiative under the Division of Health, Well-being & Safety aimed at enhancing the safety and accessibility of micromobility devices on campus. With the increasing use of scooters, bikes, and other devices, this program addresses concerns such as safety risks, theft, collisions, and infrastructure inadequacies. Through a combination of data collection, education, and policy recommendations, the program seeks to create a safer environment for riders and pedestrians while fostering a culture of compliance and awareness.

Goals

1. **Improve Micromobility Safety**: Reduce the number of accidents and safety incidents involving micromobility devices on campus.
2. **Enhance Infrastructure**: Develop and implement micromobility-specific infrastructure, such as repair stations, bike lanes, and e-scooter charging racks, to support safe and efficient usage.
3. **Educate and Raise Awareness**: Promote rider education through campaigns, courses, and in-person tabling to encourage compliance with safety rules and mandates.
4. **Foster Community Engagement**: Collaborate with students, faculty, and local organizations to identify and implement desired safety measures and resources.

Methods

The Micromobility Safety Program study employed a mixed-methods approach, integrating survey data collection with statistical analyses to examine the relationships between micromobility device usage, safety concerns, and infrastructure needs.

Participants: The study recruited 125 participants, of whom 108 fully completed the survey, yielding an 86.4% response rate. The sample included undergraduate and graduate students, as well as staff and faculty. The majority of respondents were first-year (22.7%), second-year (23.6%), and third-year (21.8%) students, with smaller proportions from other academic years.

Survey Design and Distribution: The survey was conducted over three weeks in April 2024. Flyers were strategically posted at high-density bicycle parking locations across campus to increase participation.

Data Collection: Participants provided demographic data, micromobility usage patterns, safety concerns, and preferences for campus resources. The survey aimed to assess the type of micromobility devices used, reasons for usage (e.g., convenience, cost-saving), and participants' safety concerns, such as accidents, pedestrian harm, and theft. Additionally, respondents were asked about their desired resources and infrastructure improvements, including repair stations, charging racks, and safety measures.

Statistical Analysis: Quantitative data were analyzed using a range of statistical techniques. Chi-square tests of independence were conducted to explore the relationships between categorical variables, such as device type, gender, academic year, safety concerns, and resource preferences. Analysis of variance (ANOVA) was used to evaluate differences in safety ratings and other concerns across various groups, such as device type or academic year. Correlation analyses assessed the strength and direction of relationships between continuous variables, including safety ratings and desired safety precautions.

The study focused on several key variables, including demographic information (e.g., gender, academic year), device usage patterns, safety concerns (e.g., perceived safety ratings and accident experiences), and preferences for resources and infrastructure. This methodological approach enabled a comprehensive analysis of the factors influencing micromobility safety and resource needs, providing a robust foundation for actionable recommendations.

RESULTS

DESCRIPTIVES

Participants

The study sample consisted of 108 participants who fully completed the survey. The gender distribution revealed that 55 participants identified as female, 51 identified as male, and 2 identified as non-binary or third gender. Most respondents are 1st, 2nd, and 3rd-year students, accounting for 22.7% (n = 25), 23.6% (n = 26), and 21.8% (n = 24) of the total, respectively. Fewer students are in their 4th year (18.2%), while only a small percentage are in their 5th year or higher (2.7%, n = 3). Graduate or professional students comprise 7.3% (n = 8) of the group, and staff or faculty represent just 1.8% (n = 2).

The majority of respondents (97) reported using a micromobility device, while 11 participants indicated they did not use one. Among micromobility device users, e-scooters were the most frequently used device (58 participants), followed by bikes (24), skateboards (8), scooters (7), e-bikes (3), and e-skateboards (2). Additionally, 11 responses were left blank for the question on device type.

