Spatial accessibility and equity analysis of Amazon parcel lockers facilities

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Acknowledgements

Jaclyn Shaefer, lead author of the paper

- Schaefer, J. S., & Figliozzi, M. A. (2021). Spatial accessibility and equity analysis of Amazon parcel lockers facilities. Journal of Transport Geography.

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Acknowledgements

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Motivation: e-commerce and equity

- During the COVID-19 lockdowns, home deliveries changed from being a desirable luxury or comfortable solution to a health-supporting and essential service for many COVID-19 at-risk populations.

- However, not all households are equal in terms of access to home deliveries.

Groups less likely to benefit from home deliveries:

- Low-income households
- Households with lower educational levels
- Small size and/or single member households
- Households with less access to electronic devices/internet
- Households that do not usually commute by auto or WFH
- Non-white households

Home-based accessibility (HBA)

Home deliveries have become a health-supporting and essential service for many at-risk populations.

Home-based accessibility (HBA): defined as the ease of accessing essential home deliveries of products such as groceries and medicines without leaving home.
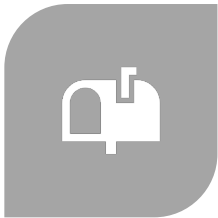
References HBA and Equity/EJ

- Figliozzi, M.A. and Unnikrishnan, A. (2021). Home-deliveries Before-During COVID-19 Lockdown: Accessibility, Environmental Justice, Equity, and Policy Implications. Transportation Research Part D: Transport and Environment

- Figliozzi, M., & Unnikrishnan, A. (2021). Exploring the impact of socio-demographic characteristics, health concerns, and product type on home delivery rates and expenditures. Transportation Research Part A: Policy and Practice.

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Business to Consumer Last Yard Delivery Types

ONTO THE PORCH

INTO A MAILBOX

INSIDE THE HOME OR CAR

INTO A STORAGE LOCKER

Least Secure -- Most Secure

OTHER FACTORS: time constrained households, cost, convenience, reliability.

Rapid growth of locker systems

- Amazon in partnership with convenience stores (7-eleven, Plaid Pantry), banks, hotels, universities, malls…

- Rapid expansion (in early 2021, 180 in Portland)
- Promise of more foot traffic and business
- Support expansion of 1-day deliveries while controlling costs
- Potential automation
- Cost and environmental benefits

Lockers nearby

① **Amazon Hub Counter - Dave's liquor** 🏅   1.7 mi

1601 East 4th Street, Long Beach, CA, …

Mon-Sun: 8am - 11:45pm

Show details

<u>Pick up here</u>

② **Amazon Hub Locker - Reference**   0.8 mi

350 the Promenade N, at Ross Dress for Less, Long Beach, CA, 90802-2480

Mon, Tue, Wed, Thu, Sun: 9am - 10pm
Fri-Sat: 8am - 10pm

Directions
You will find the Locker inside the Store..

