CITE Center for Infrastructure, Transportation, and the Environment

Rensselaer

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

WEBINAR #1

Impacts of the COVID-19 Pandemic on Purchasing of Critical Supplies: *Roots and Measures to Mitigate "Panic Buying"*

July 8, 2020 • 11AM EST

José Holguín-Veras

Trilce Encarnacion

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

Impacts of the COVID-19 Pandemic on Purchasing of Critical Supplies: Roots and Measures to Mitigate "Panic Buying"

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Transportation Research at Rensselaer

Key Research Areas

- Freight Transportation Behavior, Modeling, Policy:
  - To identify the best ways to influence supply chains to adopt socially beneficial behavior changes that increase sustainability, reduce energy consumption, reduce congestion, etc.
- Disaster Response Logistics:
  - This area focuses on field work, characterization, and analytical modeling of novel disaster response procedures. The team has studied has studied: Katrina, Port-au-Prince, Hurricane Irene, Japan tsunami, etc.
- Travel Behavior Modeling:
  - Explore people's travel behavior in new social and economic contexts, such as enhanced peer influence via online social networking and new forms of interaction enabled by IT, etc.
- Data analytics for transportation systems:
  - Develop data acquisition processes and analytical methods to investigate emerging issues in transportation systems, with a focus on impact assessment of new technologies and disruptive events.
- Transportation network modeling and simulation:
  - To develop analytical and simulation models tools to facilitate the design of innovative operations to improve system efficiency, robustness, and resilience.

Disaster Response Logistics

Our Goal is To Avert This…

"We need medicines, something to eat …"

"We are asking for food, water, medicine, shelter and clothing. Aren't we humans?"

(Pictures taken by JHV 10 days after the disaster)

Major Components of Our Work

- Fieldwork: 9/11, Katrina, Indian Ocean, Haiti, Chile, Joplin, Japan, Nepal, Ecuador, etc. etc.
- Diagnosis and characterization:
  - Causes of problems encountered
  - How disaster response logistics take (and should take) place
  - Quantification:
    - Aimed at obtaining empirical estimates
    - Provide support to analytical modeling
- Define mechanisms to improve response
  - Policy Suggestions → FEMA, Catastrophic Planning Groups
- Basic research on analytical modeling
  - To develop Decision Support Tools

The Top Ten Lessons Learned from Fieldwork ...

