

**THE IMPACTS OF COVID-19 ON TELE-ACTIVITIES, TRAVEL,
AND PURCHASING BEHAVIORS WEBINAR SERIES**

WEBINAR #3

**Impacts of the COVID-19
Pandemic on Person-Trips
and Tele-Activities
(Part 2)**

July 22, 2020 • 11AM EST



José Holguín-Veras



Cara Wang

Mechanics of the Seminar

- The webinar is being recorded, the link to it will be sent out to participants and posted, in a few days at:

<https://cite.rpi.edu/index.php/training-and-outreach/>

- Audio options:
 - Use Webex to receive the audio (PRIMARY method)
 - Dial 1-415-655-0001, access code 733 020 237
 - Refer to confirmation email for local number
- Submit questions using the Q&A feature – they will be answered at the end of the webinar



Outline

- Introduction and Preliminary Findings (Cara Wang)
- Discussion of Equity Issues and Concluding Remarks (José Holguín-Veras)
- Questions and Answers



Introduction and Preliminary Findings



Cara Wang

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Overview of Webinar Series

- Webinar #1: Impacts of the COVID-19 Pandemic on Purchasing of Critical Supplies, Roots and Measures to Mitigate “Panic Buying”
- Webinar #2: Impacts of the COVID-19 Pandemic on Person-trips and Tele-Activities (Part 1: Mandatory and Discretionary Activities)
- Webinar #3: Impacts of the COVID-19 Pandemic on Person-trips and Tele-Activities (Part 2: Maintenance Activities)

Link to Recordings of Previous Webinars

<https://cite.rpi.edu/index.php/training-and-outreach/>



Outline

Introduction and Background

Preliminary Findings

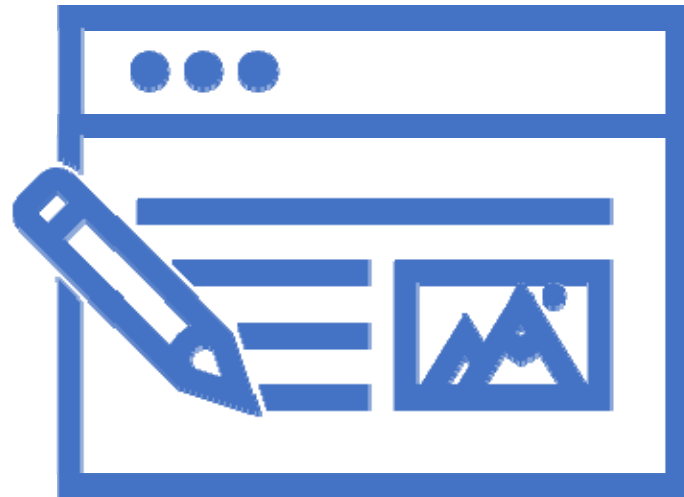
- Changes in delivery patterns
- Person-trips and deliveries
- Influence of socioeconomic factors
- Key insights

Discussion of Equity Issues

- Related to person travel patterns
- Related to purchasing patterns: USA and world

Concluding Remarks





Introduction and Background

Webinar #2

Webinar #3

Mandatory Activities



Recreational & Social Venues

Discretionary Activities

Maintenance Activities



**Service Providers
Health, Beauty...**

Maintenance Activities

**Color Code:
Types of Flow**

- Communication Flows
- Traveler Flows
- Freight & Service Flows

**Arrow Direction:
Flow Directions**

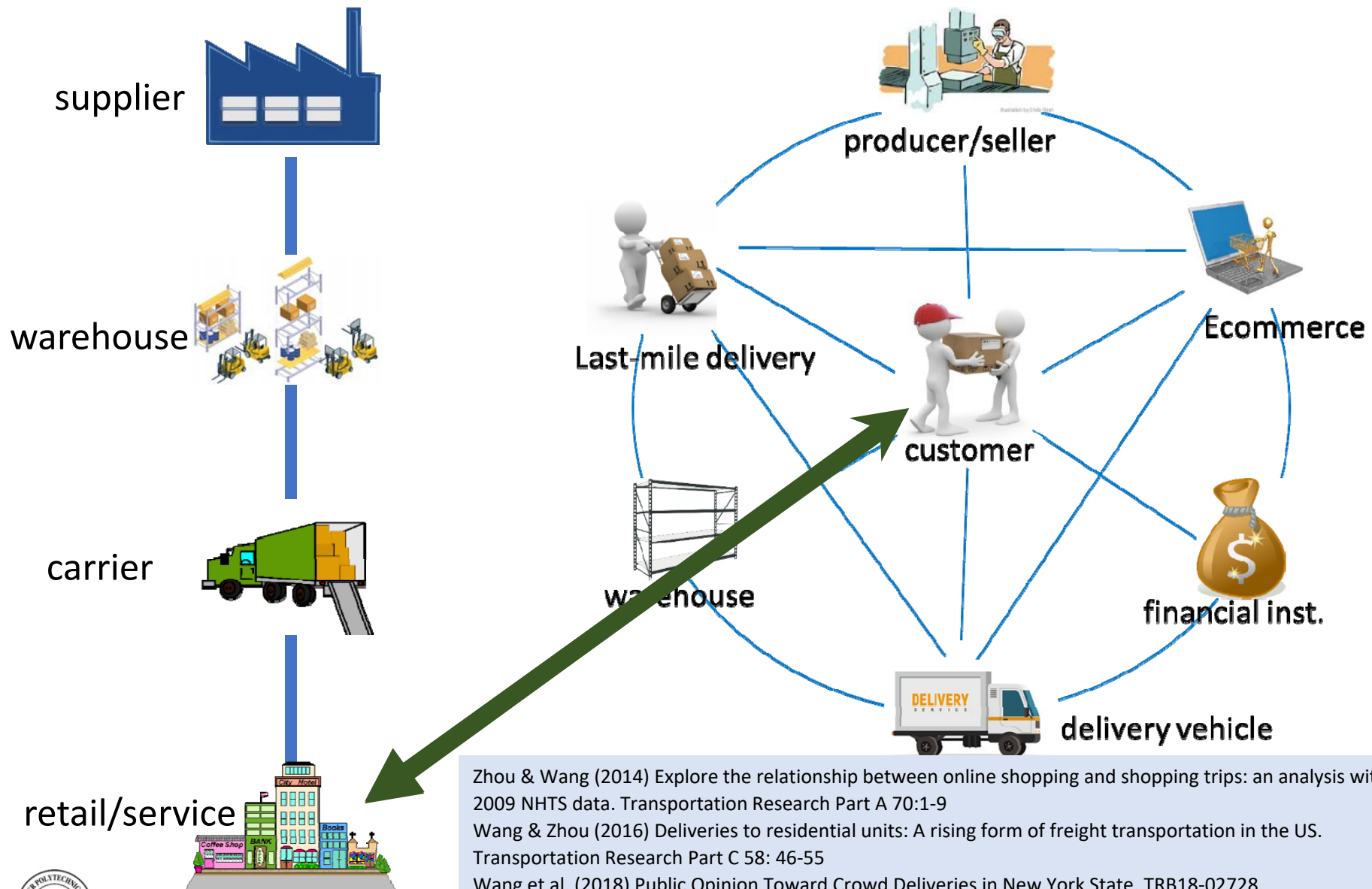
- People travel to complete activities
- Vendors travel to people's locations

**Arrow Thickness:
Volume of Flow**

- Small Volume
- Large Volume



Ecommerce and Transportation



Zhou & Wang (2014) Explore the relationship between online shopping and shopping trips: an analysis with the 2009 NHTS data. Transportation Research Part A 70:1-9
 Wang & Zhou (2016) Deliveries to residential units: A rising form of freight transportation in the US. Transportation Research Part C 58: 46-55
 Wang et al. (2018) Public Opinion Toward Crowd Deliveries in New York State. TRB18-02728.
 Schmid & Wang (2019) Geographic Heterogeneity of Home Deliveries in the US. TRB19-02185
 Schmid & Wang (2019) Trends of Home Deliveries in the US: Changes from 2009 to 2017. TRB1902312



Questions to be answered

- How has shopping and service behavior changed?
 - Person trips
 - Deliveries
- What factors influence the behavior change?
- How much of the change will remain?
 - Short term
 - Long term

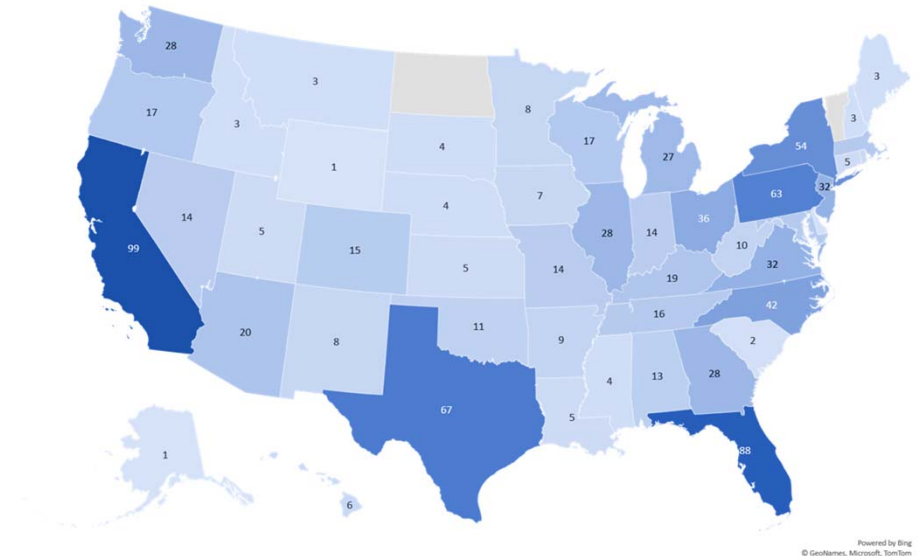




Preliminary Findings

Survey Process

- Observations collected using Amazon Mechanical Turk
- Two rounds of data collection
- 1163 observations total
 - 938 after cleaning
- Additional waves of data will be collected



Key Variable Distributions

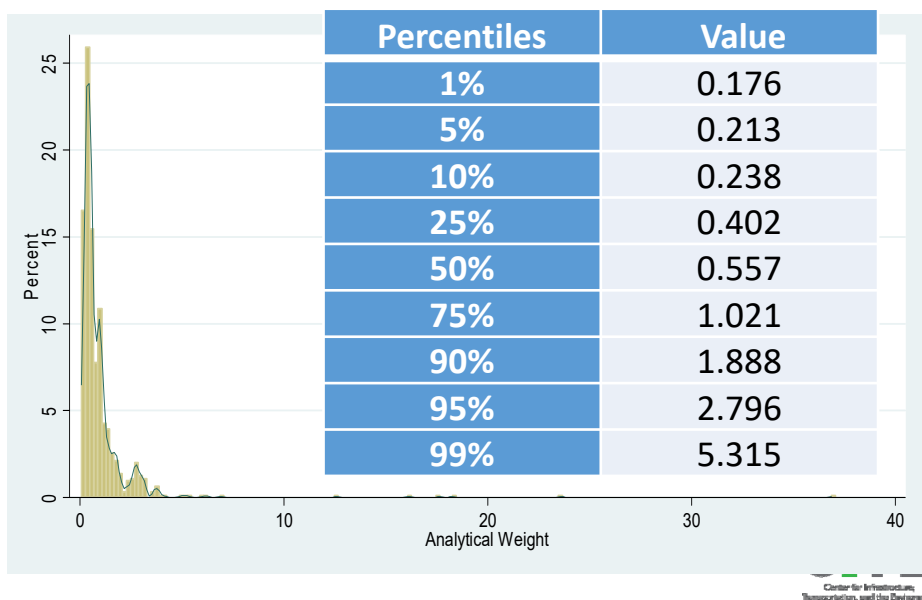
Category	Sample	Population
Less than high school	0.5%	12.0%
High School graduate	34.8%	45.0%
Associate degree	18.4%	13.0%
Bachelor's degree	34.3%	19.0%
Master's or PhD	11.9%	11.0%

Category	Sample	Population
<25	6.1%	12.1%
25~35	28.8%	17.8%
35~45	25.1%	16.4%
45~55	14.0%	16.4%
55~65	16.8%	16.6%
>=65	9.3%	20.6%

Category	Sample	Population
Female	47.2%	50.3%
Male	52.2%	49.4%

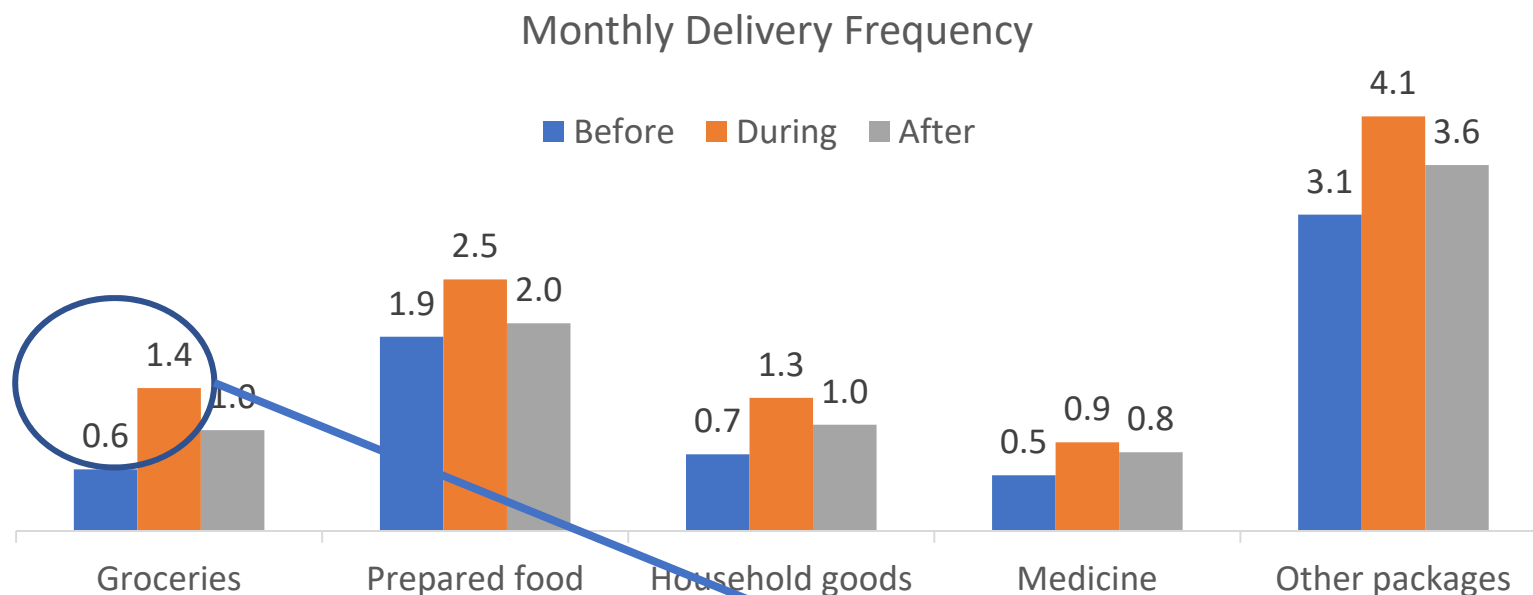
Weighting-IPF with Population Distributions

Category	Sample	Population
Less than \$14,999	6.1%	10.6%
\$15,000 - \$24,999	9.0%	9.0%
\$25,000 - \$34,999	12.0%	8.9%
\$35,000 - \$49,999	18.7%	12.4%
\$50,000 - \$74,999	21.1%	17.4%
\$75,000 - \$99,999	13.0%	12.6%
\$100,000 - \$149,999	14.1%	15.0%
\$150,000-\$199,999	3.5%	6.6%
\$200,000 and above	2.6%	7.6%