Hide details

<u>Pick up here</u>

③ **Amazon Hub Counter - Your Hair N More**   0.9 mi

408 E 3rd St, Long Beach, CA, 90802

Mon-Fri: 10am - 7pm
Sat: 10am - 3pm

♿ Staff assistance at location

Hide details

<u>Pick up here</u>

④ **Amazon Hub Locker - Ant**   1 mi

601 Pine Ave, at Rite Aid, Long Beach, …
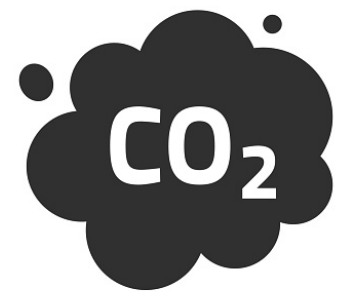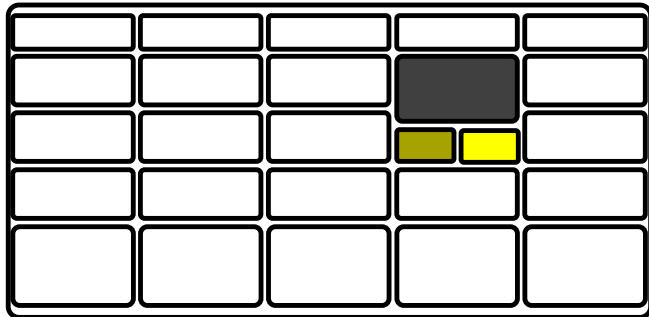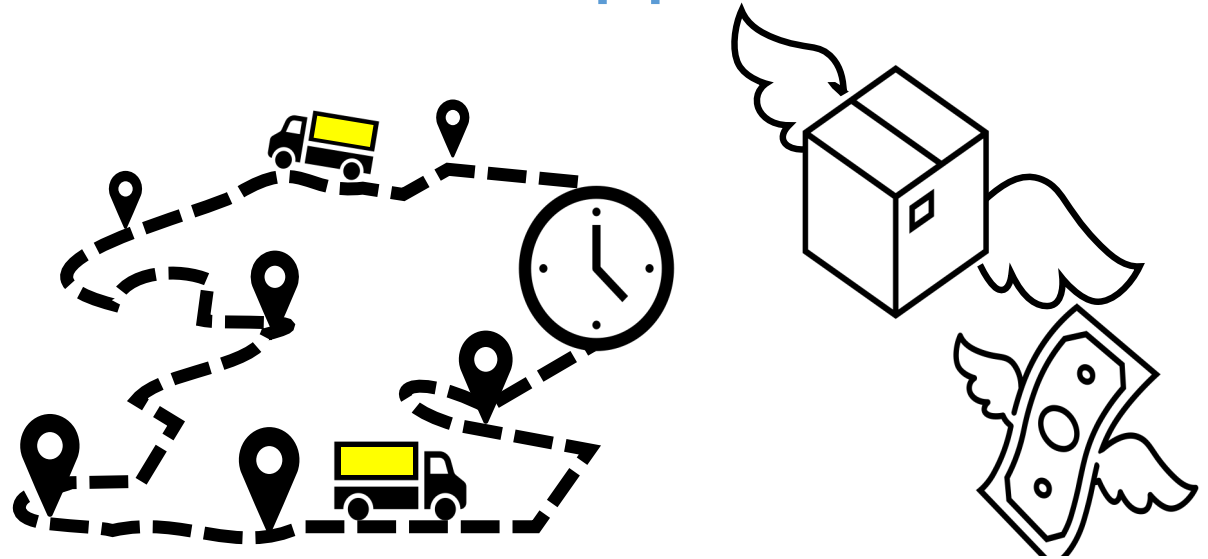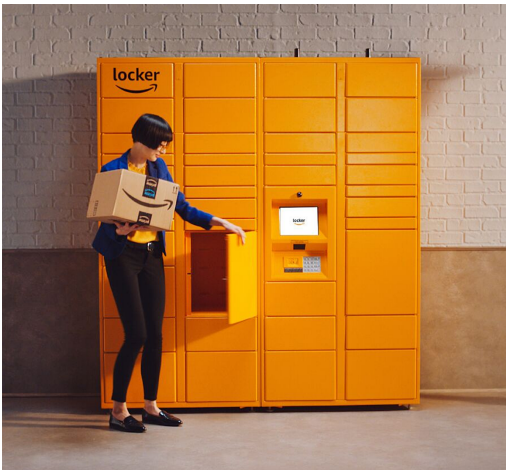
Mon-Sun: 7am - 10pm