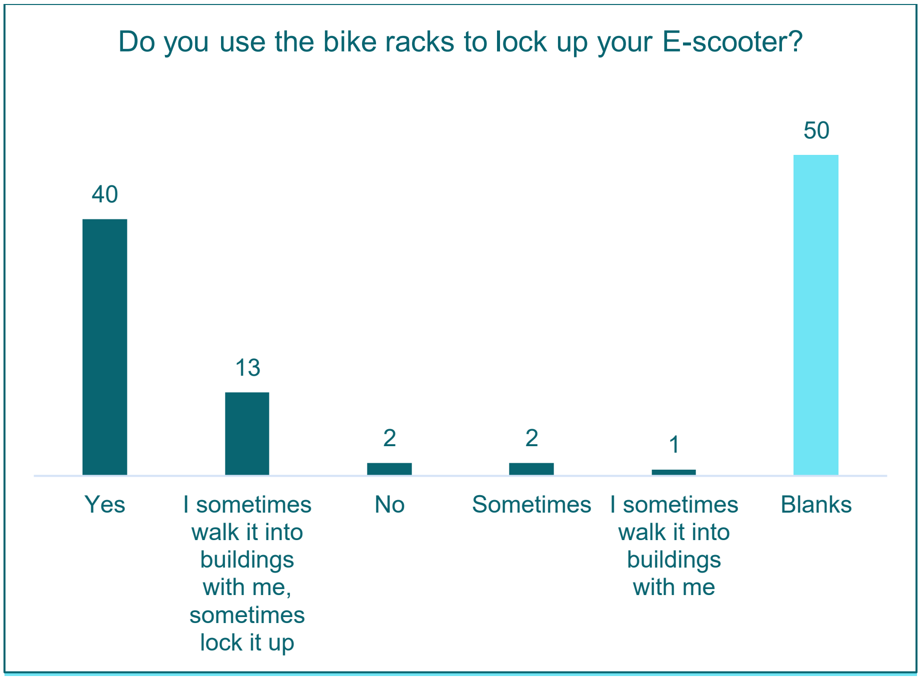


Figure 1. Participant responses to whether they use bike racks to secure their e-scooters.

Figure 1 shows participant responses to whether they use bike racks to secure their e-scooters. A majority of participants (40) reported using bike racks, while 13 indicated sometimes walking the e-scooter into buildings but occasionally locking it up. A small number reported not using bike racks (2), sometimes using them (2), or only walking the e-scooter into buildings (1). Fifty participants left this question blank. Figure 3 illustrates responses to whether the current bike racks work for e-scooters, with 55 participants affirming that they do and one participant indicating a lack of a lock.

The most requested resource was scooter and bike supplies and repair stations (46 respondents), followed by e-scooter charging stations (41), bike racks (36), and e-scooter-specific racks (28). Other resources were requested by 16 respondents, while skateboard racks were the least requested (5). Eleven participants left this question unanswered. These findings indicate a strong demand for infrastructure improvements, particularly repair stations and charging facilities, to support micromobility device users on campus. Figure 2 displays the desired resources for micromobility users at UCR.

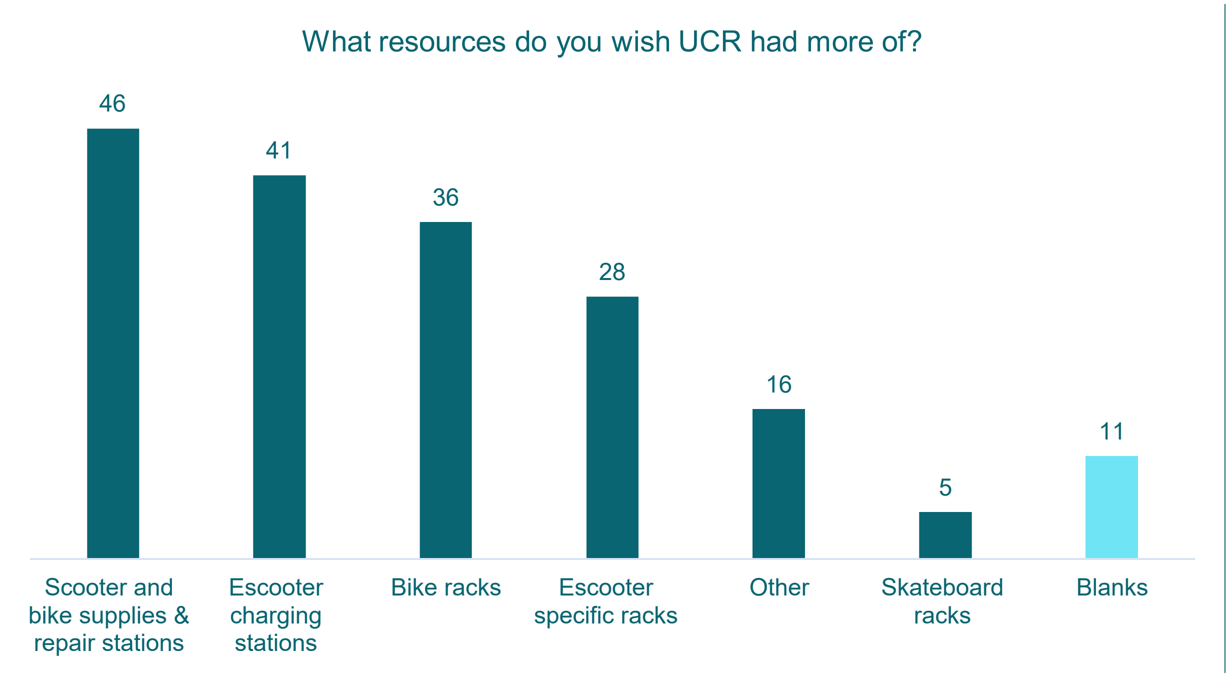


Figure 2. Desired resources for micromobility users at UCR.