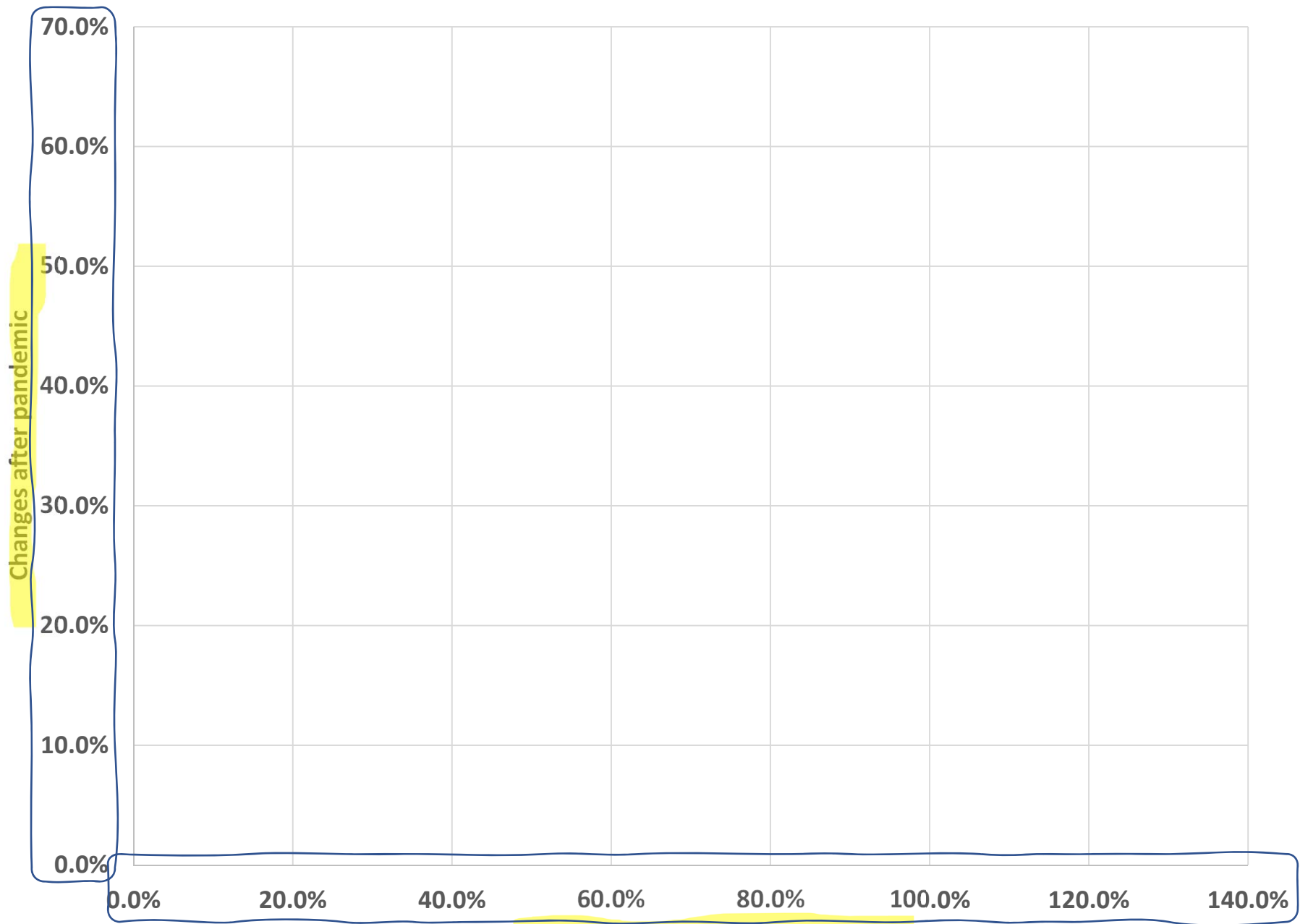


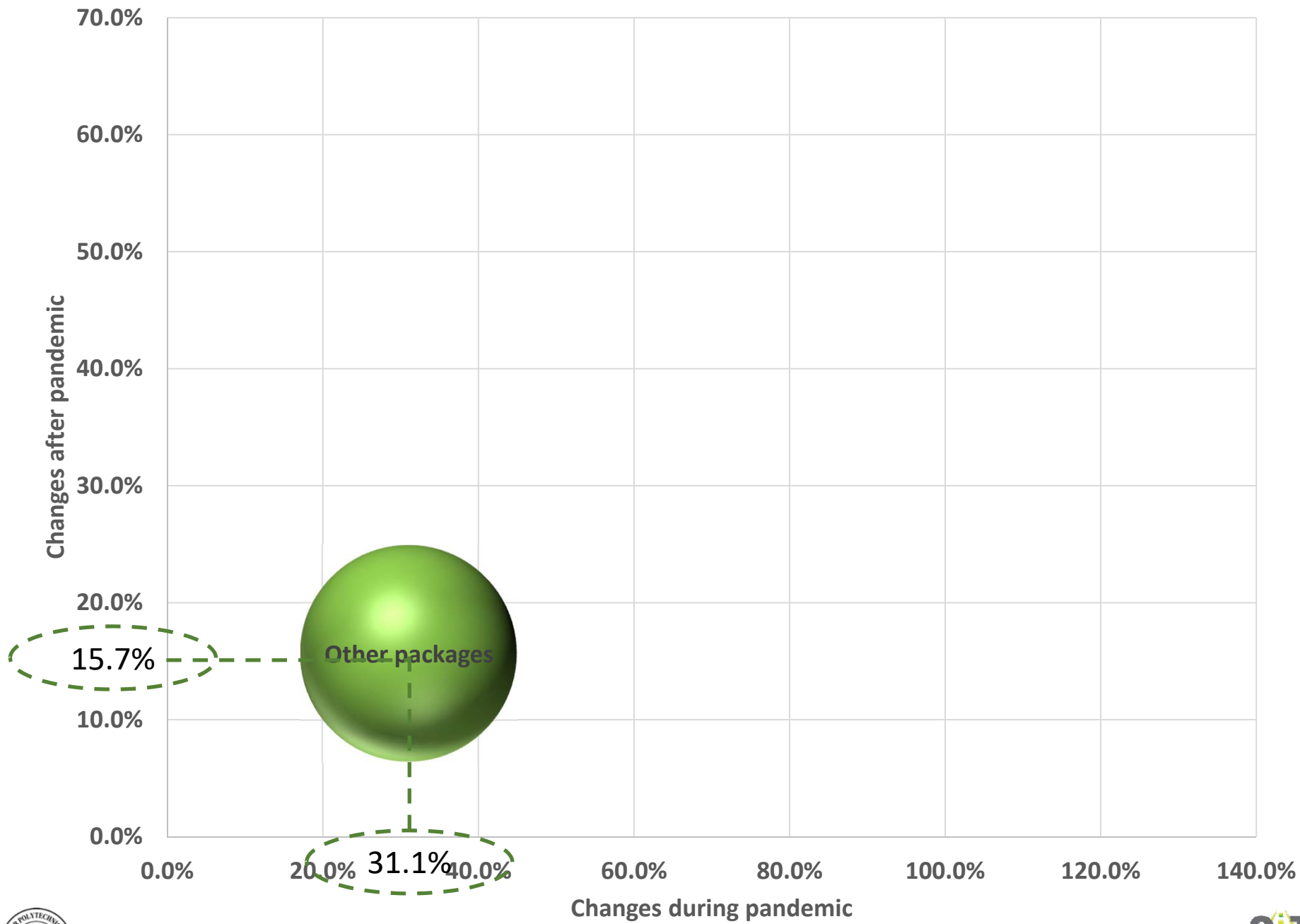
Changes in Delivery Patterns

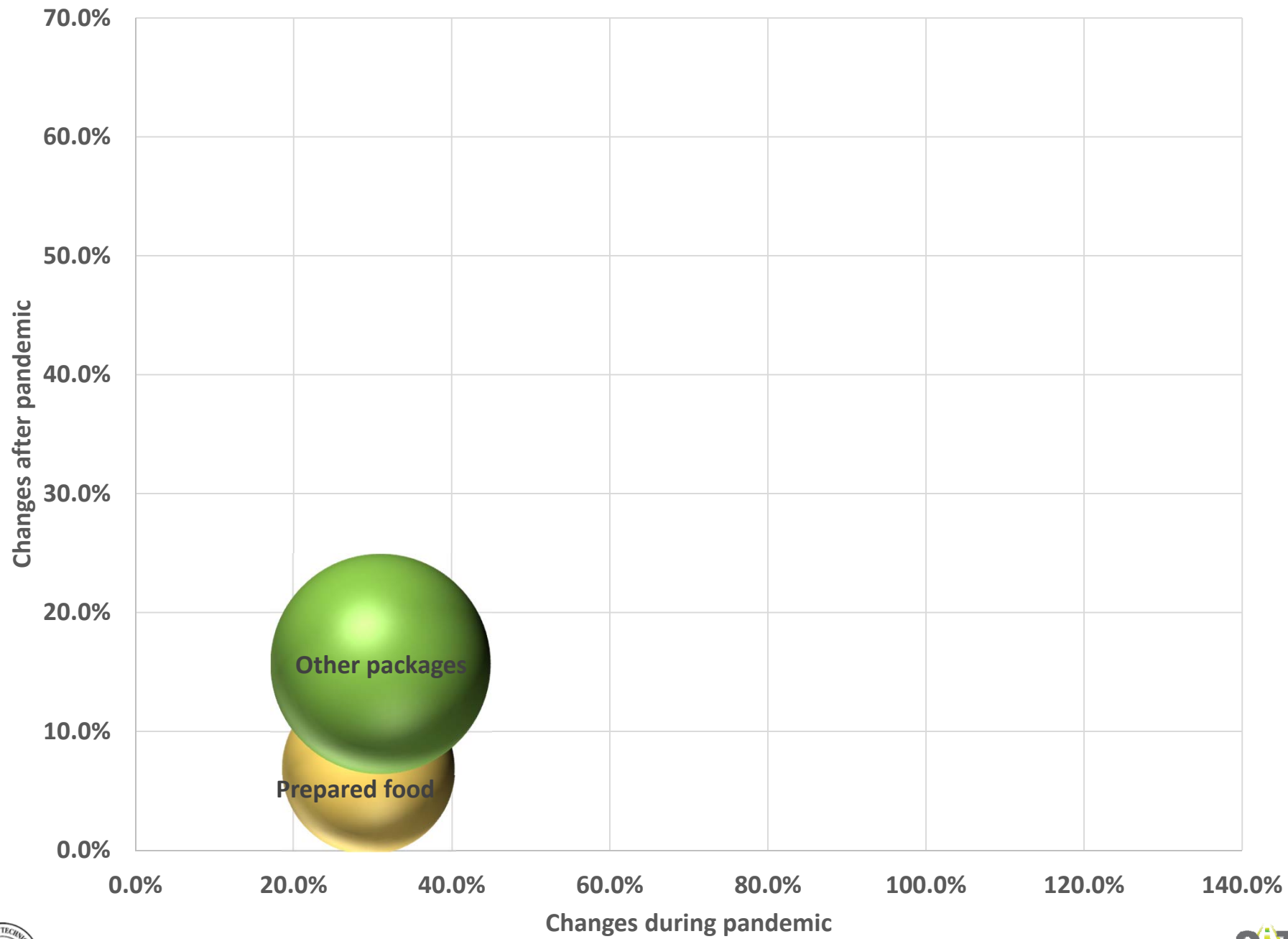
Monthly Delivery Frequency by Types of Goods