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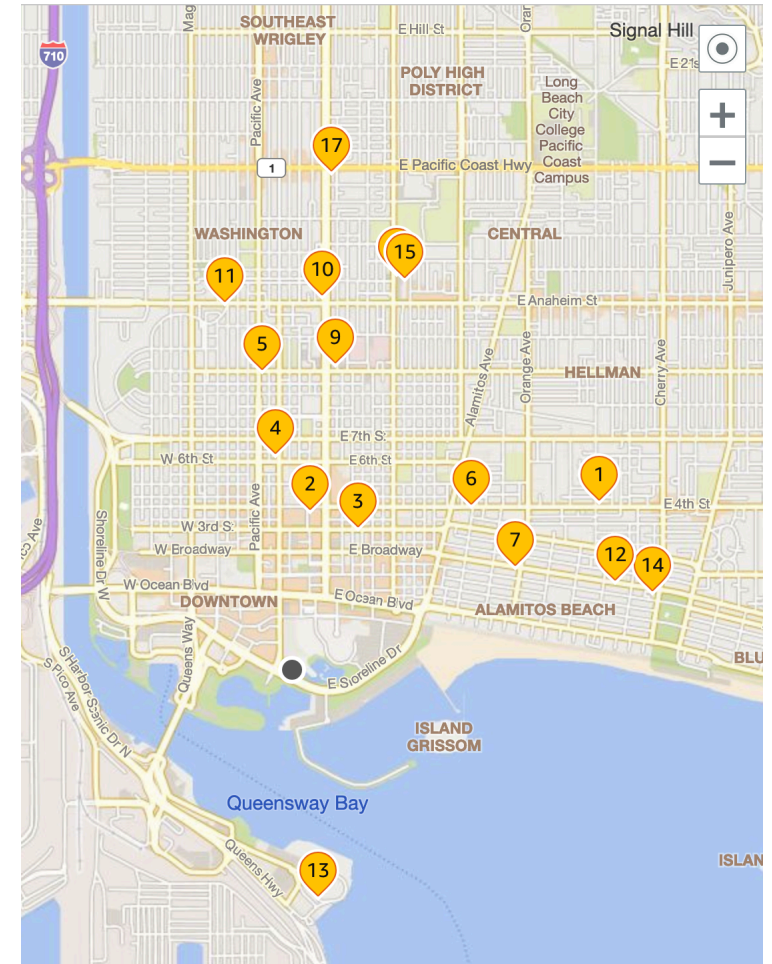
Research questions

(a) How are lockers distributed with respect to accessibility measures such as population coverage and employment by mode of transportation? and

(b) What are the equity implications of the current distribution of lockers?

Lockers: traditional research approach

Locker Accessibility

Focus on PEOPLE

Income
- Household income
- Per capita income
- Housing unit value

Computer/Internet
- Computer access
- Internet access
- Type of internet

Non-Income Demographic
- Age
- Race or origin
- Education attainment
- Employment status
- Etc.

Transportation/Built Enviro.
- Population density
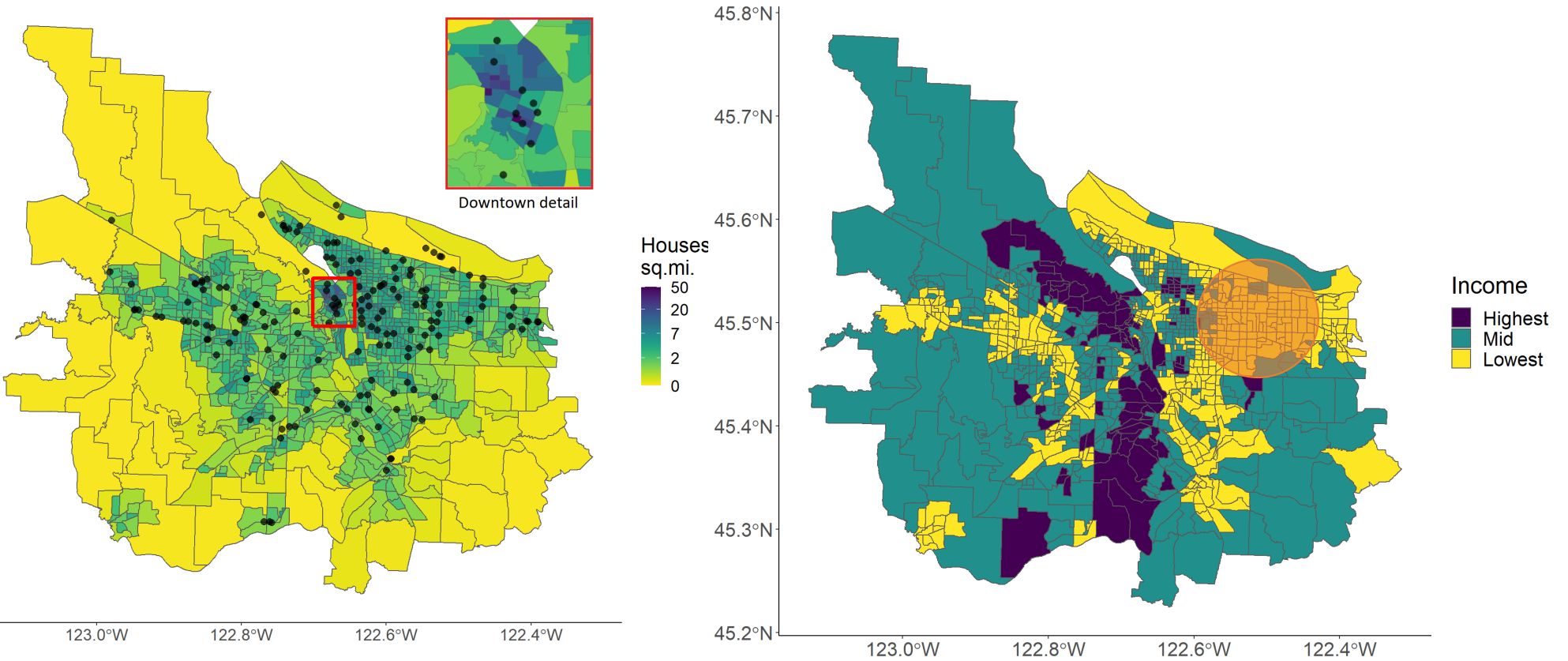- Type of housing
- Commute mode