The majority of respondents (61) reported hearing about accidents involving bikes, scooters, pedestrians, or other modes of transportation. Forty-eight participants indicated they had witnessed an accident, while 21 reported being personally involved in an accident. Thirteen participants stated they had no experience witnessing, hearing about, or being in an accident. Eleven participants left this question blank.

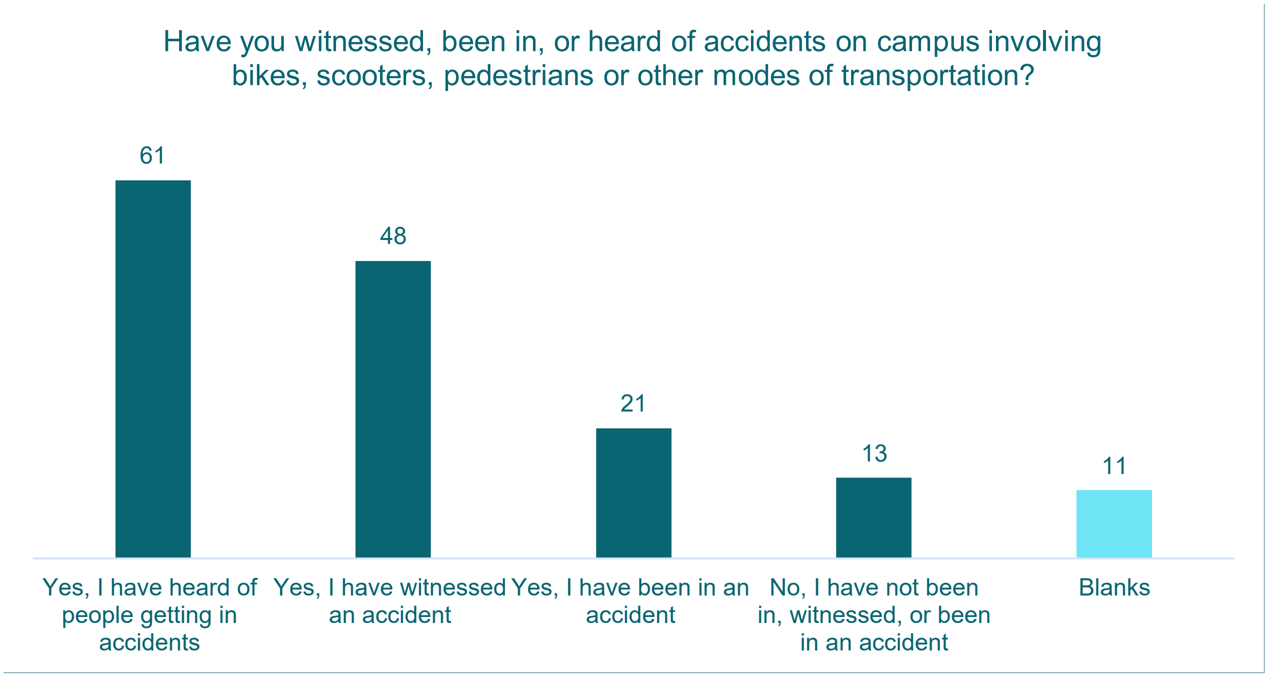


Figure 3. Accident experiences and observations among participants.

The most commonly reported concern was pedestrian harm caused by micromobility users (50 participants), followed closely by theft (49). Collisions between micromobility users (46) and between micromobility users and car drivers (41) were also significant concerns. Thirty-four respondents highlighted unsafe roads, walkways, or sidewalks, while 30 identified unintended self-harm as a concern. Three participants selected "Other," and 38 left this question blank.