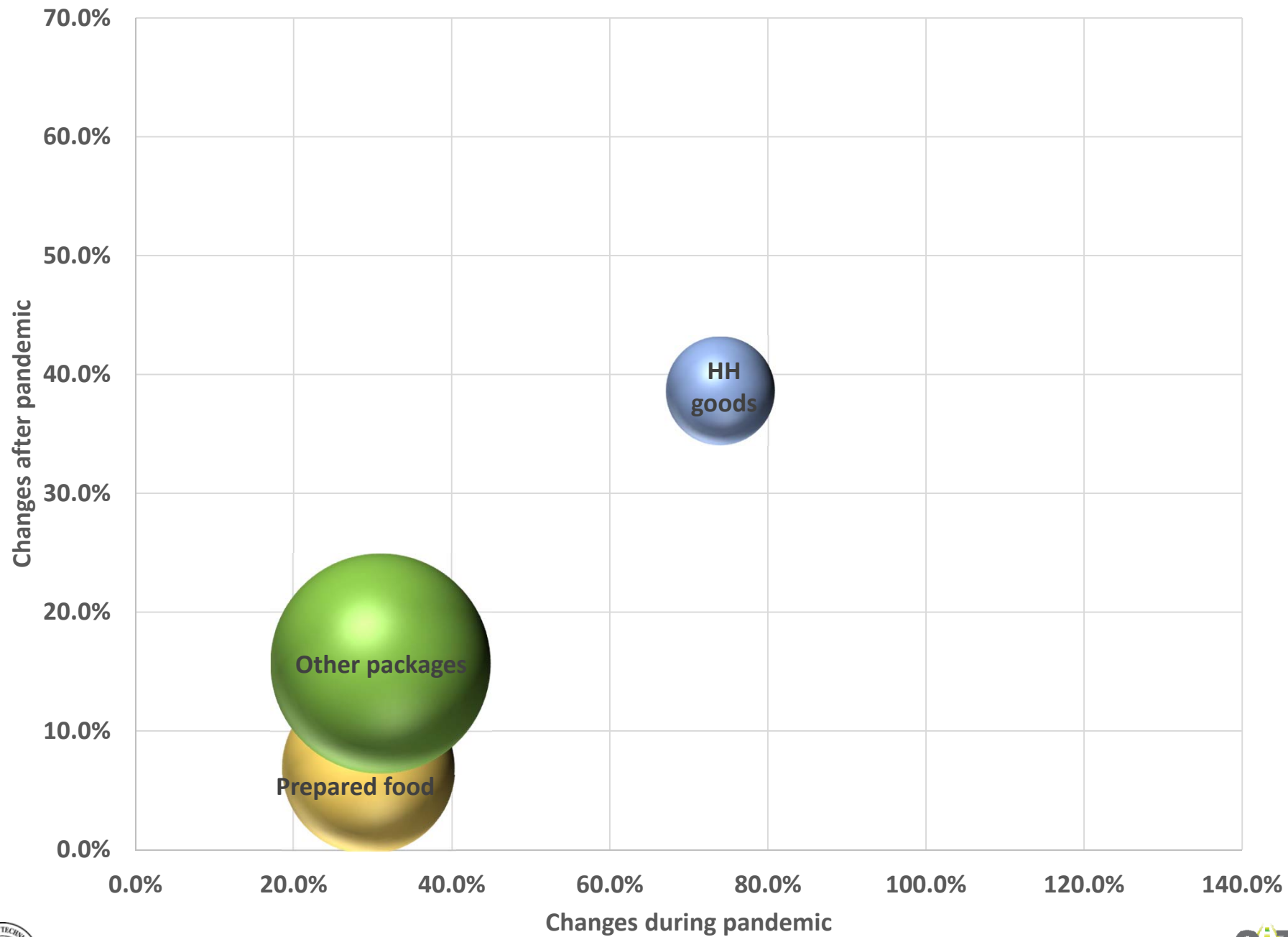


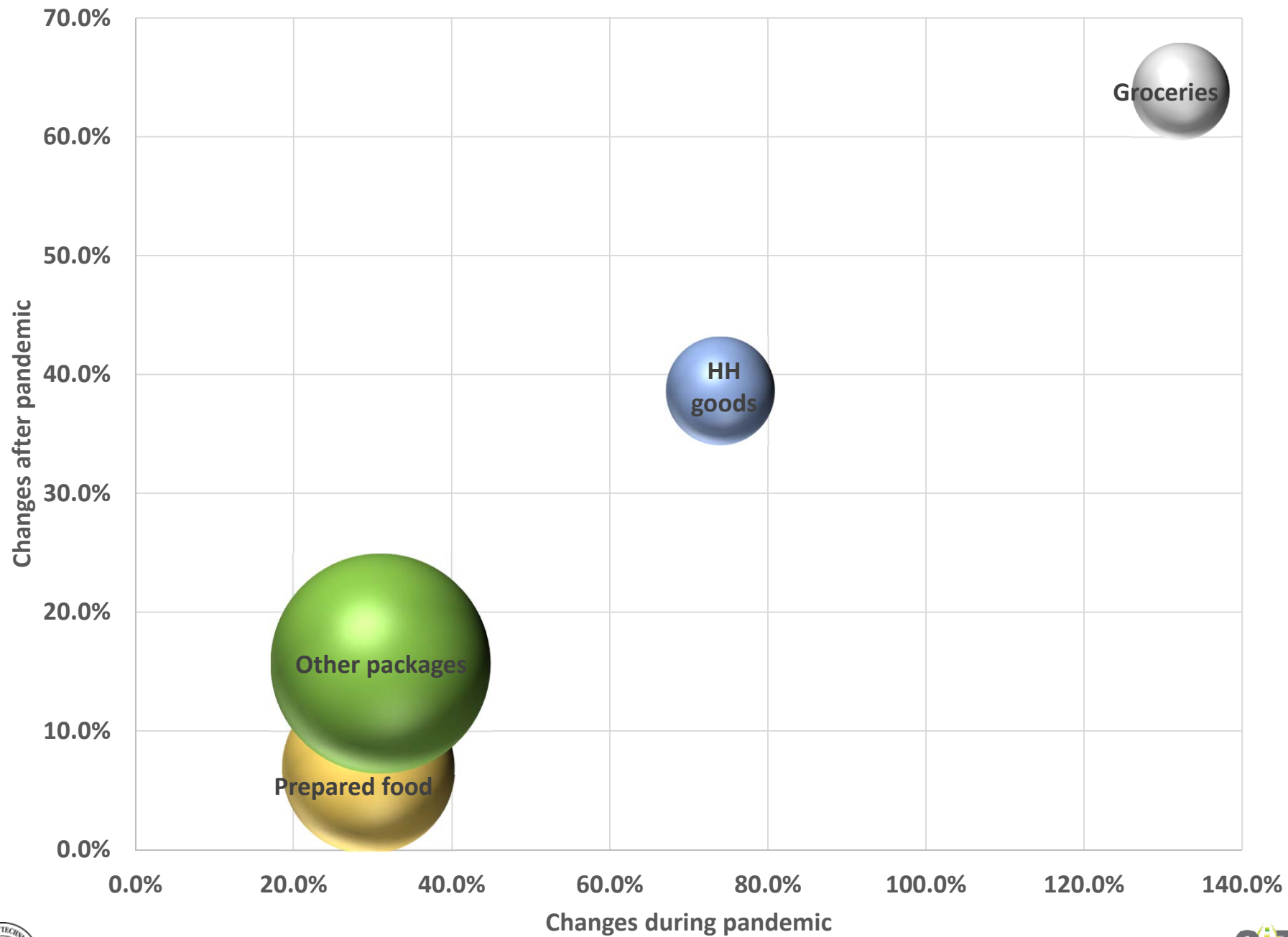
	During	After
Groceries (Fresh Direct, Instacart, Blue Apron, etc.)	132.2%	63.8%
Prepared food	29.5%	6.9%
Household goods (Paper products, cleaning supplies, etc.)	73.9%	38.6%
Medical supplies, medications	59.1%	41.4%
Other packages (clothing, books, electronics, etc.)	31.1%	15.7%
Total	46.3%	22.0%

