Center for Urban Science + Progress

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Understanding Climate Vulnerability of Delivery Drivers in NYC

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1 Objectives

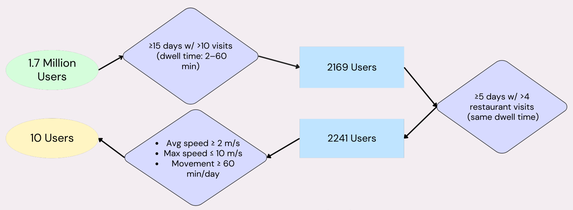
To understand and address the environmental risks faced by NYC delivery workers, our project focuses on the following key goals:

- Map where NYC delivery workers face climate hazards like heat, flooding, and pollution using location data.
- Build a Climate Vulnerability Index (CVI) based on their mobility patterns using spatial tools (Hotspot Analysis, Accessibility Analysis, GINI Index).
- Use interviews and surveys to capture real experiences, challenges, and coping strategies.
- Recommend clear, data-backed policies for safer infrastructure, fair wages, and better worker protections.

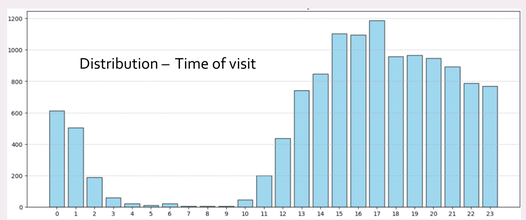
2 Background

NYC's 99,000+ delivery workers—mostly immigrant and low-income—face significant climate risks, including **extreme heat**, **air pollution**, and **urban flooding**, while enduring 10–12 hour shifts with limited access to **basic amenities**. Despite their vital role in the gig economy, these workers often **lack insurance**, **fair wages**, and **regulatory protection**, with **language barriers** and minimal platform support further heightening their **vulnerability**. Our project addresses these disparities by integrating **mobility data**, **environmental factors**, and **field interviews** to expose the risks they face and advocate for equitable policy changes.

4 Trajectory Extraction - GPS



Extraction method



Delivery Temporal Distribution: Analysis of active speeds and working hours revealed peak delivery times and areas with consistently high delivery intensity.

Hotspot Areas of Delivery: Geo-visualization and hotspot mapping showed specific zones where delivery workers are highly concentrated, indicating areas of high demand.

Hotspots of Visits

3 Methodology

Data Processing

- Extract delivery workers' records from a large mobile phone location dataset using spatial-temporal machine learning and deep learning models.
- Utilize existing mobility studies and behavioral assumptions to refine extraction criteria.

Modeling & Analysis

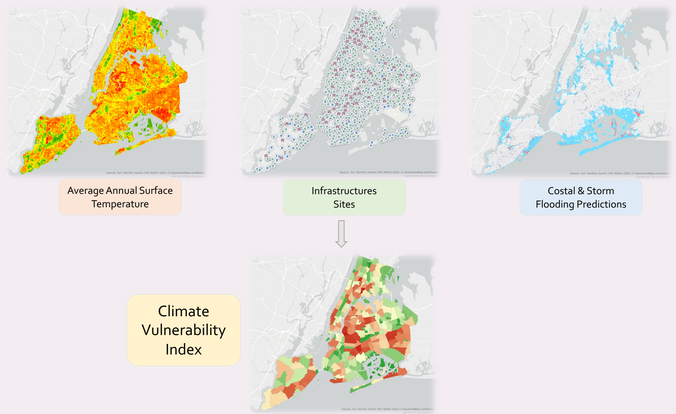
- Trajectory analysis: Map the daily trajectory of delivery drivers to identify their most frequented areas
- Hot spot analysis: Identify high risk climate zones for various threats (flooding, temperature, etc.) through analysis in GIS
- Surveys and Interviews: Conduct field studies, surveys, and interviews to gather insights into delivery workers' concerns, challenges, working conditions, and behavior patterns.

Visualization & Policy Recommendations

- Visualize high-risk climate zones for delivery workers to guide the placement of essential infrastructure like water fountains, restrooms, and sheltered rest areas.
- Develop feasible policy suggestions informed by both quantitative and qualitative insights.

5 Climate Vulnerability Index

This diagram illustrates our workflow for constructing a Climate Vulnerability Index for New York City. We integrated three key spatial layers: average annual surface temperature to capture urban heat exposure, infrastructure site density to reflect resource access, and coastal and storm flooding predictions to assess flood risk. By combining these environmental and infrastructural factors, we generated a composite index highlighting neighborhood-level climate vulnerability across the city.



Infrastructure Needs: The spatial patterns revealed underserved or overburdened areas, suggesting where infrastructure improvements, such as restrooms, drinking fountain, or shutter, could better support delivery workers.

6 Field Survey and Interviews

Our project investigates the lived experiences of NYC delivery workers, focusing on work conditions, climate-related risks, and digital platform dynamics. Using field-based pilot interviews and surveys, we refined a list of final questions, now submitted to the Institutional Review Board (IRB). Full-scale interviews will continue after IRB approval—providing a foundation for future teams to expand on.

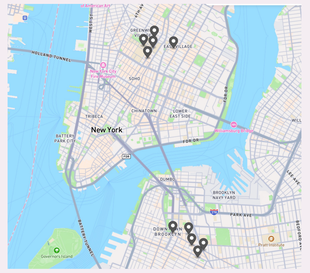
Fieldwork Snapshot

Locations: Downtown Brooklyn, Astor Place, West Village

Methods: Street interviews, surveys, observation

Languages encountered: Spanish, French, Mandarin, Bangla, Hindi

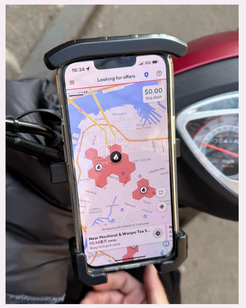
Times observed: Afternoons (2-4PM), and evenings (5-7PM)



Locations of pilot interview

Platform & Tech Use

- Workers use e-bikes (many rented via JOCO or Whiizz).
- Few lock bikes; delivery bags are often left unattended.
- Most platforms (Uber Eats, Hungry Panda) use standardized hexagonal order maps.



DoorDash's order distribution Interface, courtesy of driver

Climate & Safety

- Weather is often "normalized" as part of the job.
- Some workers avoid snow/rain; others continue regardless, using personal protective strategies.
- Cold weather pushes workers indoors—fast food spots double as informal shelters.

Language & Trust

- Spanish-speaking workers were most receptive.
- Trust improved when approached in native language or with translated materials.

Work Conditions

- Workers often operate 10–12 hour shifts with no formal breaks.
- Many avoid water to skip restroom needs—access is limited.
- Most workers earn below NYC's minimum wage.
- Injuries (e.g., cycling accidents) go untreated due to lack of insurance.

Design Takeaways

- Workers prefer short, direct questions (avoid technical language).
- Interviews were more successful with a translator or visual aids.
- Engagement increased when researchers returned to same locations multiple times.

Driver working during snow, wearing protective gears

7 Conclusion and Future Considerations

Our mixed-methods research highlights that NYC delivery workers face long shifts, limited rest access, and climate-related risks—especially in high-traffic zones with poor infrastructure. Mobility and climate data revealed hotspots of vulnerability, informing targeted support needs. With IRB approval pending, future teams will build on this work.

Policy Recommendations:

- **Target Infrastructure Gaps:** Install water fountains, restrooms, and shelters in high-risk delivery zones.
- **Protect Gig Workers:** Ensure fair wages and access to insurance for app-based delivery contractors.

8 Data & References

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