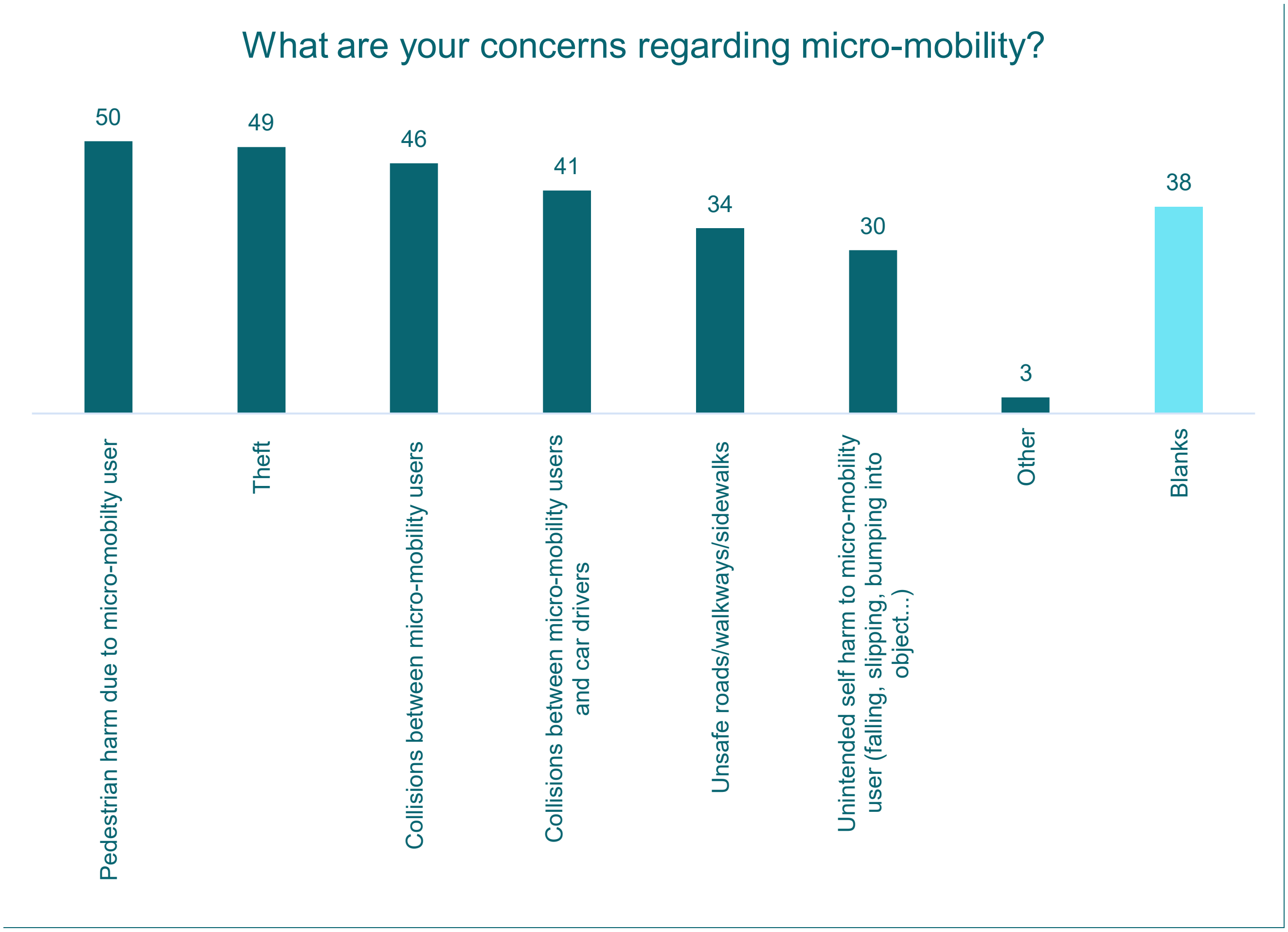


Figure 4. Concerns regarding micromobility safety.

1. Demographics and Device Usage

1.1 Does the year in school affect the likelihood of using a micro-mobility device?

The relationship between year in school and the likelihood of using a micro-mobility device was examined using a chi-square test of independence. The analysis revealed no significant association between the two variables, X^2 (6, N) = 3.22, p = .78). Therefore, the year in school does not significantly affect the likelihood of using a micro-mobility device.

1.2 Does gender affect the likelihood of using a micromobility device?

The relationship between gender and the likelihood of using a micro-mobility device was analyzed using a chi-square test of independence. The results indicated no significant association between gender and the likelihood of using a micro-mobility device, X^2 (2, *N*) = 2.40, *p* = .30).