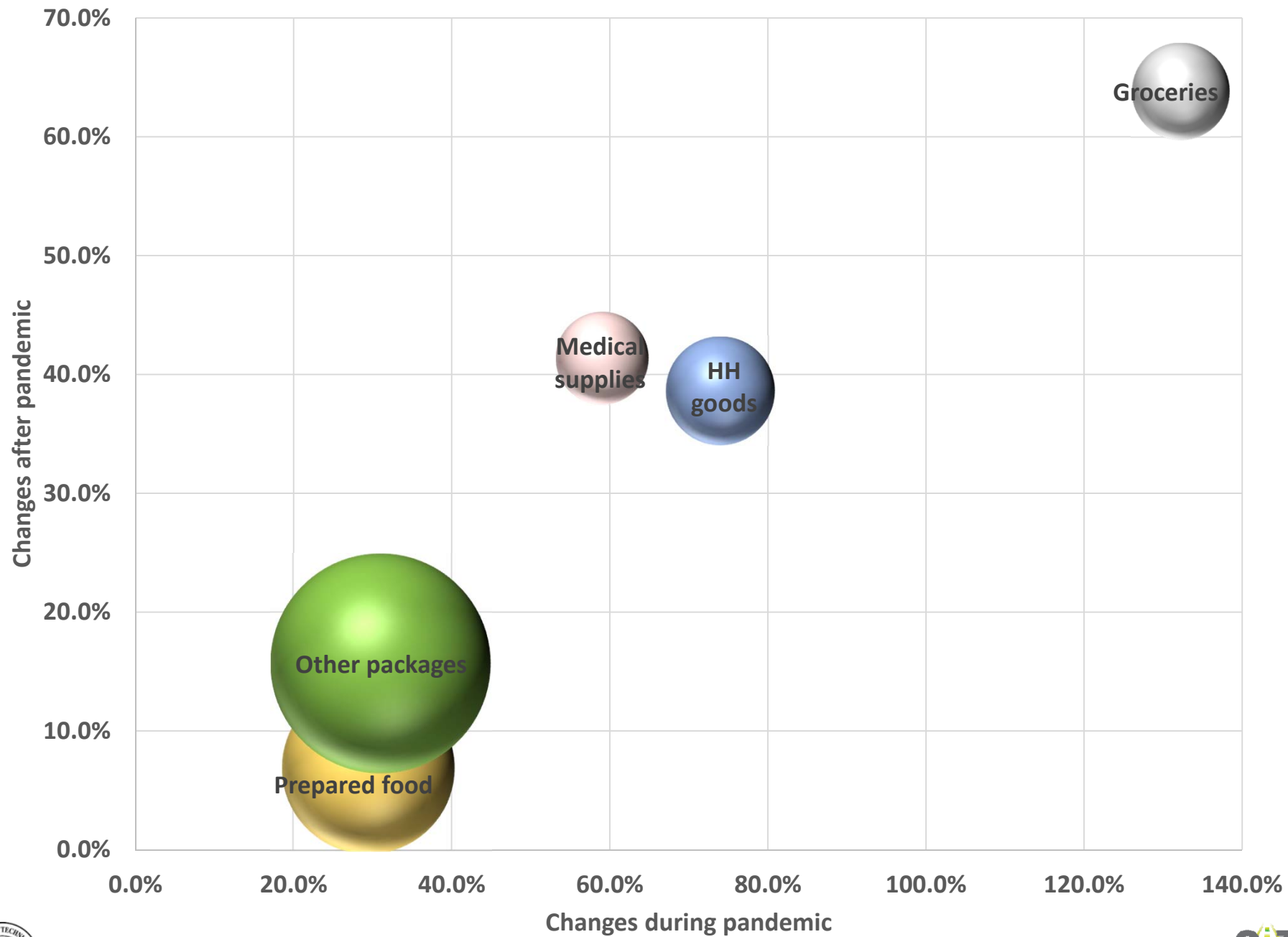


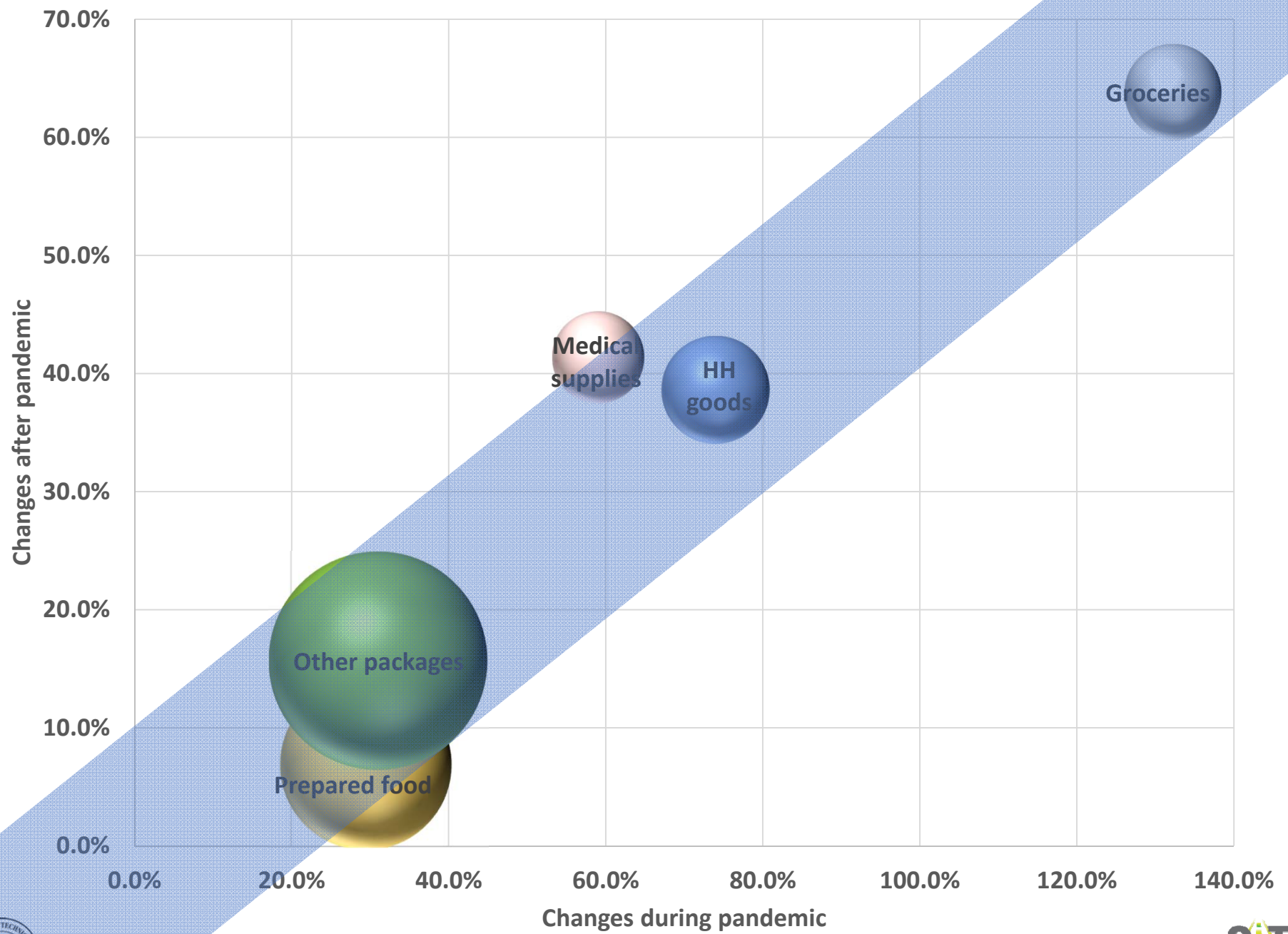


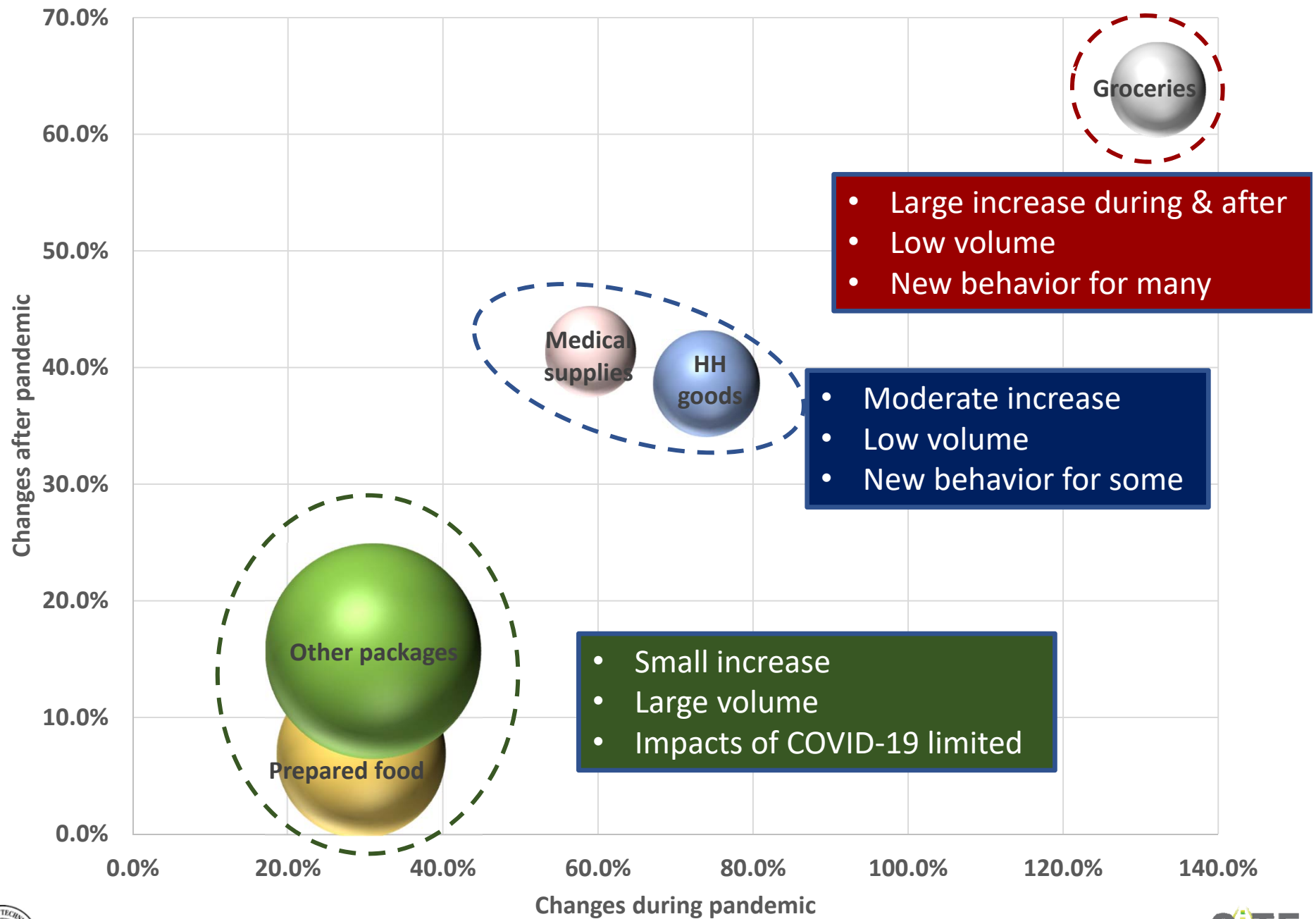






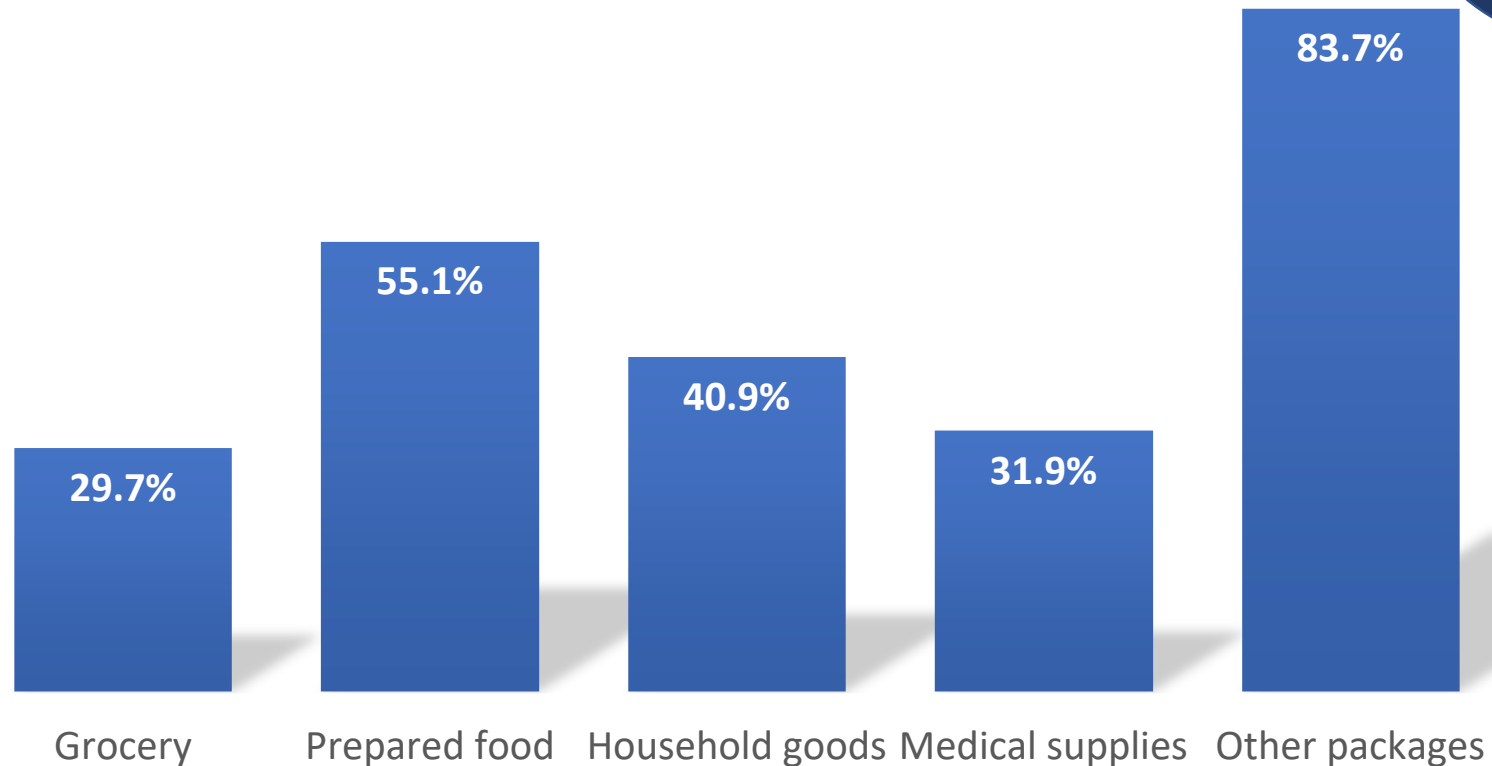






Delivery Service Users

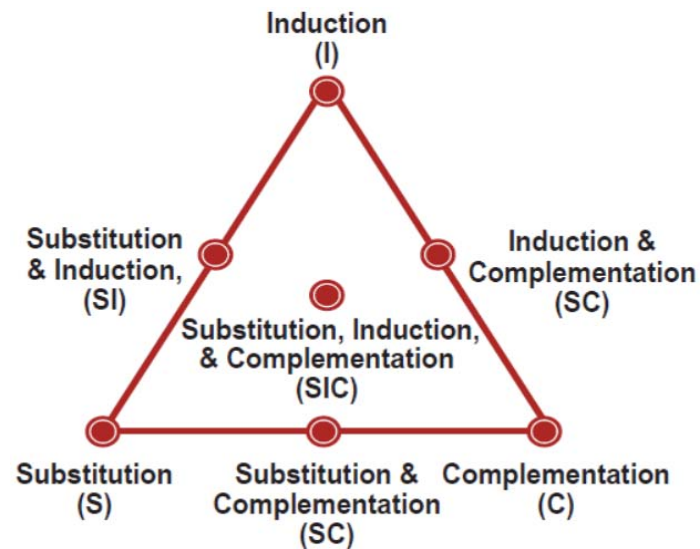
Percentage of Respondents Stating Use of
Delivery Service after Pandemic



93%
delivery
service
users in at
least one
category



Person Trips and Deliveries



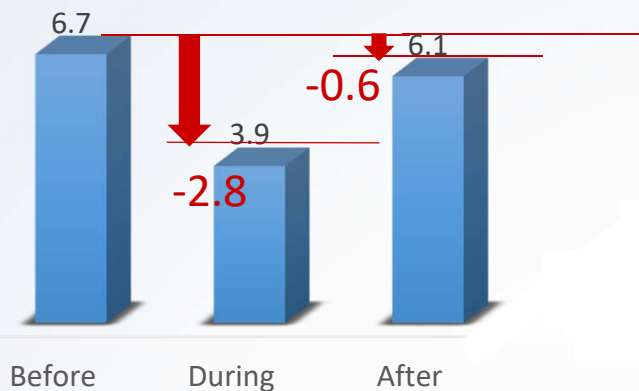


Grocery Shopping

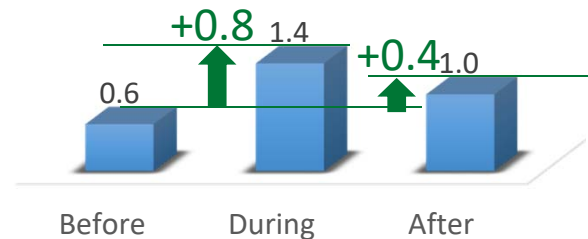
Grocery Shopping: Average Respondent

Average respondent corresponds to the entire sample, including 29.7% who use grocery delivery service after pandemic, and the rest 70.3% who do not

Monthly Trip Frequency to Grocery Stores and Supermarkets



Monthly Grocery Delivery Frequency

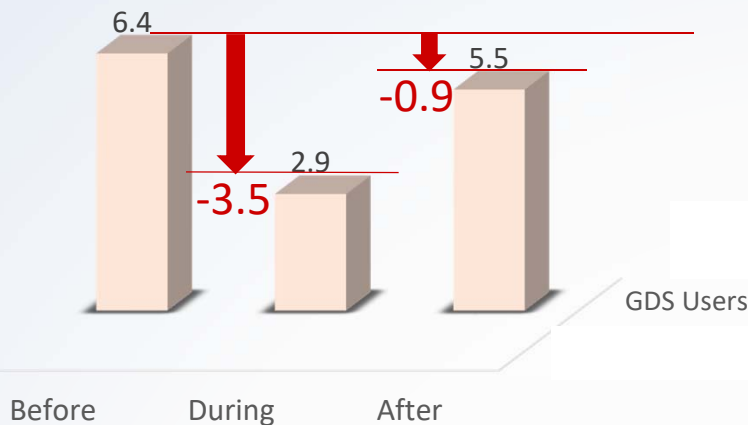


- During pandemic: significant changes in both grocery shopping trips and grocery deliveries
- After pandemic: grocery shopping trips slightly decrease, grocery deliveries increase

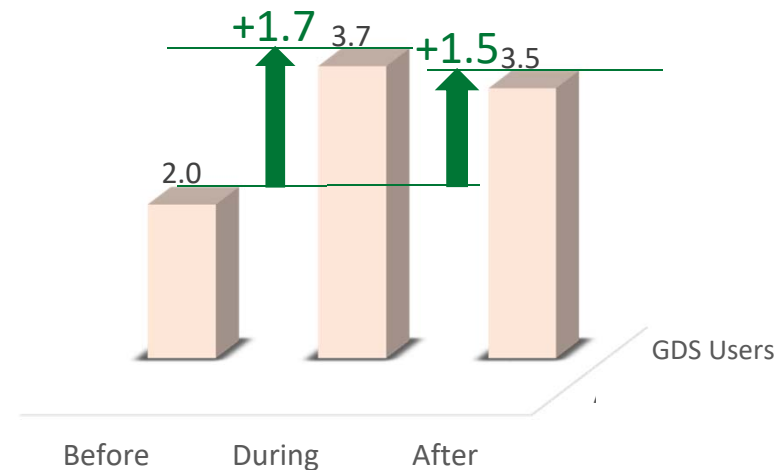
Grocery Shopping: Grocery Delivery Service (GDS) Users

GDS users: The average of the 29.7% using grocery delivery service after pandemic

Monthly Trip Frequency to Grocery Stores and Supermarkets

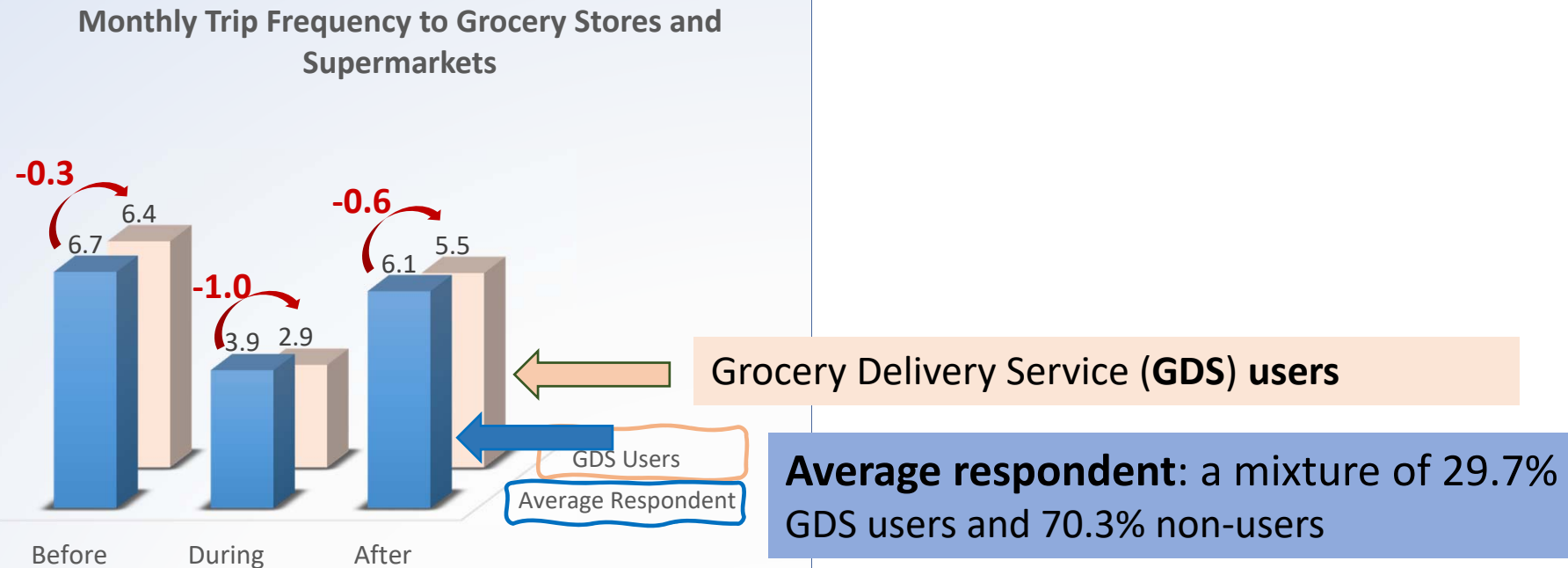


Monthly Grocery Delivery Frequency



- During pandemic: significant changes in both grocery shopping trips and grocery deliveries
- After pandemic: grocery shopping trips decrease, grocery deliveries increase, slightly lower than during pandemic

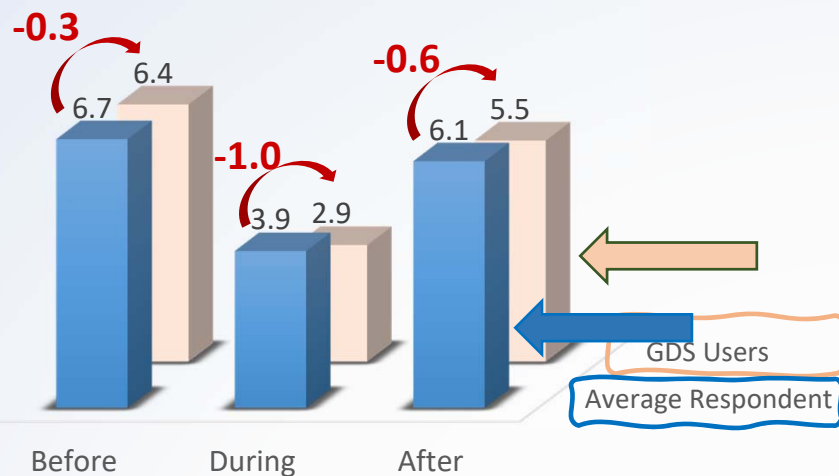
Grocery Shopping: Average Respondent vs GDS Users



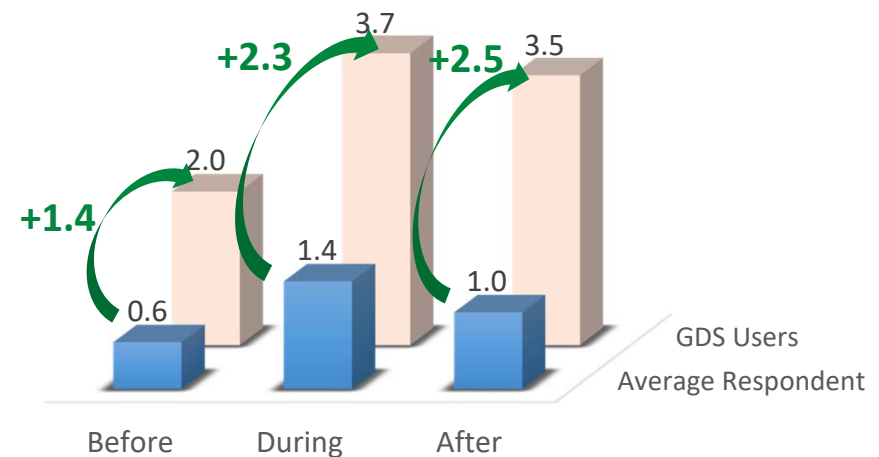
- Compared to average respondent, GDS users' grocery shopping trip frequency is lower, but overall difference is minimal through all stages of pandemic

Grocery Shopping: Average Respondent vs GDS Users

Monthly Trip Frequency to Grocery Stores and Supermarkets



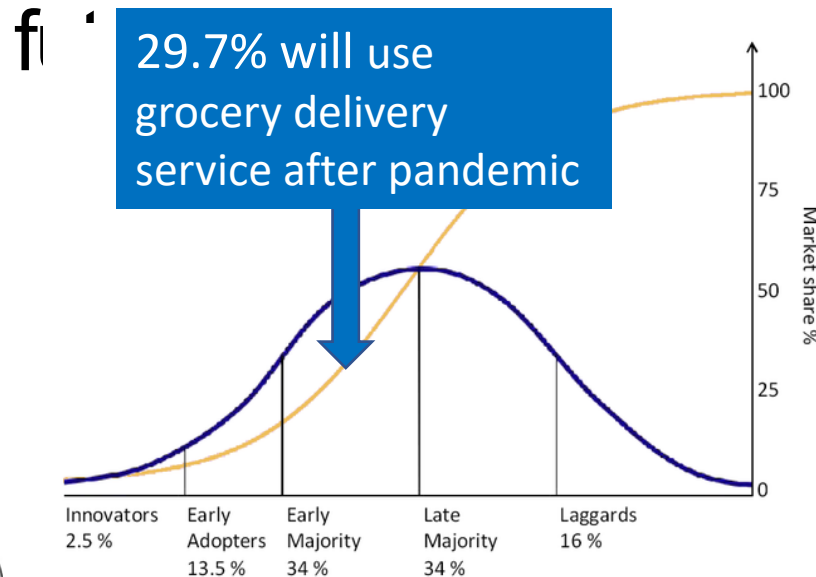
Monthly Grocery Delivery Frequency



- Compared to average respondent, GDS users' grocery shopping trip frequency is lower, but overall difference is minimal through all stages of pandemic
- GDS users receive significantly more deliveries through all stages of pandemic, especially after pandemic

Grocery Shopping: Short Term Change vs Long Term Change

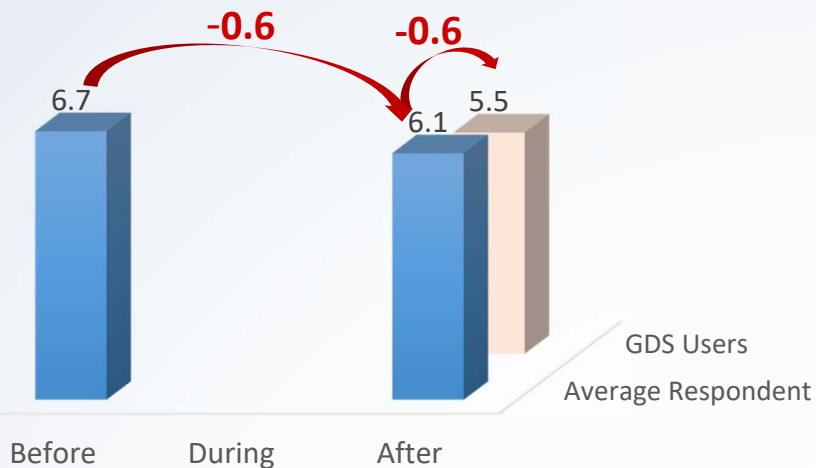
- The average respondent represents the current population
 - The stated “after pandemic” behavior compared to their “before pandemic” behavior shows population’s **short-term change** after the pandemic
- GDS users’ behavior provides insights into the



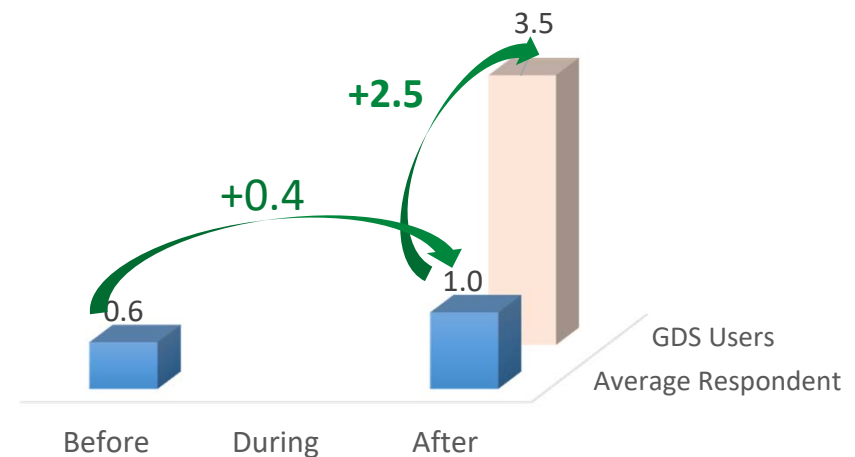
Difference between *Average Respondent*’ and *GDS users*’ “after pandemic” behavior suggests the direction of **long-term change**

Grocery Shopping: Short Term Change vs Long Term Change

Monthly Trip Frequency to Grocery Stores and Supermarkets



Monthly Grocery Delivery Frequency



- In the short term, grocery shopping trips and grocery deliveries are substitution with -0.6: +0.4
- In the long term, substitution and induction, with -0.6:+2.5



Non-food Retail

Clothing, books, electronics...