Methodology

- Google Places API
- US Census Bureau Zip Code Business Patterns for employment data
- US Census Bureau ACS for population and socio-demographic data
- Geographic tools and methods: spatial correlations, kernel density, clustering
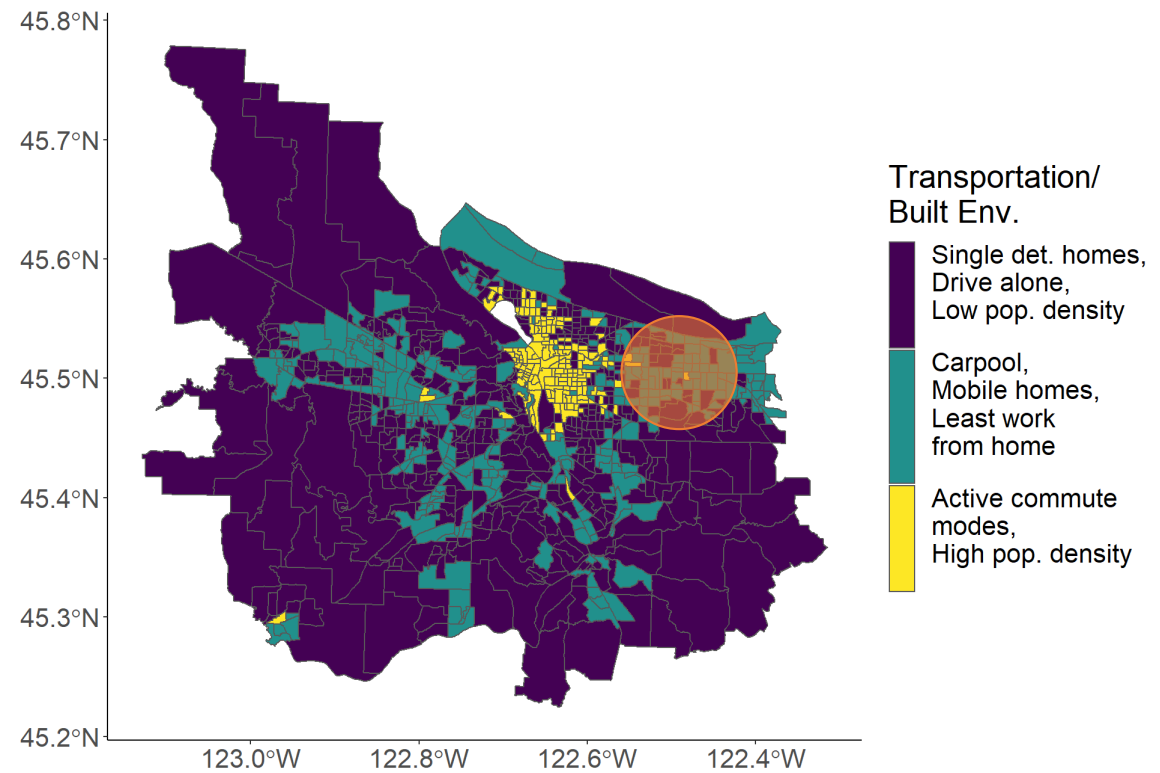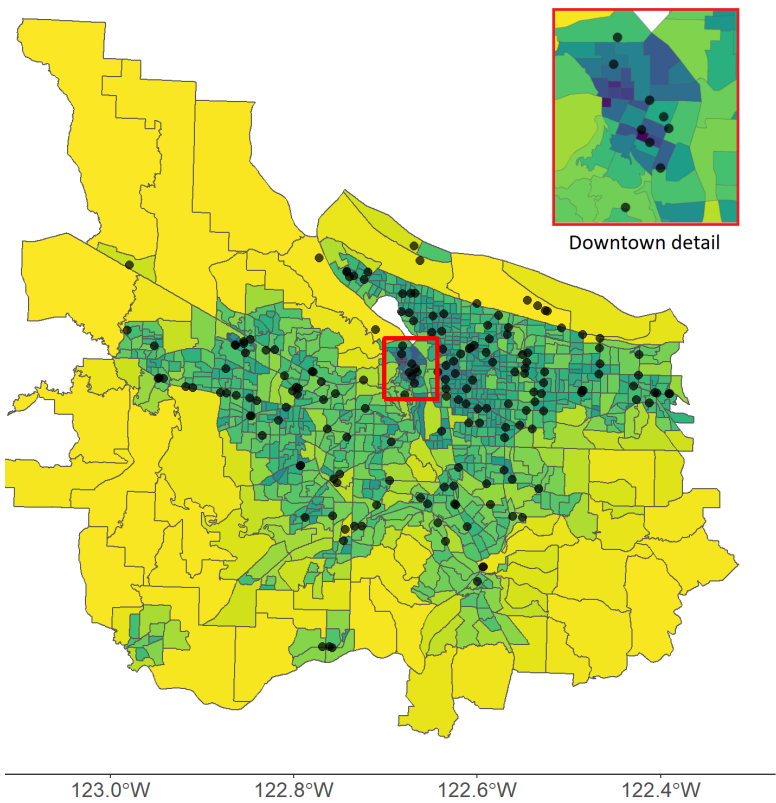
Accessibility by Mode