1.3 Do gender identities differ in their preferred types of micro-mobility devices?

The relationship between gender identities and their preferred types of micro-mobility devices was explored. While descriptive statistics suggest that males have a higher proportion of preferences for bikes (29.2%) and skateboards (6.3%) compared to females, and females demonstrate a dominant preference for e-scooters (65.9%) compared to males (52.1%), these differences are not statistically significant. A chi-square test of independence showed no significant association between gender identities and preference types, X^2 (20, *N*) = 11.82, *p* = .92).

1.4 Investigate how academic year and gender relate to micro-mobility device usage and type.

The relationships between academic year, gender, and the type of micro-mobility device used were investigated using chi-square tests of independence. The results indicated a statistically significant relationship between academic year and the type of micro-mobility device used, X^2 (77, *N*) = 146.72, *p* < .001. This suggests that the type of device used varies significantly across different academic years. Similarly, a statistically significant relationship was found between gender and the type of micro-mobility device used, X^2 (33, *N*) = 109.94, *p* <.001. This indicates that micro-mobility device preferences differ significantly by gender.

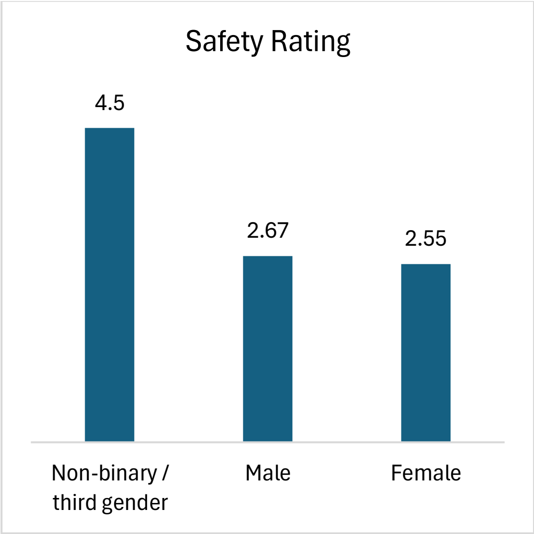
2. Safety Concerns and Experiences

2.1 Descriptives

Users rated their concerns regarding the safety of micro-mobility users and pedestrians on campus on a scale of 0-5. 1st-year students, graduate or professional students, staff or faculty, and 5th-year or higher students seem very concerned with average ratings ranging from 3.00 to 5.00. All genders are concerned about safety, and the concerns are more pronounced among non-binary/third-gender users. Of those who currently use a micromobility device, the average safety concern is rated 2.65. While both years in school and gender have a pronounced effect on how concerned they are about the safety rating, two-way ANOVA suggested there is no statistically significant combined effect of Year in School and Gender on safety ratings.

- **Year in School**: $F(6,81) = 0.44$, $p = 0.65$ — No significant main effect.
- **Gender**: $F(2,81) = 0.006$, $p = 0.94$ — No significant main effect.
- **Interaction (Year in School * Gender)**: $F(12,81) = 0.76$, $p = 0.64$ — No significant interaction.

Year in school	Average Safety Rating
5th Year or higher	5.00
Staff or Faculty	3.50
Graduate/Professional student	3.13
1st Year	3.00
4th Year	2.89
3rd Year	2.24
2nd Year	2.04



2.2 Is there a significant difference in perceived safety concern ratings between different micro-mobility device users?

A one-way analysis of variance (ANOVA) was conducted to determine whether there is a significant difference in perceived safety concern ratings among users of different micro-mobility devices. The results indicated no statistically significant differences in safety concern ratings between the groups, $F(12.41, df) = 12.41$, $p = .26$. Thus, the type of micro-mobility device used does not appear to be related to perceived safety concern. The box plot illustrates the variation in safety concern ratings (on a scale of 0 to 5) among users of different micromobility devices. E-scooters and bikes exhibit the widest range of safety concern ratings, with median ratings of 3.5 and 2.0, respectively. E-skateboards and scooters show more concentrated ratings around medians of 2.5. E-bikes have a median rating of 3.0, while skateboards exhibit the lowest median concern rating of 1.0.