Non-Food Retail: Average Respondent

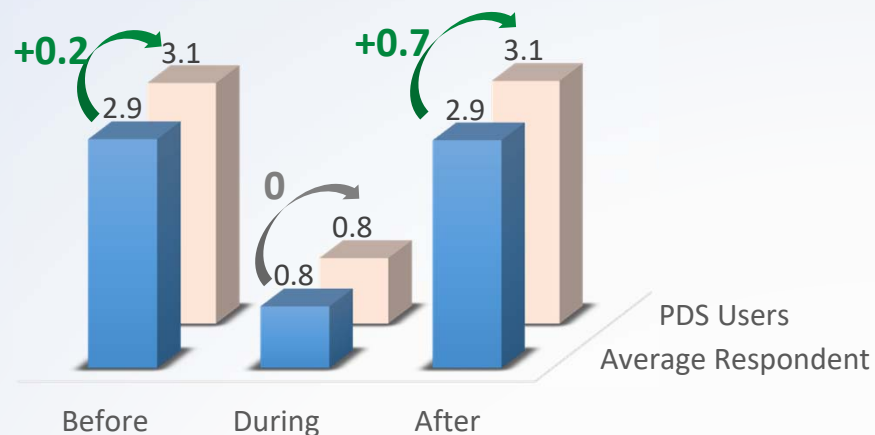
Average respondent corresponds to the entire sample, including 83.7% who use package delivery service (PDS) after pandemic, and the rest 16.3% who do not



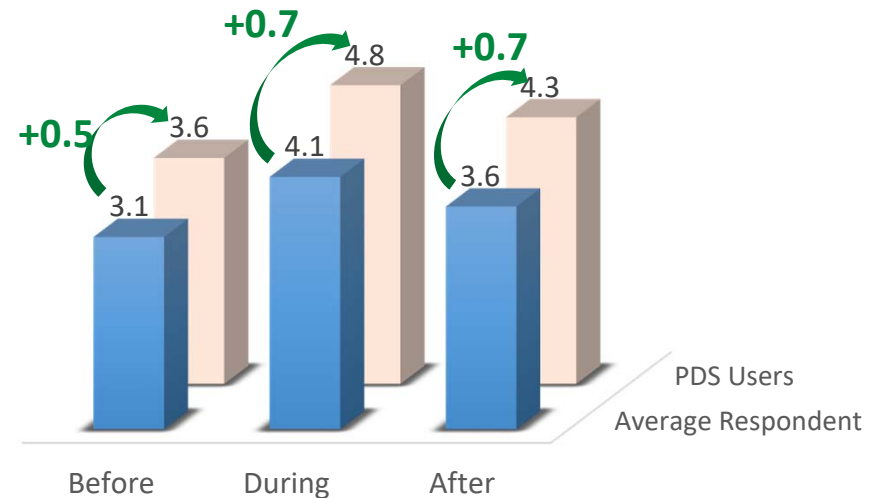
- Retail shopping trips decreased significantly & package deliveries increased during pandemic
- No change in retail shopping trips, increase in package delivery after pandemic

Non-Food Retail: Average Respondent vs PDS Users

Monthly Trip Frequency to Non-Food Retail Stores



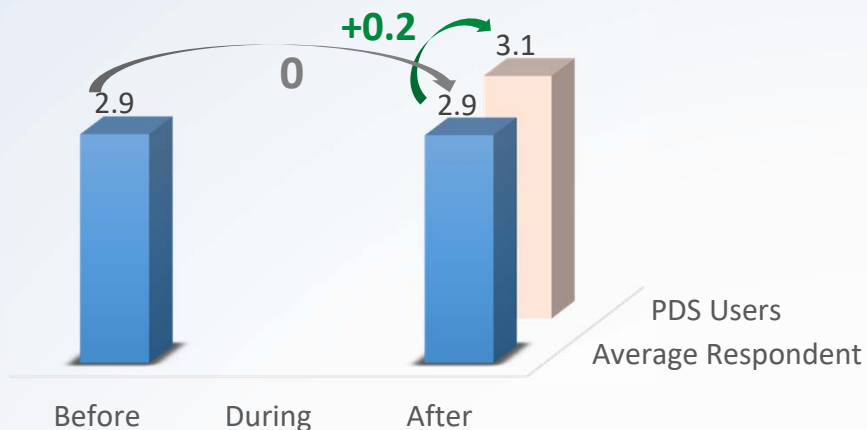
Monthly Delivery Frequency for Other Packages



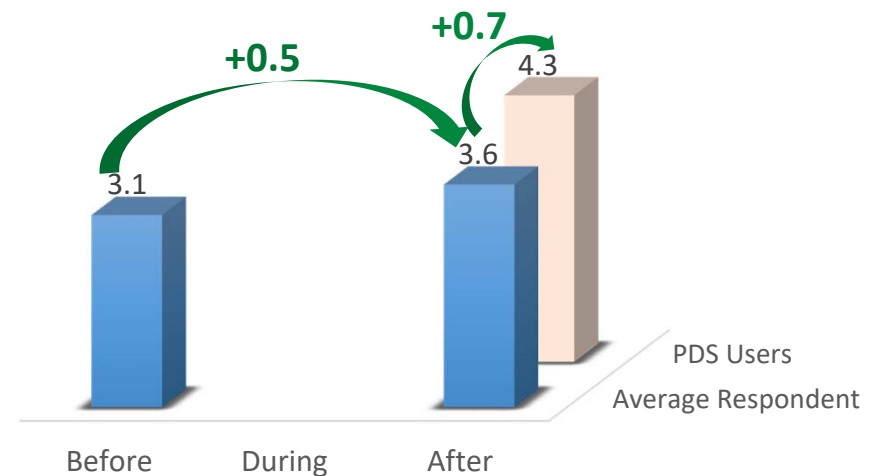
- Difference between average respondent and PDS users are small
- PDS users make more retail shopping trips and receive more package deliveries

Non-Food Retail: Short Term Change vs Long Term Change

Monthly Trip Frequency to Non-Food Retail Stores



Monthly Delivery Frequency for Other Packages



- In the short term, shopping trips to retail stores very stable, small increase package deliveries, with a rate of 0:+0.4
- In the long term, shopping trips to retail stores remain stable, more delivery expected with a rate of +0.2:+0.7
- Complementation & induction, net increase in travel activities in the future

Influence of Socioeconomic Factors: Grocery Shopping as Example

Grocery Shopping: In-store vs Delivery



Individual

⑩ Gender



Household

- Household with vs without children under age 18



Regional

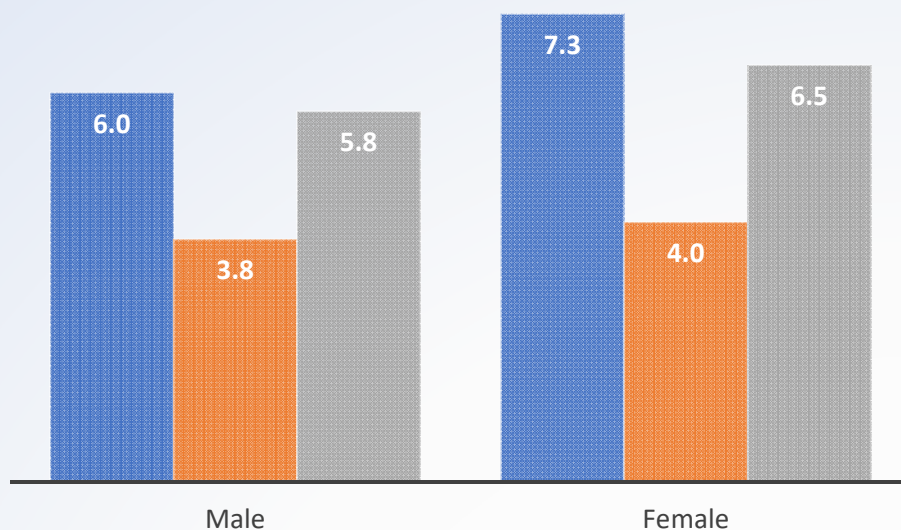
- Density of grocery store and supermarket employment (/sq-mi)



Grocery Shopping by Gender

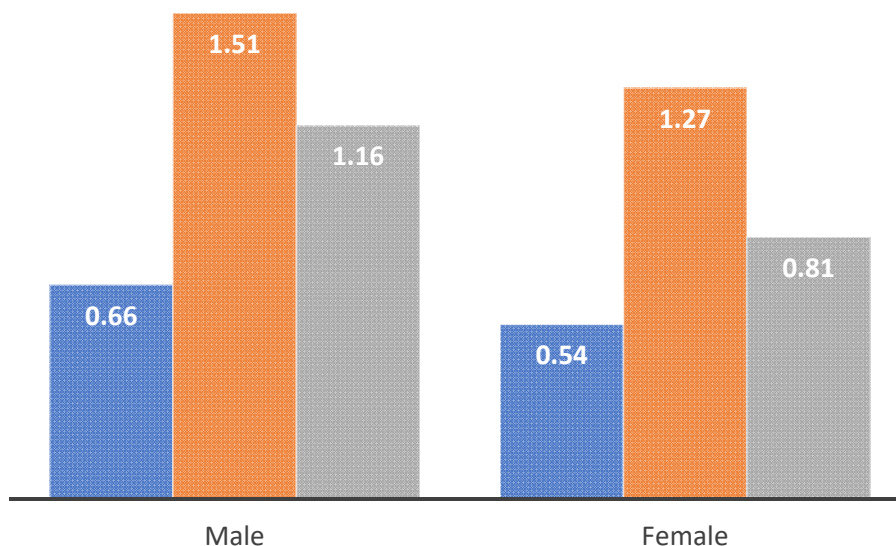
Monthly Trip Frequency to Grocery Stores and Supermarkets

■ Before ■ During ■ After



Monthly Grocery Delivery Frequency

■ Before ■ During ■ After

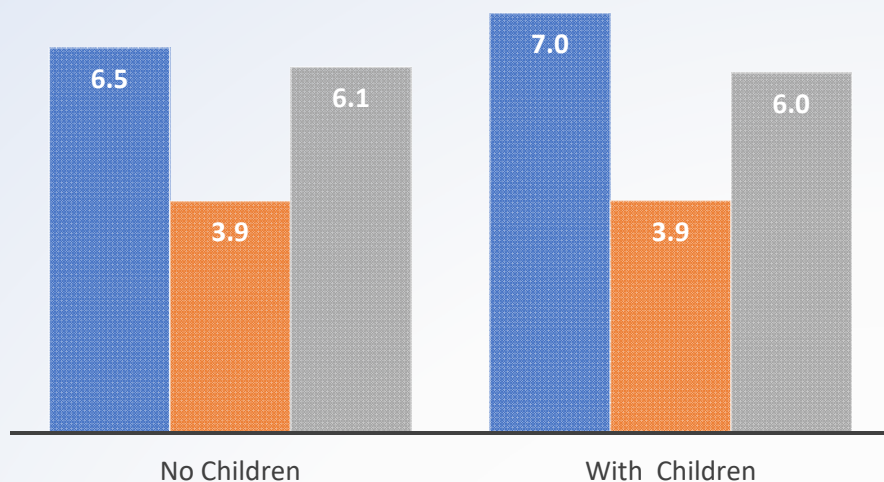


- Female exhibit preference over grocery shopping in physical stores
- Gender difference remains during and after pandemic

Grocery Shopping w. vs w/o Children

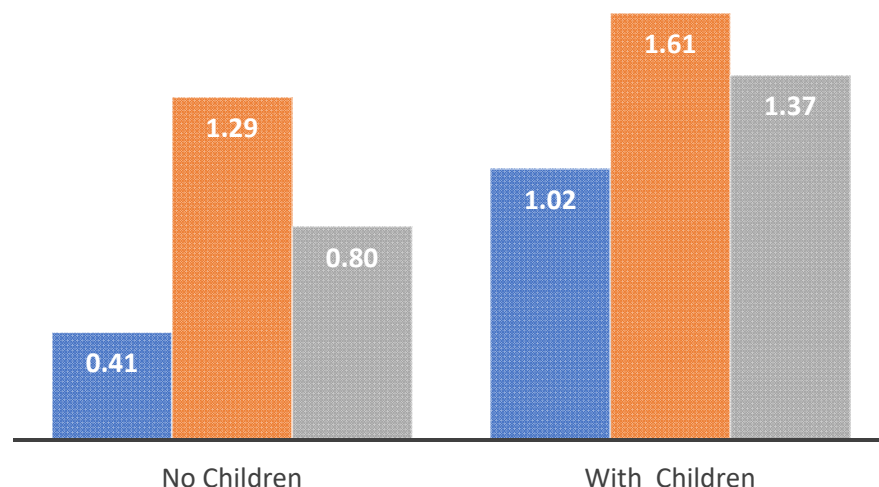
Monthly Trip Frequency to Grocery Stores and Supermarkets