Mode (Range)	Households		Employment	
	HH (Thous.)	% of Total HH	Emp. (Thous.)	% of Total Emp.
Walk (0.25-0.5 Mi.)	81-232	12.6-36.1	103-285	11.7-32.4
Bike (1.5-3.0 Mi.)	546-605	84.9-94.0	673-785	76.4-89.1
Drive (3.0-5.0 Mi.)	605-624	94.0-97.0	785-828	89.1-93.9

Locker Distribution and Income Clusters

Locker Distribution and Trans. Built Env. Clusters

Downtown detail

Houses/sq.mi.
50
20
7
2
0

Transportation/Built Env.

Single det. homes, Drive alone, Low pop. density

Carpool, Mobile homes, Least work from home

Active commute modes, High pop. density

Locker Distribution and Internet clusters
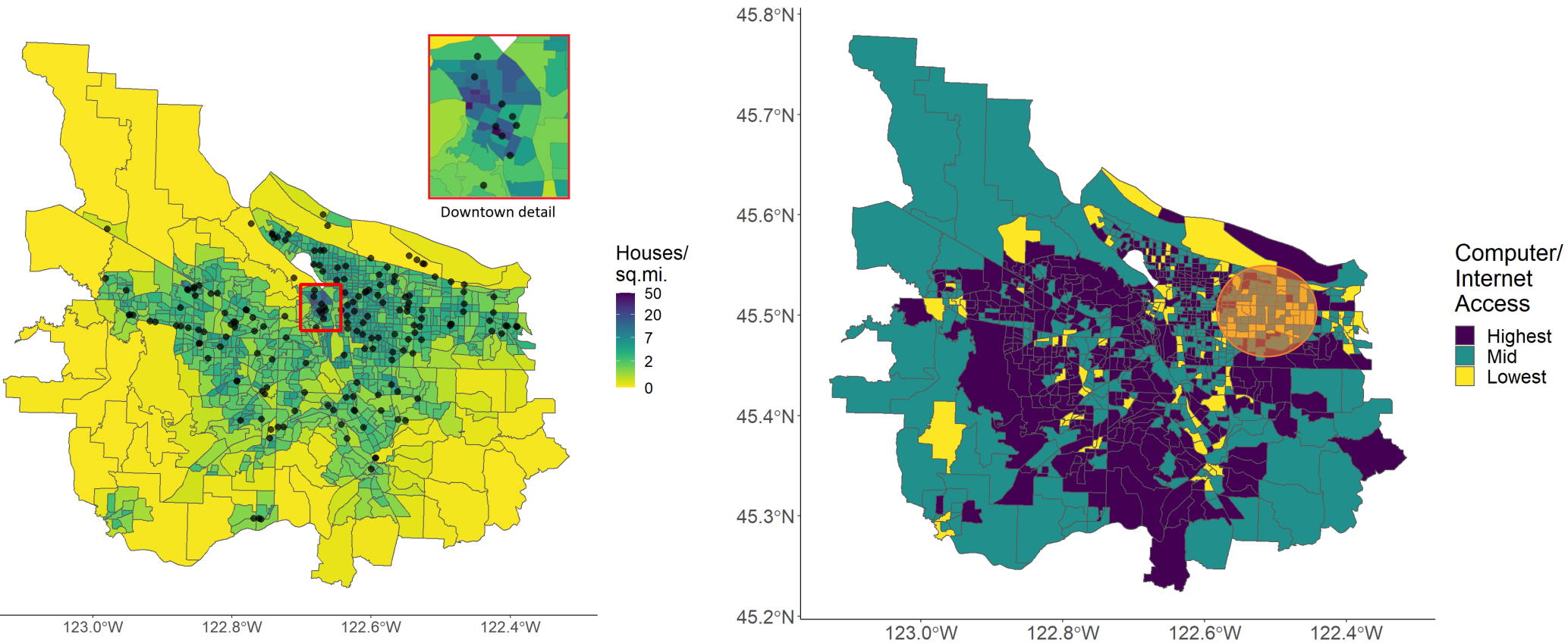
Locker Distribution and Socio-Dem. Clusters
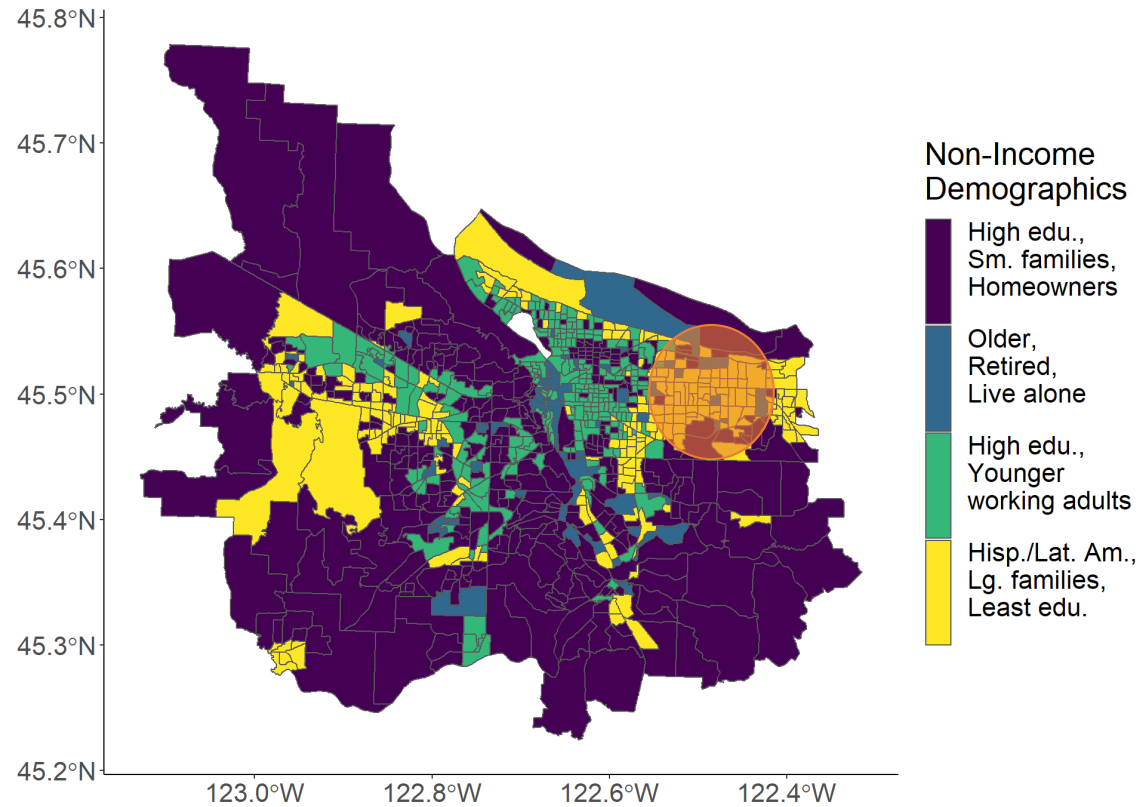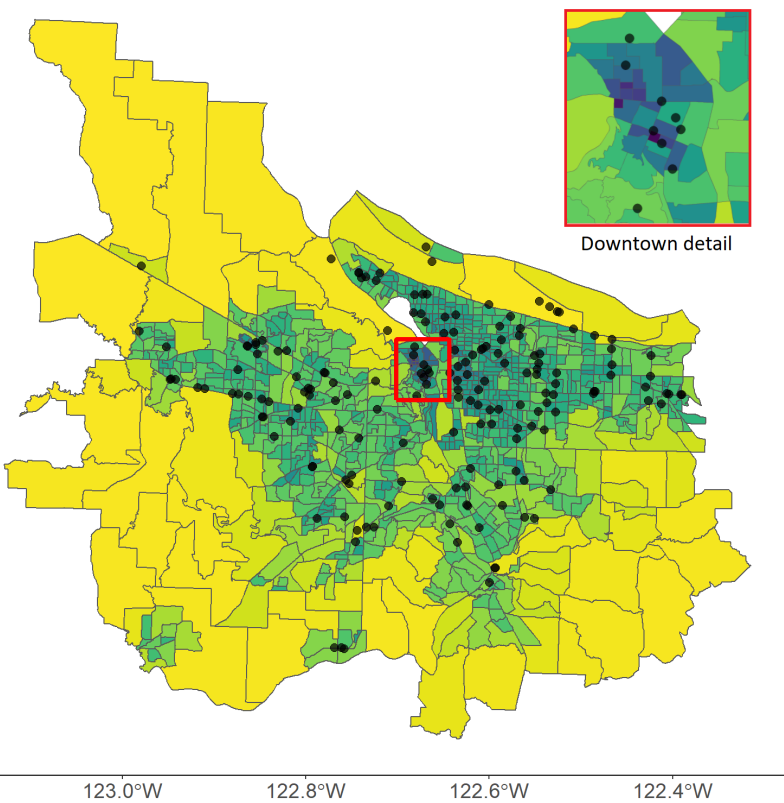
Population by race/ethnicity in the area studied