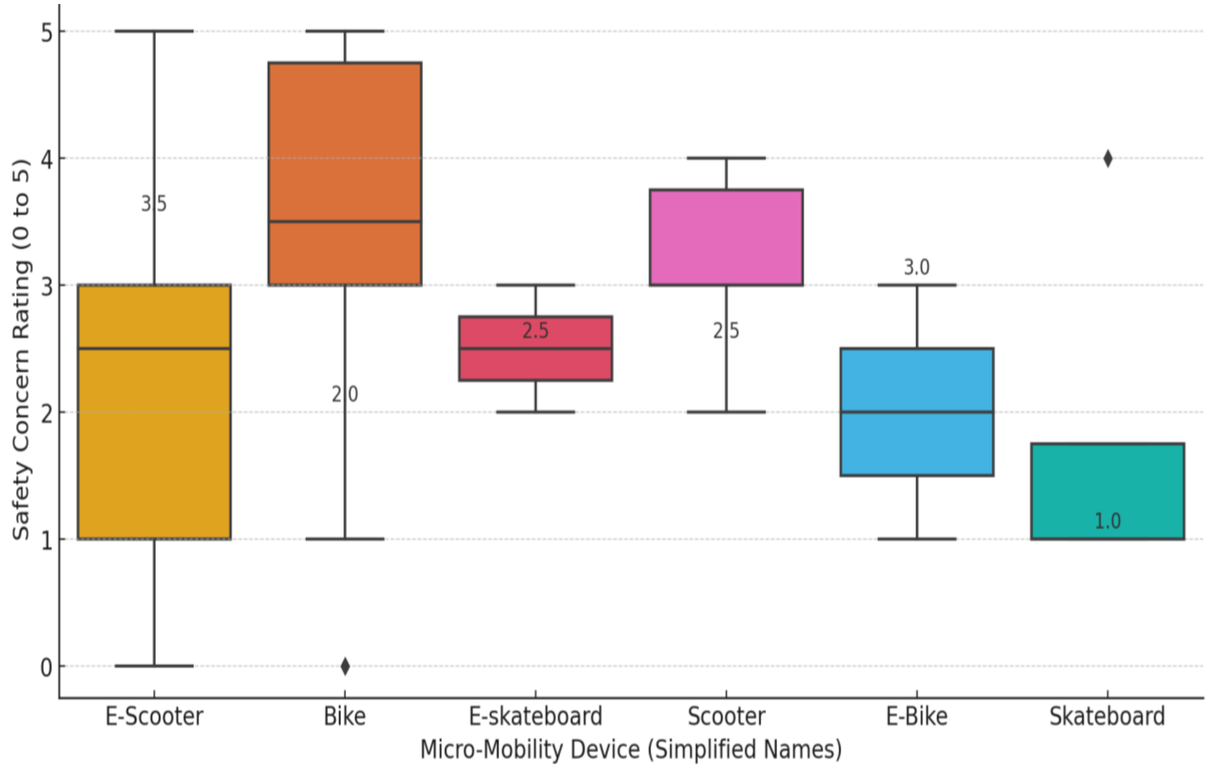


Figure 5. Distribution of safety concern ratings by micromobility device type.

2.3 Is there a significant difference in safety concerns between different micro-mobility device users?

A chi-square test of independence was conducted to examine the relationship between safety concerns and different micro-mobility device users. The results revealed a statistically significant association, $X^2 = 163.58$, $p < .001$. This indicates that safety concerns vary significantly among users of different micro-mobility devices.

Table 1. Safety concerns reported by micromobility device type, highlighting collisions, pedestrian harm, theft, and infrastructure issues.

Devices	Collisions between micro-mobility users	Collisions between micro-mobility users and car drivers	Pedestrian harm due to micro-mobility user	Theft	Unsafe roads/walkways/sidewalks
Bike	0	0	16	16	0
E-Bike	2	2	0	0	0
E-Scooter	28	0	29	0	0
E-skateboard	0	1	0	1	0

Scooter	4	0	5	0	0
Skateboard	0	0	0	3	3

2.3 Are participants who witness accidents more likely to be concerned about micro-mobility safety?

A one-way analysis of variance (ANOVA) was conducted to determine whether witnessing accidents is associated with greater concern about micro-mobility safety. The results indicated no statistically significant relationship between witnessing accidents and safety concerns, F (1,95) = 2.16, p = .145. This suggests that witnessing accidents does not significantly influence participants' concerns about micro-mobility safety.

2.4 Examine the relationship between safety concerns and device usage type.

A one-way analysis of variance (ANOVA) was conducted to examine the relationship between safety concerns and device usage type. The results showed no statistically significant relationship between the two variables, F (1,95) = 1.23, p = .286. This indicates that safety concerns do not significantly vary based on the type of device used.