■ Before ■ During ■ After



Monthly Grocery Delivery Frequency

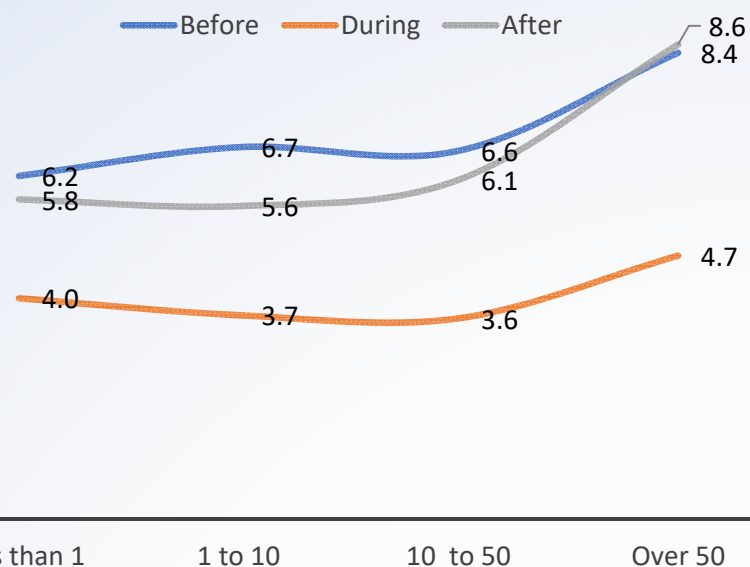
■ Before ■ During ■ After



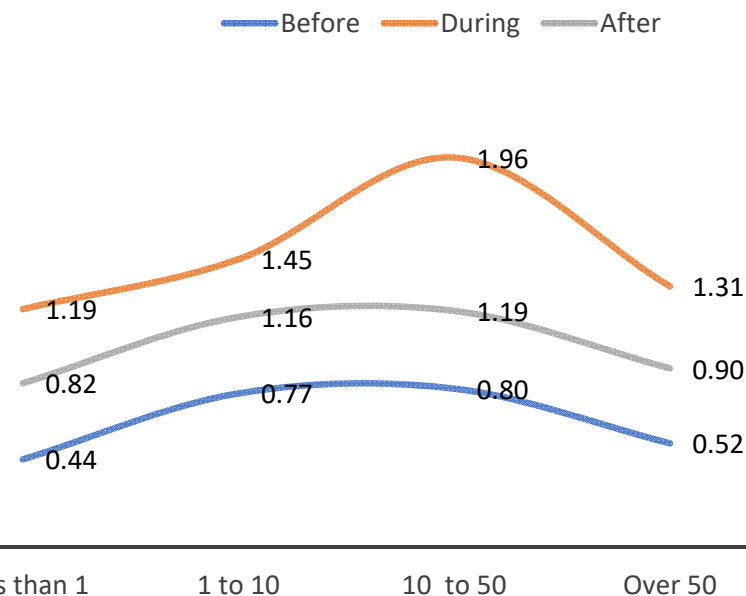
- Grocery shopping trip frequency does not differ
- Family with children more likely to use grocery delivery service

Grocery Shopping by Density of Grocery Store and Supermarket Employment

Monthly Trip Frequency to Grocery Stores and Supermarkets



Monthly Grocery Delivery Frequency



- Grocery shopping trip frequency increases with physical store density
- Grocery delivery used more in locations with medium density of grocery stores

Key Insights



Key Insights

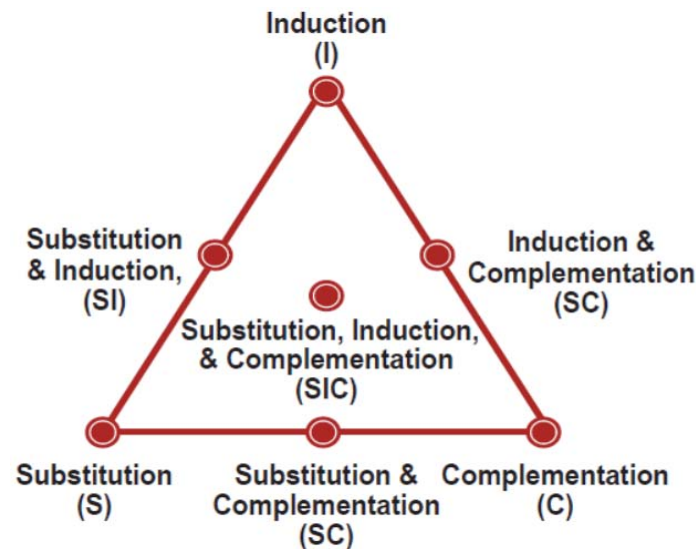
- Behaviors differ by sociodemographic features
- Pandemic has caused short term behavior change
- Part of the change will remain after pandemic and continue to develop in the long term



Key Insights

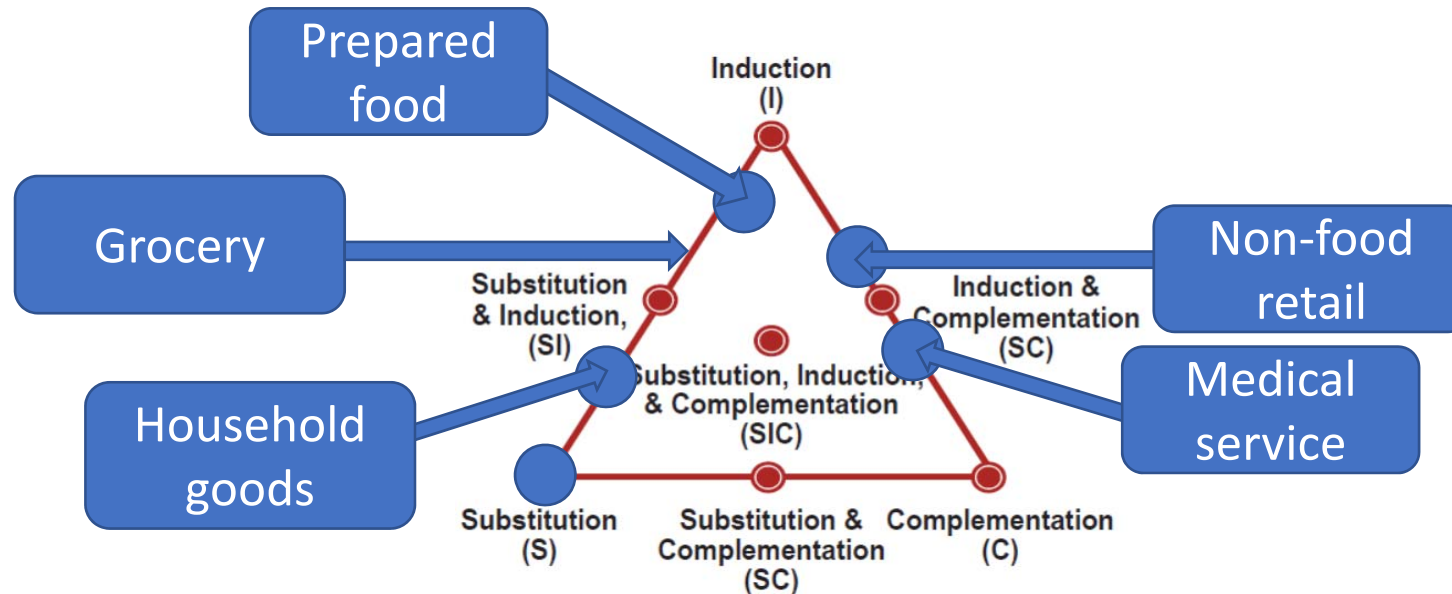
- Online deliveries unable to replace shopping and service travel activities for most categories:

Grocery



Key Insights

- Online deliveries unable to replace shopping and service travel activities for most categories:



In the long term, net increase in VMT expected from shopping and service activities

Equity Issues and Concluding Remarks



José Holguín-Veras

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Equity Issues

Related to Personal Travel Patterns

Collected Data about Intensity of



Work/Online working



Social activities/Online social



Entertainment activities/Online entertainment



Shopping Grocery stores/Grocery delivery



Restaurants/Prepared food



Medicine/Tele-medicine

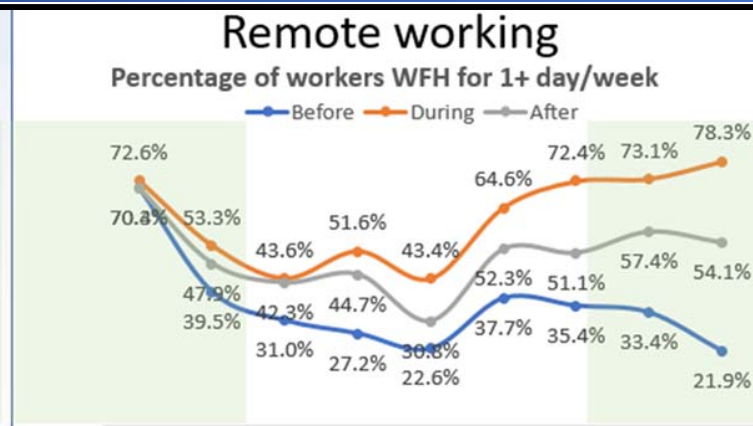
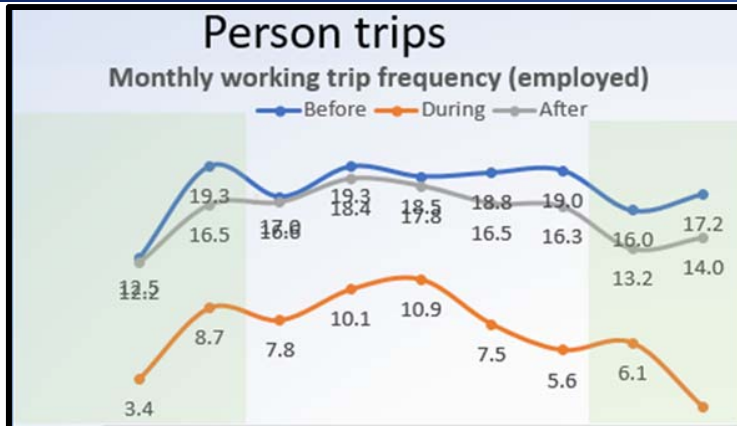


Retail stores/Online shopping

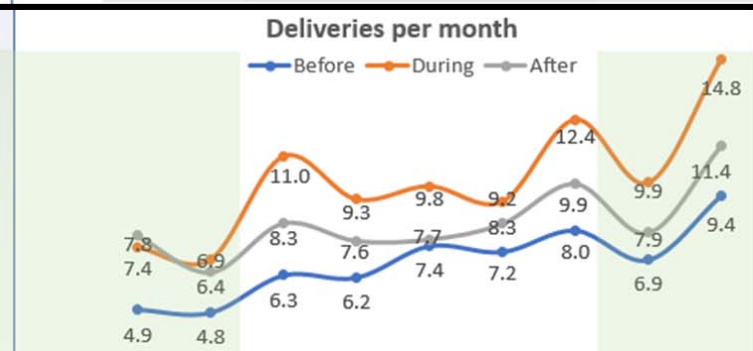
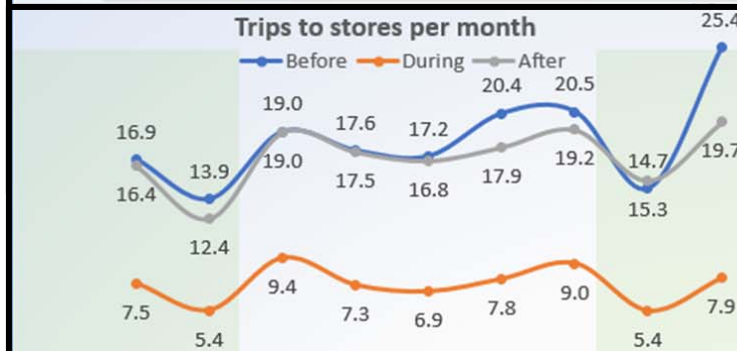
...though for time reasons only income is discussed today

Person-Trips vs. Tele-Activities by Income

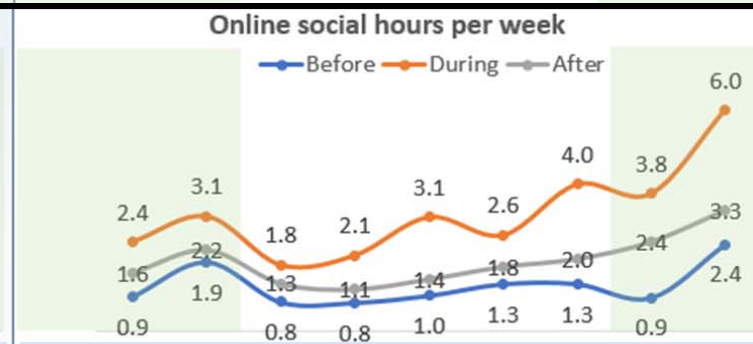
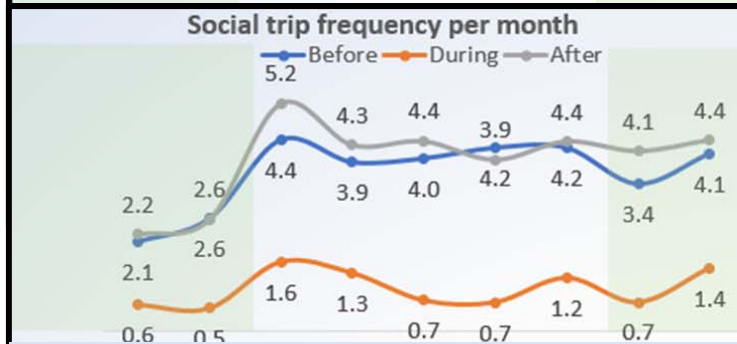
Work
Related



Shopping
Related



Social
Related

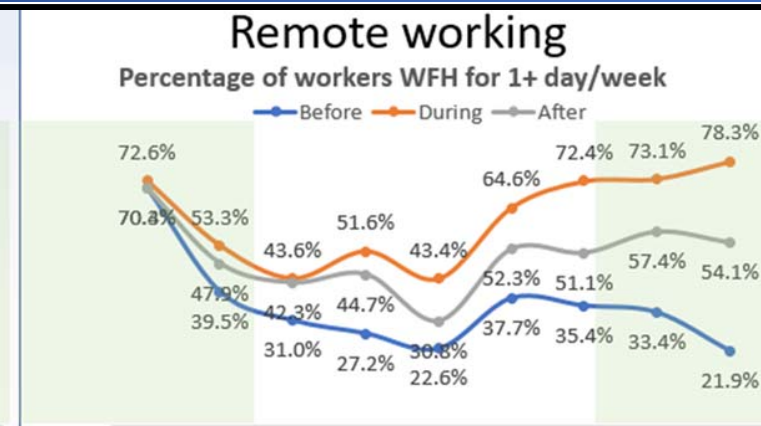
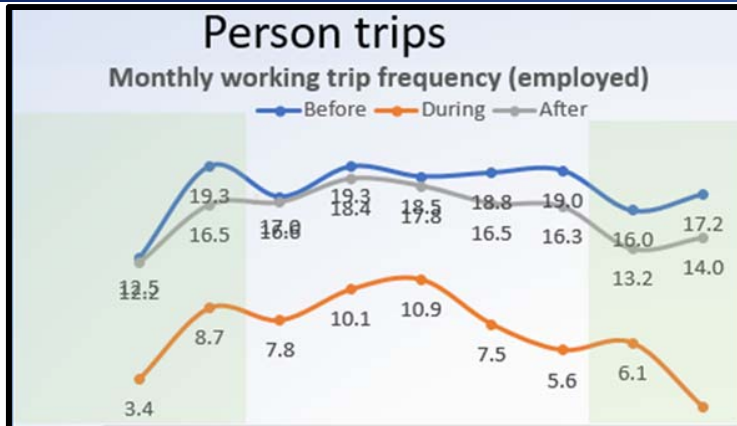


- Either stable or slightly decreasing with income

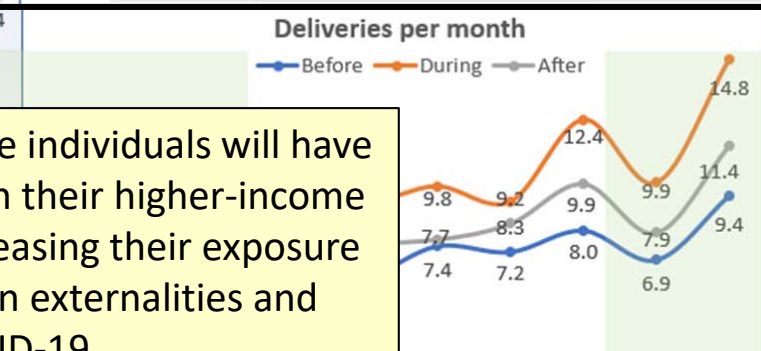
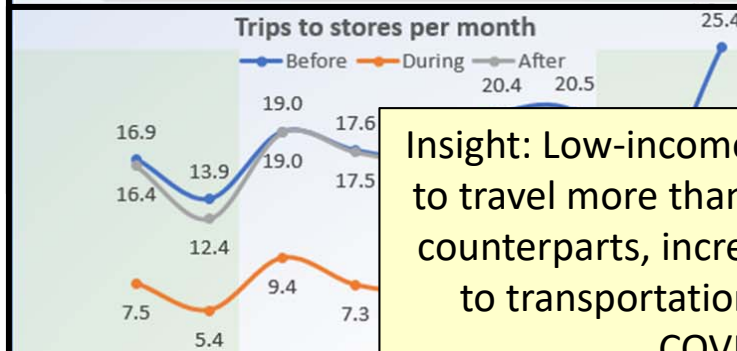
- Increasing with income