- White ~ 77% (US 60%)

- Black ~   3% (US 12%)

- Asian ~   8% (US   6%)

- 2+   ~   7% (US   3%)

- Other ~   5%

Hispanic ~ 12% (US 18%)

It is possible to quantify differences by Cluster

- Lockers per square mile

- Lockers per person

- Lockers per household

Key findings

- Lockers tend to be in mixed-use areas and can be utilized by a large percentage of the population.
- The equity metrics indicate that the current distribution of lockers could be improved to reach traditionally underserved populations.
- Clustering is useful, but also mapping/spatial analysis because there are pockets with low accessibility within large clusters.

Market failure?

- Amazon is a private, profit-seeking entity, and the placement of lockers may not necessarily match the allocation of lockers based on equity or need considerations

- The term market failure implies a situation when a minimum level of accessibility or mobility that should be available to all is not met by private/public providers

Incentives to install lockers in certain areas?

- *Supplementary* common carrier (open) public parcel lockers in transit stations where they are needed the most to fill an equity or accessibility

- Incentives for businesses that can be granted at the local level (parking, etc.)

Key findings and questions

- Lockers have many environmental and economic advantages, should policymakers do more to encourage the expansion of this type of last mile solution? How?

- How to avoid market failures in low income communities that are currently underserved?

THANK YOU

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