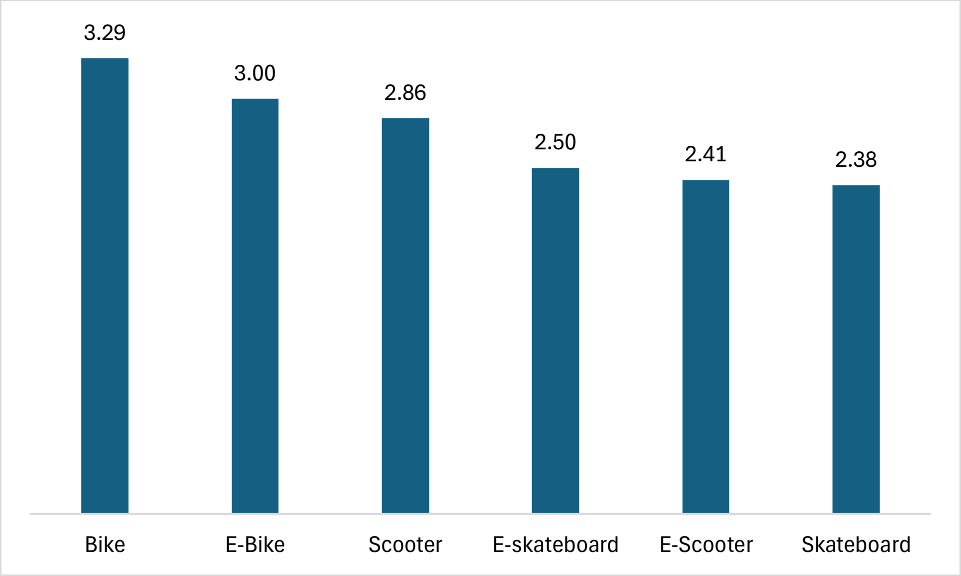


Figure 6. Average safety concern ratings by micromobility device type.

2.5 Analyze the correlation between safety concerns and desired safety precautions.

A simple correlation analysis was conducted to examine the relationship between safety concerns and desired safety precautions. The results indicated a weak positive correlation between the two variables, r = 0.195. This suggests that as safety concerns increase, there is a slight tendency for individuals to desire more safety precautions, but the relationship is not strong.

2.6 Analyze the correlation between safety ratings and desired safety precautions.

A simple correlation analysis was conducted to examine the relationship between safety ratings and desired safety precautions. The results revealed a strong negative correlation, $r = -0.895$. This indicates that as safety ratings increase (indicating a perception of higher safety), the desire for safety precautions decreases significantly. Conversely, lower safety ratings are associated with a greater desire for safety precautions.

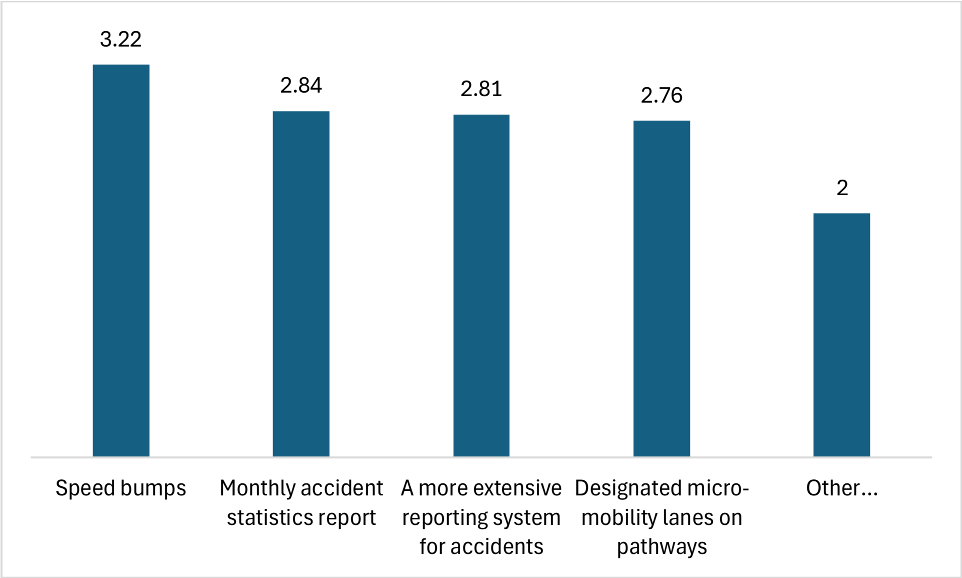


Figure 7. Average safety concern ratings by desired safety measures.

3. Device-specific behaviors

3.1 Is there a relationship between the type of micro-mobility device used and the use of bike racks?

A chi-square test of independence was conducted to examine the relationship between the type of micro-mobility device used and the use of bike racks. The results indicated no statistically significant association between the two variables, X^2 (1, *N*) = 0.16, *p* = .689. This suggests that the type of micro-mobility device used does not significantly influence the use of bike racks.