Person-Trips vs. Tele-Activities by Income

Work
Related

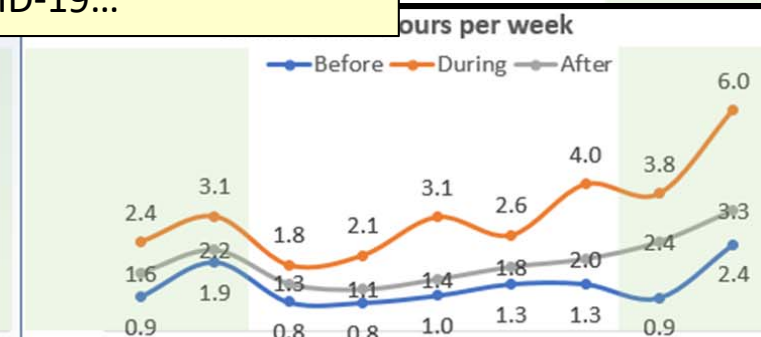
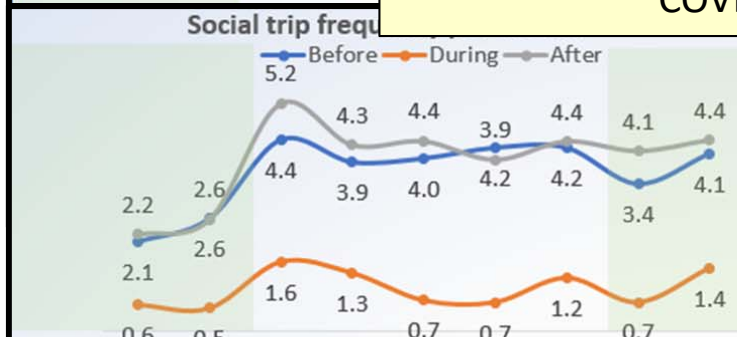


Shopping
Related



Insight: Low-income individuals will have to travel more than their higher-income counterparts, increasing their exposure to transportation externalities and COVID-19...

Social
Related



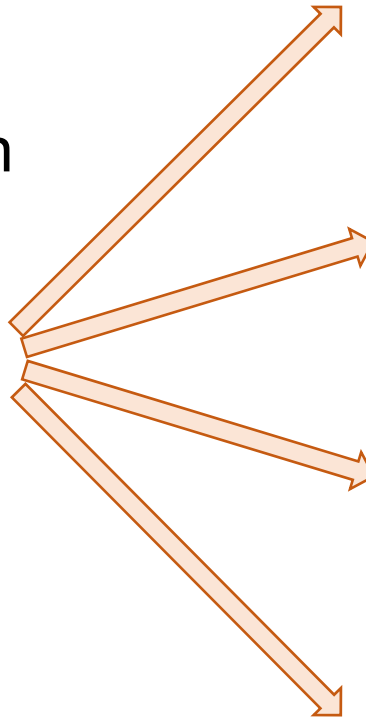
- Either stable or slightly decreasing with income

- Increasing with income

Related to Purchasing Patterns: USA

In reaction to the COVID-19 crisis people...

- Try to get the supplies needed:
- If not possible
 - Reduce consumption
 - Substitute supplies
- If possible:
 - Purchase what is needed
 - Purchase more
 - Larger quantities
 - More frequently



Retail stores



Ecommerce



Grocery Delivery Services



Black markets



Others

Reasons to Purchase More than Needed

- I need them immediately
- I will need them this week
- Someone in my family needs to isolate or...

- Concern for myself and my family
- I was afraid they would run out
- I was afraid I would not be able to buy them
- So that I won't have to go to purchase them later
- I will need them within 7 to 14 days
- I may need them in the future
- I was afraid the stores would close

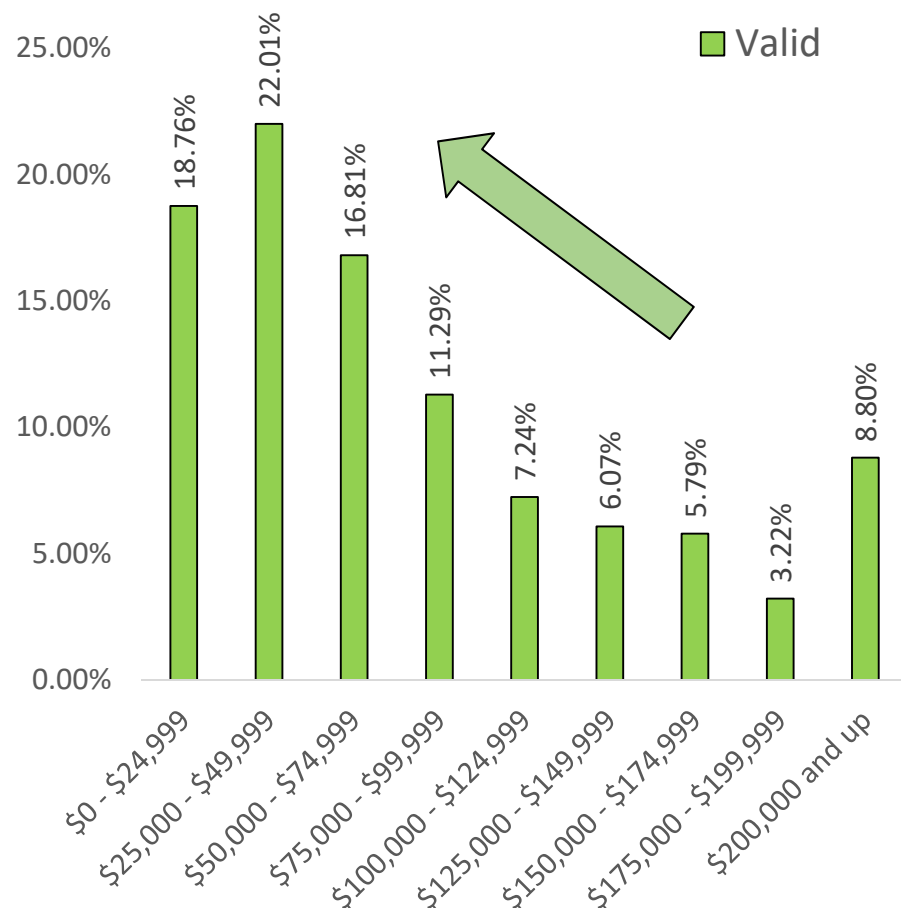
- To Sell

“Valid” reasons (28.3%),
→ there is a need

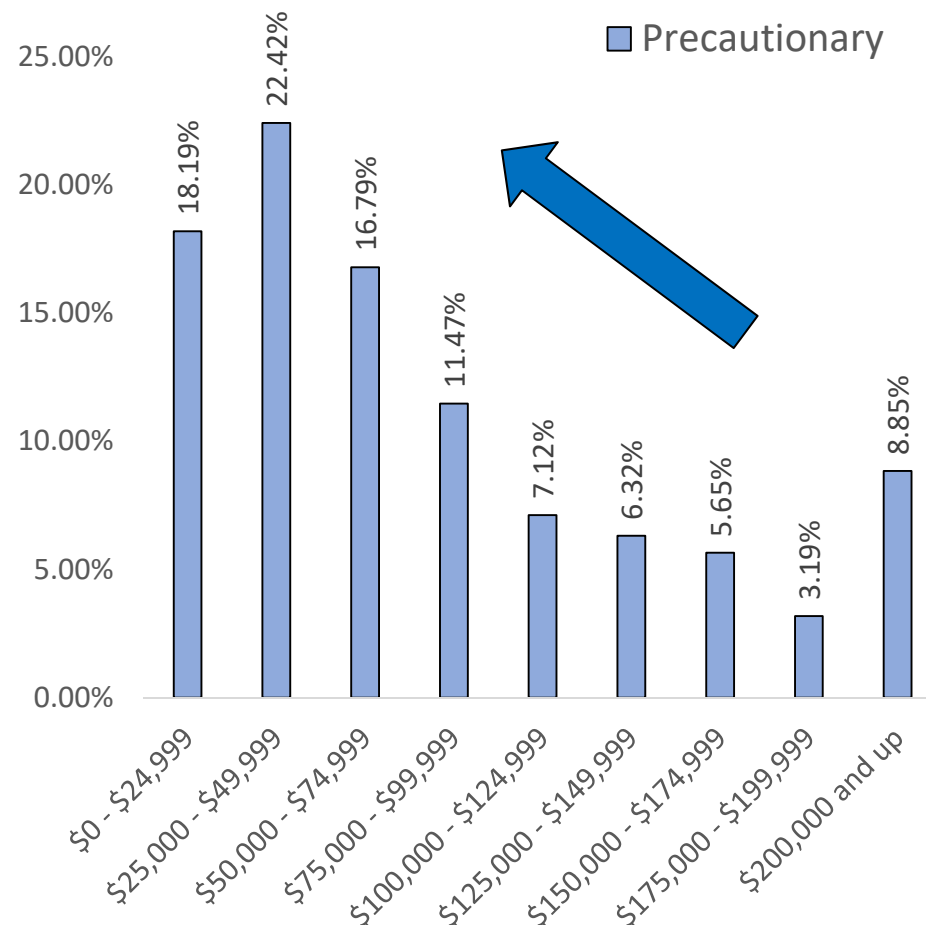
Precautionary (71.2%)
→ concerns about future...

Opportunistic (0.5%)
→ desire to benefit

“Valid” and “Precautionary” vs. Income

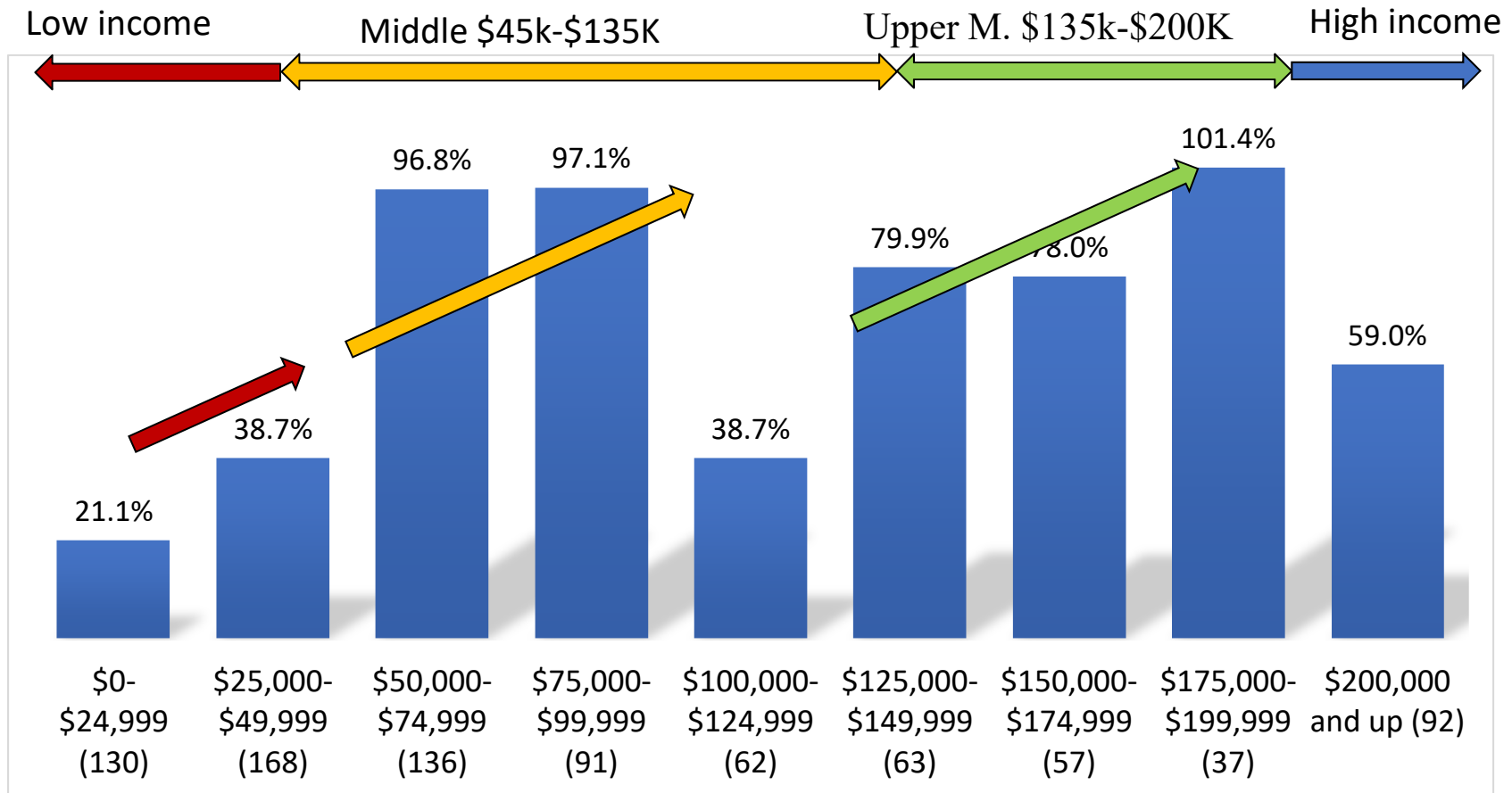


Insight: Low income individuals were significantly more impacted than higher income individuals



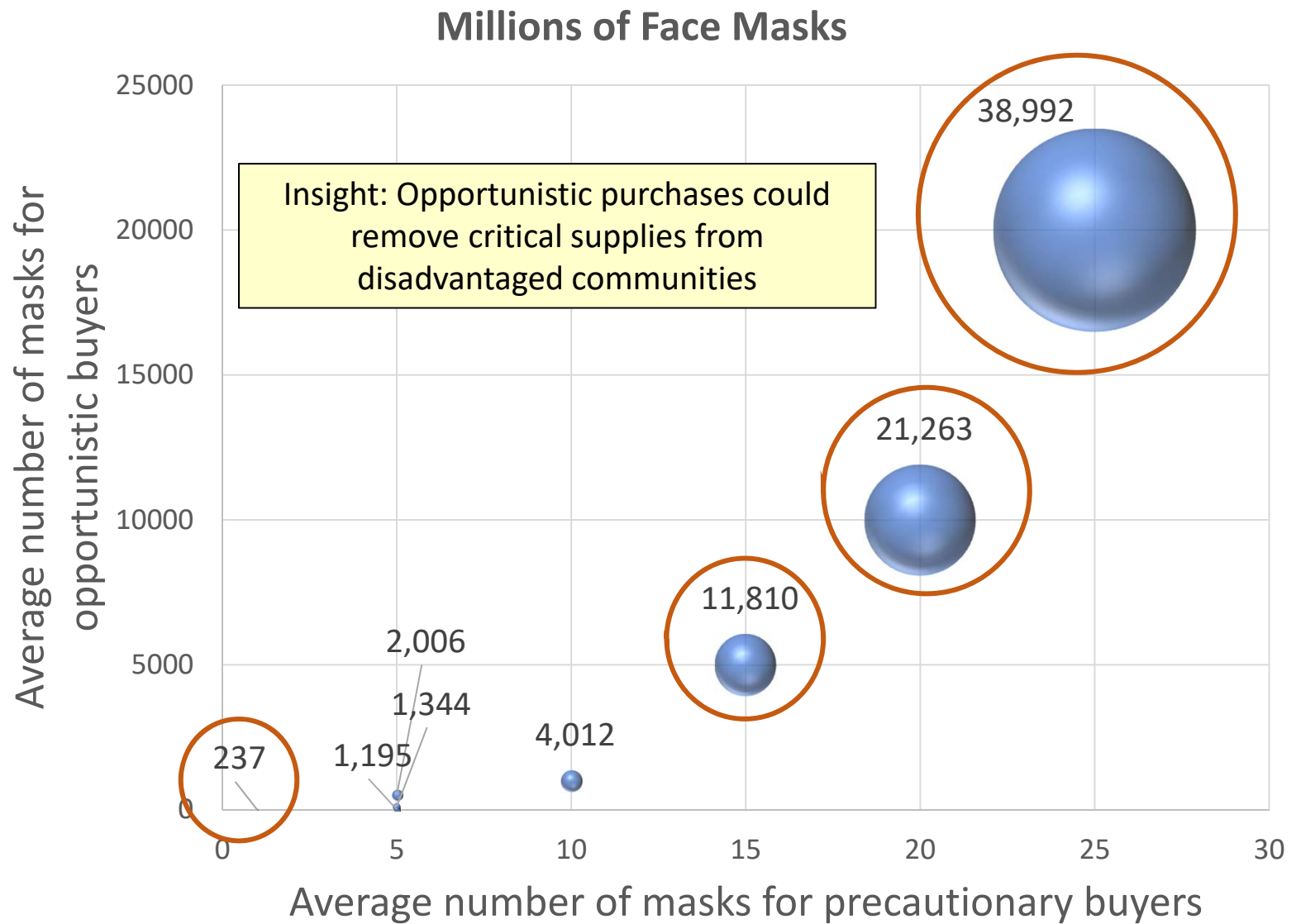
Insight: Low income individuals feel much less safer than higher income individuals