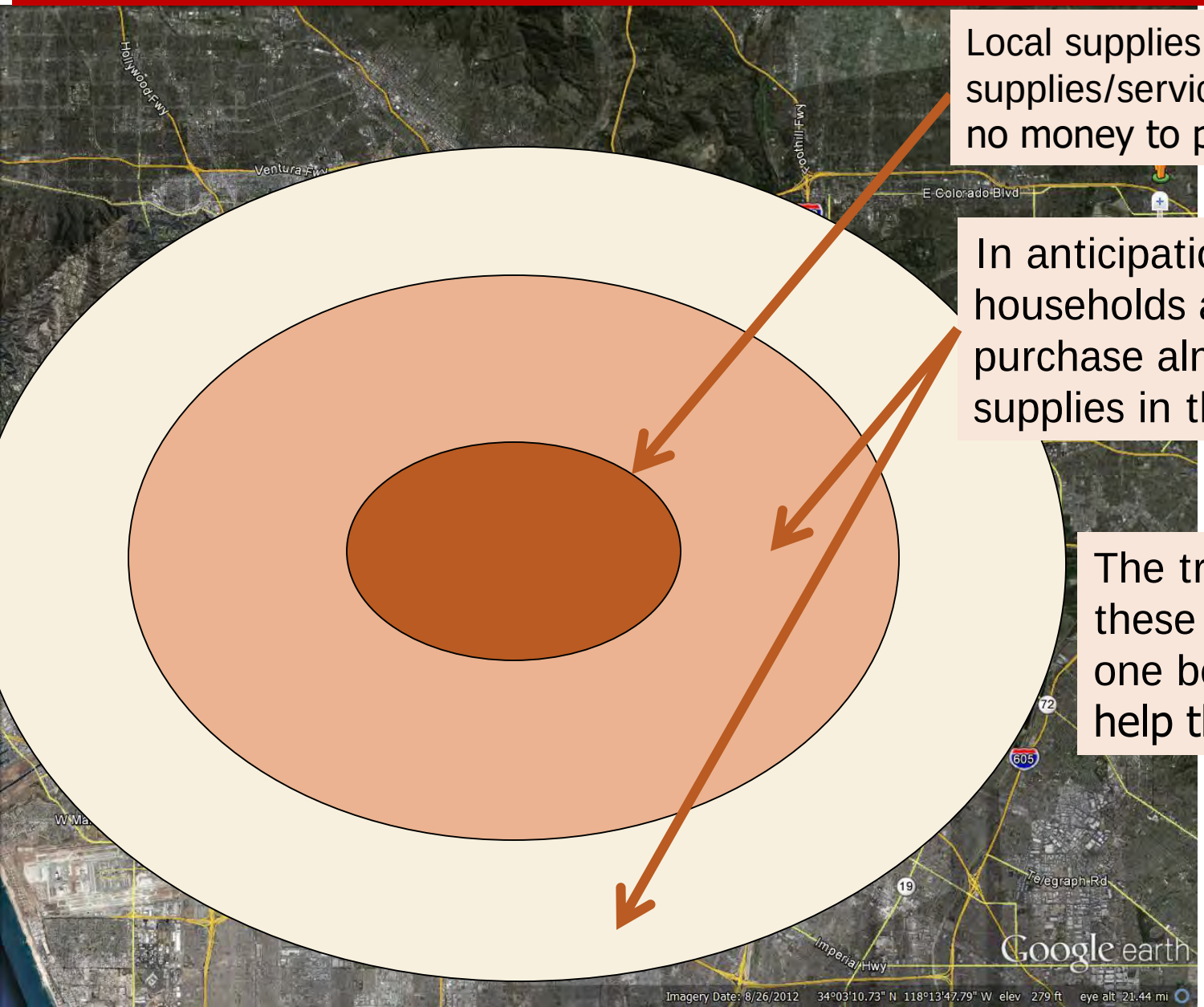
- Disaster Response is a Socio-Technical Process
- Disasters ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ Catastrophes
- Commercial Logistics ≠ ≠ ≠ Post-Disaster Logistics
- Controlling Material Convergence is a MUST
- In Catastrophes: Local Distribution Is the Challenge, Only option: Collaborative Aid Networks
- Effective Private Sector Integration is KEY
- Supply and Demand Are Very Dynamic, Be Ready
- Controlling "Panic Buying" Is Essential
- Preventing Collapse of Private Supply Chains is Key
- Comprehensive Approaches Are Needed

Past Evidence on Disaster Related Buying Behaviors

About "Panic Buying"

- Often referred to as "panic buying," this is a misnomer
  - A human reaction to concerns about potential shortages that may occur when disasters are expected, or have occurred.
  - Nevertheless. the practice is problematic
- Expected to appear in ALL large disasters and catastrophic events
- There is no formal taxonomy of behaviors, we have identified two main types (there may be others):
  - Precautionary, prompted by concern of self or others…
  - Opportunistic, prompted by the desire of making money, seeking power, political influence, etc.

The Main Issue…



Local supplies destroyed, no supplies/services to purchase, no money to pay for them…

In anticipation of shortages, households and businesses purchase almost ALL critical supplies in the market

The tragedy is that these supplies are the one best positioned to help the survivors…