3.2 E-scooter specific analysis: Analyze the relationship between current bike rack usage, and interest in e-scooter-specific racks with charging stations.

An analysis was conducted to examine the relationship between current bike rack usage and interest in e-scooter-specific racks with charging stations. A chi-square test of independence showed no statistically significant association between the two variables, X^2 (1, *N*) = 0.53, *p* = .466. Additionally, a simple correlation analysis revealed a weak positive correlation (*r* = 0.18), indicating a slight but non-significant tendency for individuals who currently use bike racks to show interest in e-scooter-specific racks with charging stations.

4. SAFETY PRACTICES AND INFRASTRUCTURE

4.1 What factors (gender, year in school) most strongly predict whether a user wears a helmet?

The relationship between gender, year in school, and helmet usage was analyzed using chi-square tests of independence. The analysis showed a statistically significant relationship between gender and helmet usage, X^2 (1, *N*) = 6.21, *p* = .013. This indicates that gender is a significant predictor of whether a user wears a helmet. Similarly, a statistically significant relationship was found between year in school and helmet usage, X^2 (4, *N*) = 8.37, *p* = .040. This suggests that year in school also predicts helmet usage, though the strength of this relationship is moderate compared to gender.

4.2 Is there a relationship between helmet usage and safety concerns?

The relationship between helmet usage and safety concerns was analyzed using a chi-square test of independence. The results indicated no statistically significant association between the two variables, X^2 (1, *N*) = 3.02, *p* = .082. This suggests that helmet usage is not significantly related to safety concerns.

4.3 Analyze the correlation between types of micro-mobility devices used and resources users wish the campus had more of.

The relationship between the types of micro-mobility devices used and the resources users wish the campus had more of was analyzed using a chi-square test of independence. The results showed no statistically significant association between the type of device used and the desired campus resources, X^2 (10, *N*) = 9.45, *p* = .49. This indicates that the type of micro-mobility device users prefer does not significantly influence the resources they wish to see improved on campus.

4.4 Compare responses about witnessed or experienced accidents with desired resources and safety precautions.

The relationships between accidents (witnessed or experienced) and desired resources, as well as safety precautions, were analyzed using chi-square tests of independence.

Accident vs. Resource Concerns: The results revealed a statistically significant association between witnessing or experiencing accidents and resource concerns, X^2 (1, N) = 27.60, p < .001. This indicates that individuals who have witnessed or experienced accidents are significantly more likely to express concerns about campus resources.

Accident vs. Safety Concerns: Similarly, a statistically significant relationship was found between witnessing or experiencing accidents and safety concerns, X^2 (1, *N*) = 8.30, p = .004. This suggests that individuals who have been involved in or witnessed accidents are more likely to express heightened safety concerns.

5. User motivations and compliance

5.1 Investigate the relationship between reasons for using micro-mobility devices and willingness to follow safety mandates.

The relationship between reasons for using micro-mobility devices and willingness to follow safety mandates was analyzed using chi-square tests of independence. The results showed no significant relationships for most reasons, including convenience ($X^2 = 0.00$, $p = 1.00$), cost-saving ($X^2 = 0.69$, $p = 0.41$), pleasure ($X^2 = 0.00$, $p = 1.00$), and health ($X^2 = 0.05$, $p = 0.83$). These findings suggest that individuals who use micro-mobility devices for these reasons are not more or less likely to follow safety mandates. However, there was a weak relationship between proximity as a reason for use and willingness to follow safety mandates ($X^2 = 3.48$, $p = 0.062$), though it was not statistically significant at the 5% level. The results indicate limited connections between the reasons for using micro-mobility devices and adherence to safety mandates.

5.2 Analyze how rule compliance correlates with desired safety precautions.

The relationship between rule compliance and desired safety precautions was analyzed using a chi-square test of independence. The results indicated no statistically significant association between the two variables, X^2 $(1, N) = 0.00$, $p = 1.00$. This suggests that an individual's level of rule compliance does not correlate with their desire for additional safety precautions.

5.3 Compare willingness to follow mandates with desired safety precautions.

The relationship between willingness to follow safety mandates and desired safety precautions was analyzed using a chi-square test of independence. The results revealed a statistically significant association between the two variables, X^2 $(1, N) = 6.13$, $p = .013$. This indicates that individuals who are more willing to follow safety mandates are also more likely to express a desire for additional safety precautions.