Increase in Days of Inventory



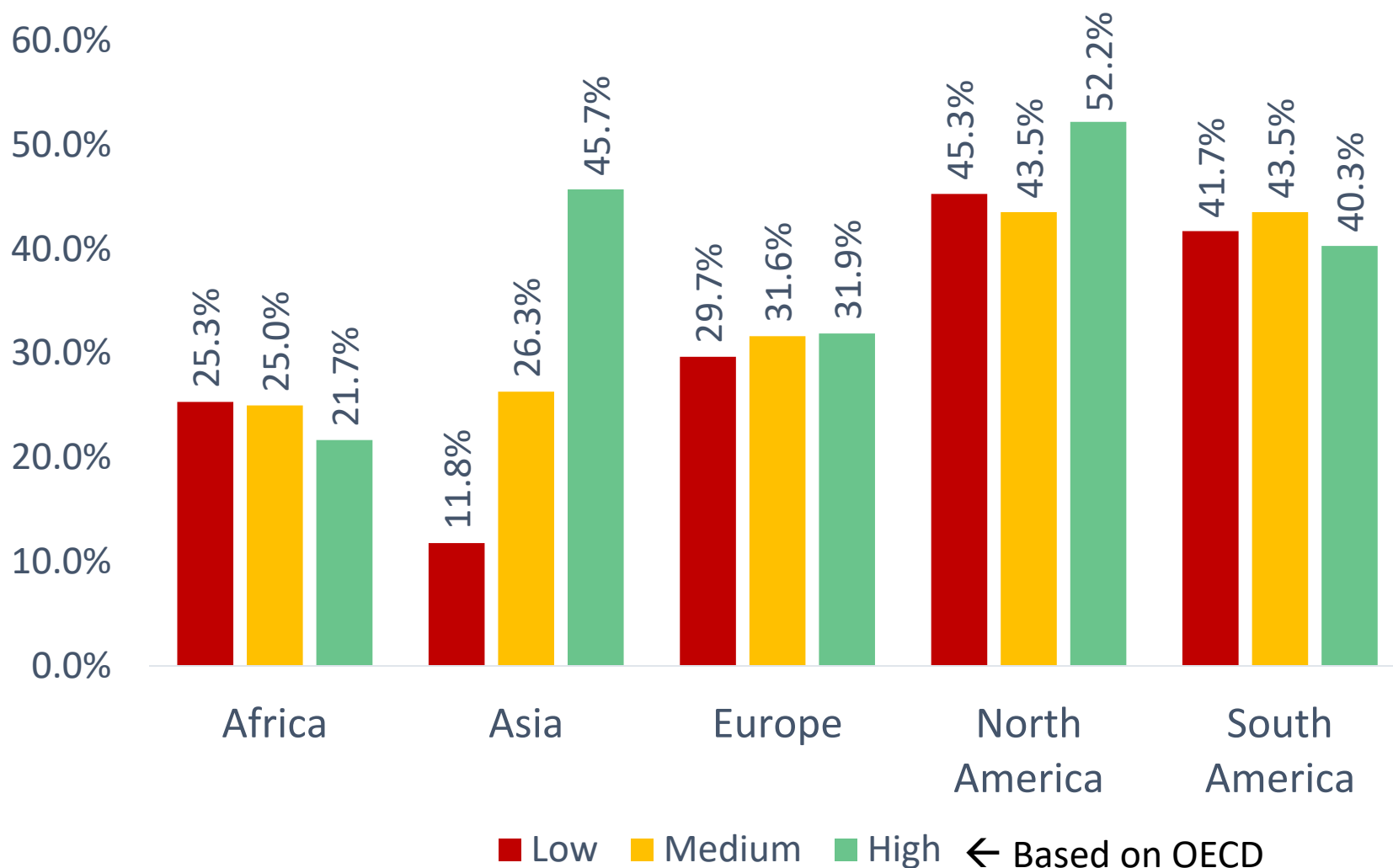
Insight: In response to higher threats, low income households were less able to stock up than other wealthier households

Impacts of Opportunistic Purchases



Related to Purchasing Patterns: World

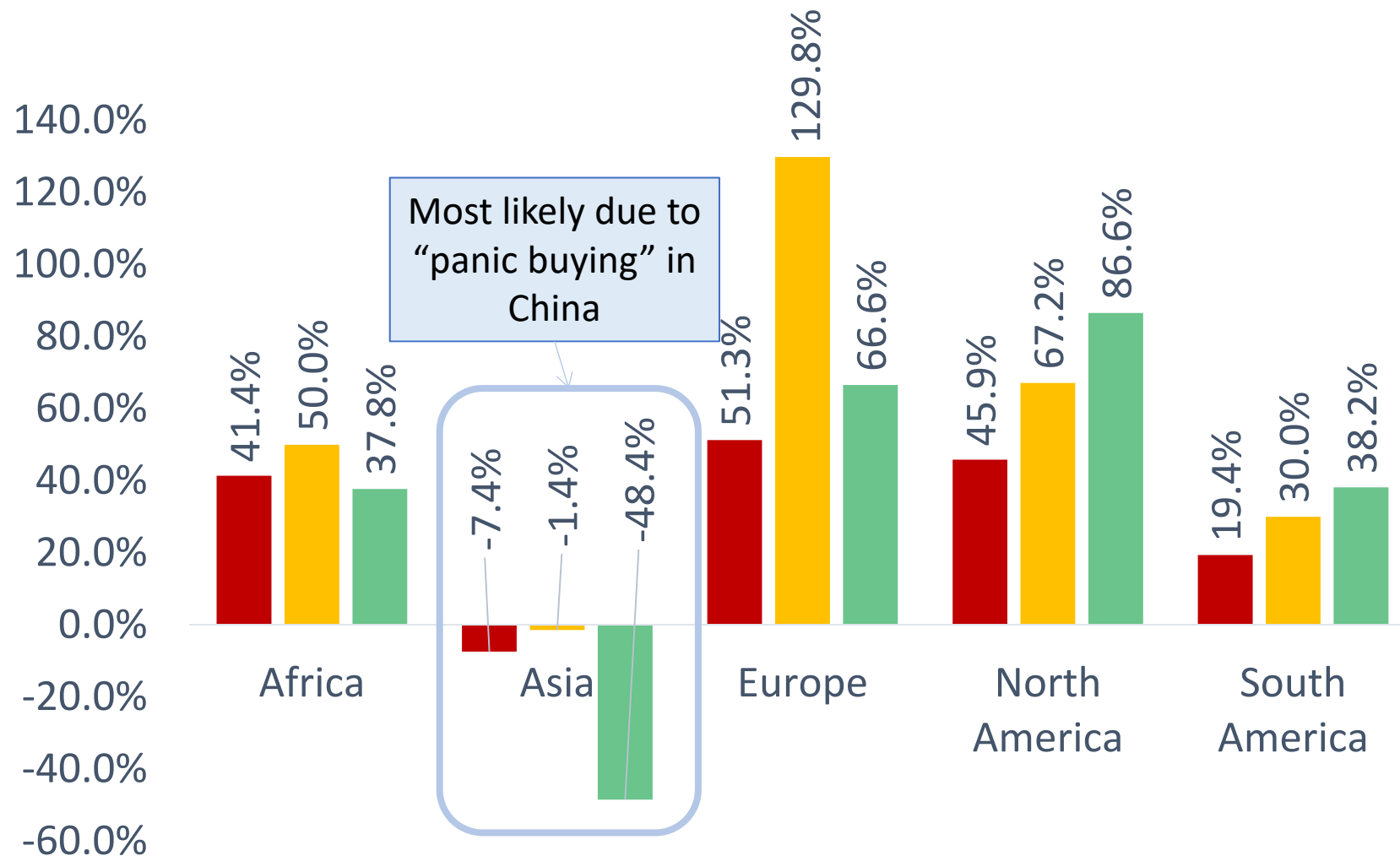
Respondents that Experienced Shortages



Insight: All income levels experienced shortages, though the definitions of “shortages” depend on income



Increase in Inventory Days (During vs. Before)

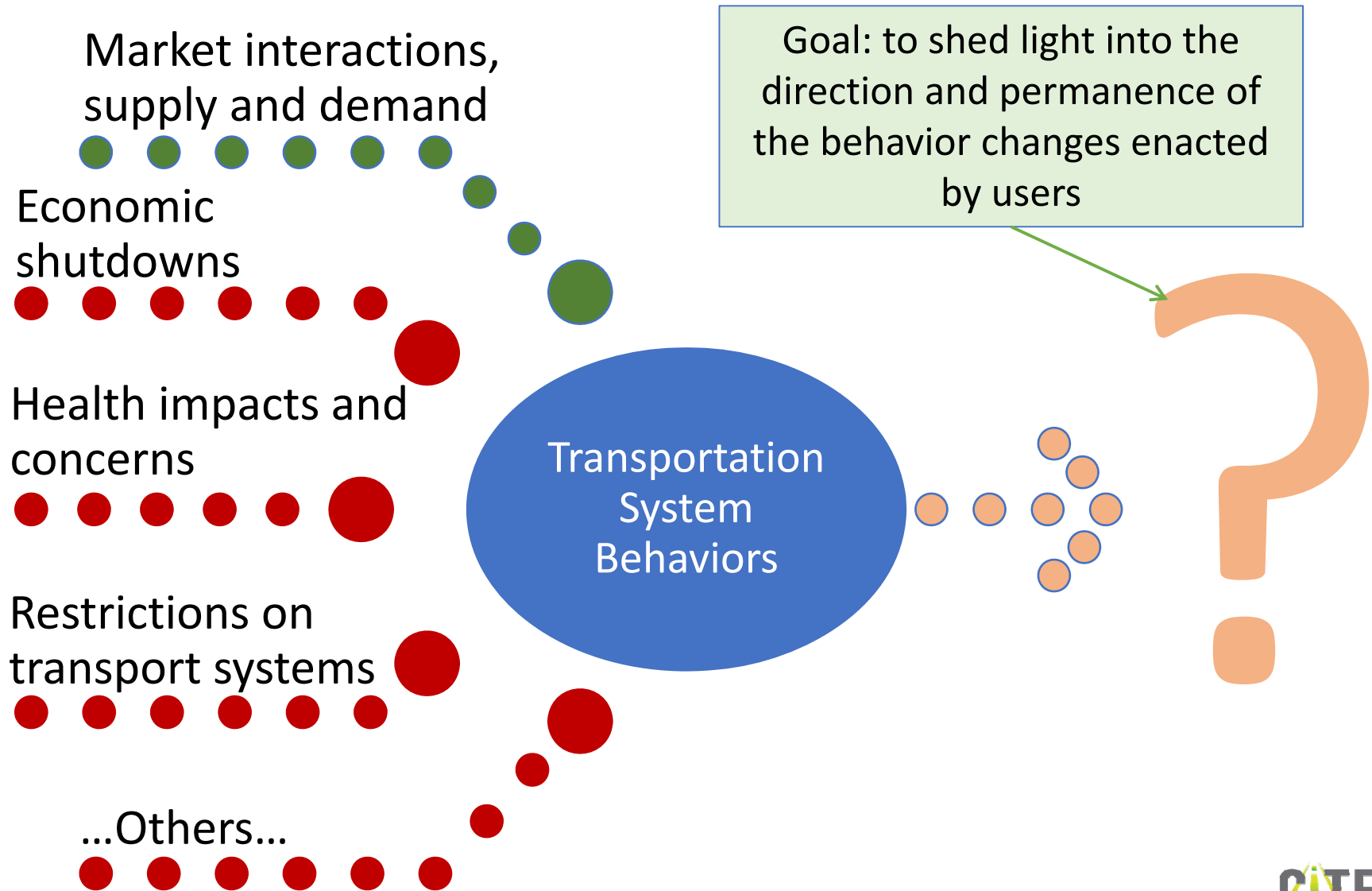


Insight: All income groups increase inventory, with medium and high income levels leading the pack in actual supplies



Concluding Remarks

Impacts of the COVID-19 Pandemic



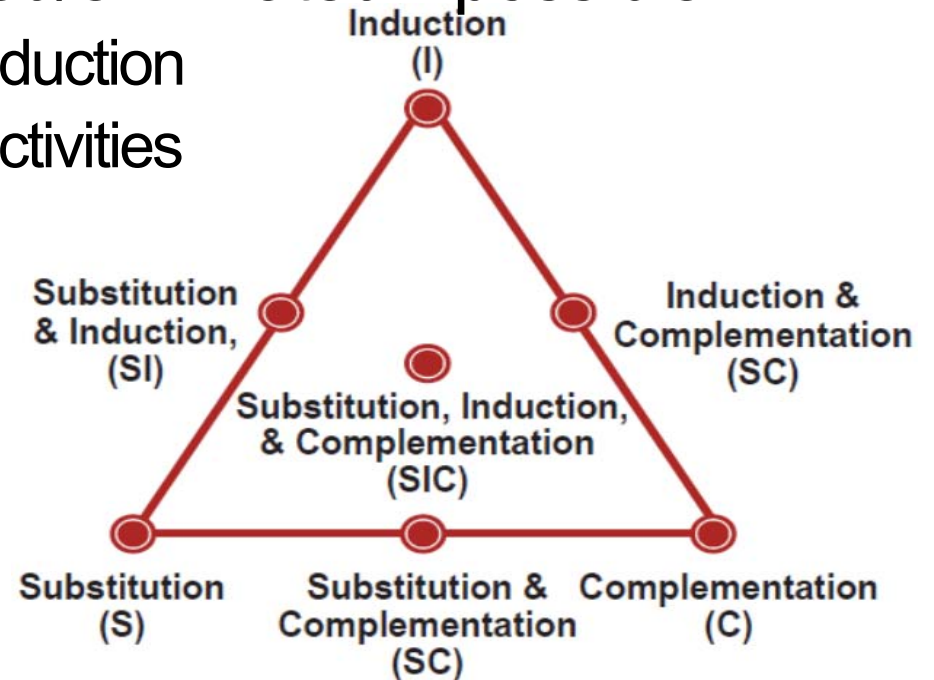
Key Findings

- Multifaceted Impacts, Affecting All Aspects of Transportation Behavior
 - Use of traditional transportation modes
 - All trip purposes
 - Purchases and purchase channels
 - ...
- Permanence of Effects
 - All signs point at an eventual “new normal”, in between the “before” and the “during” the pandemic
 - Co-evolution of supply and demand is almost certain, suggesting that the “real new normal” will be different than the one captured in these surveys...



Key Findings

- There Are Reasons for Concern and Optimism
 - Numerous beneficial effects have been advanced by the C-19 pandemic → They should be preserved
 - Increases in tele-activities,
 - Numerous detrimental effects have taken place → They should be mitigated/eliminated if possible
 - Tremendous potential for induction
 - Inequitable access to tele-activities
- Proactive Policy Making is Essential to Maximize Net Benefits...



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Thanks!
Questions and Answers