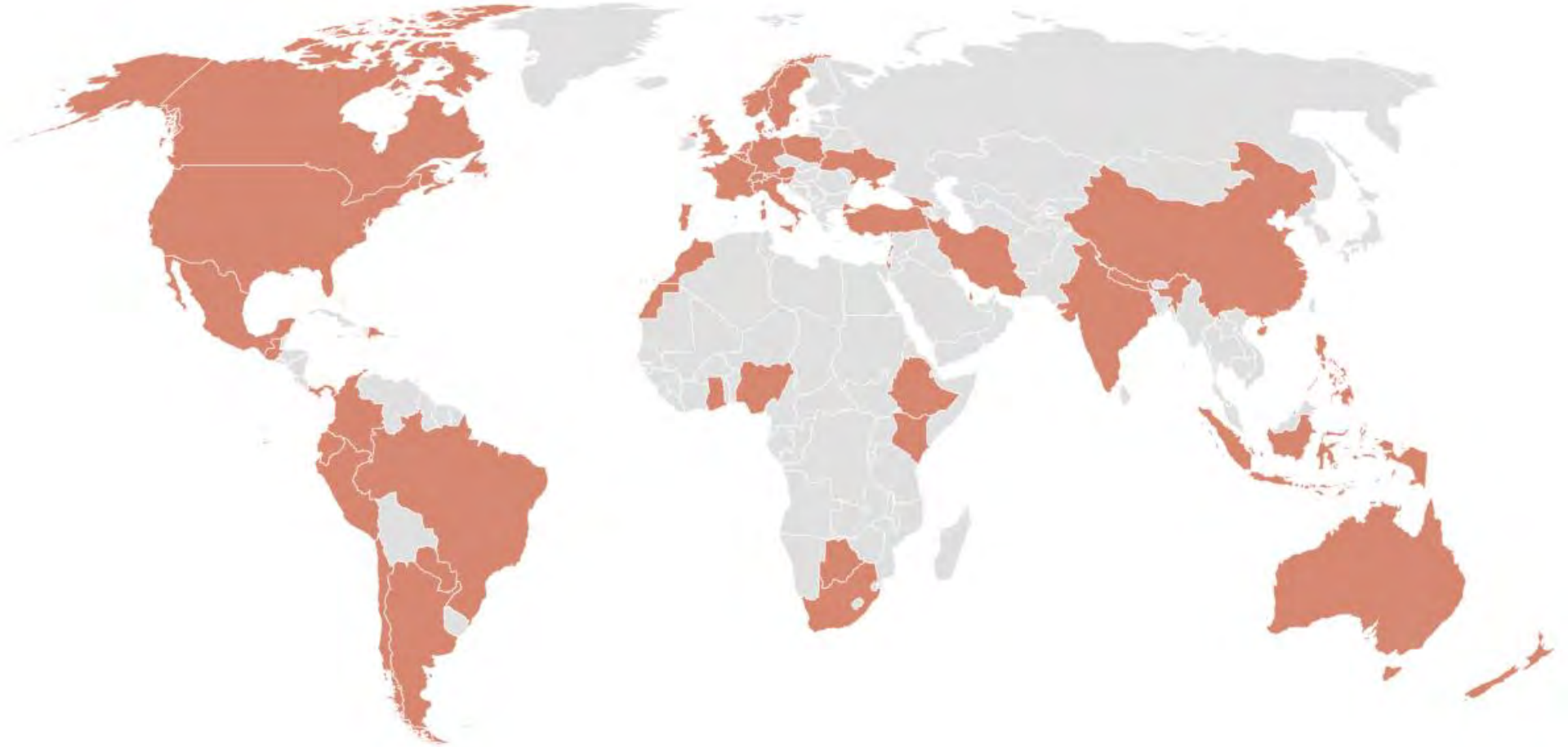
Examples

- In the case of the Tohoku disasters in Japan, the manager of one of the largest distribution centers in the Tohoku area indicated that the demand "doubled" after the tsunami… he "did not know what to do"…
- Logisticians of a large retailer, after Super Storm Sandy, reported that the closer to the disaster area, the more pronounced the buying is

Overview of Survey

International Data Collection

- Objective: Gain insight into the determinants that explain precautionary and opportunistic buying by individuals during the COVID-19 Pandemic



Survey Implementation and Cleaning

- Collected using Mechanical Turk and SurveyMonkey
- Two rounds of data collection
  - First round (mid-April): unrestricted
  - Second round (late June): targeted demographics
- USA
  - 605 + 430 = 1035 observations → reduced to 924 after cleaning
- International
  - 5015 observations → reduced to 4,039 after cleaning
- Weighting with population distributions
  - Gender, age, income level, education level

Survey Sections

- Purchases of supplies during normal times
  - Frequency and duration of supplies, Store types, Preparation for emergencies, by type of supply
- Purchases of supplies during COVID-19 times
  - In addition to above… reasons, influencer media, key factors, shortages…
- Perceived Trust and Level of Knowledge of relief groups…
- Willingness to change COVID's purchasing behavior
- Demographics

Basic Supplies

- The survey focused on shopping behaviors related to basic supplies made in each household.
- These supplies include:
  - Food items
  - Personal hygiene items
  - Cleaning supplies
  - Medications
  - Other items required to satisfy basic needs

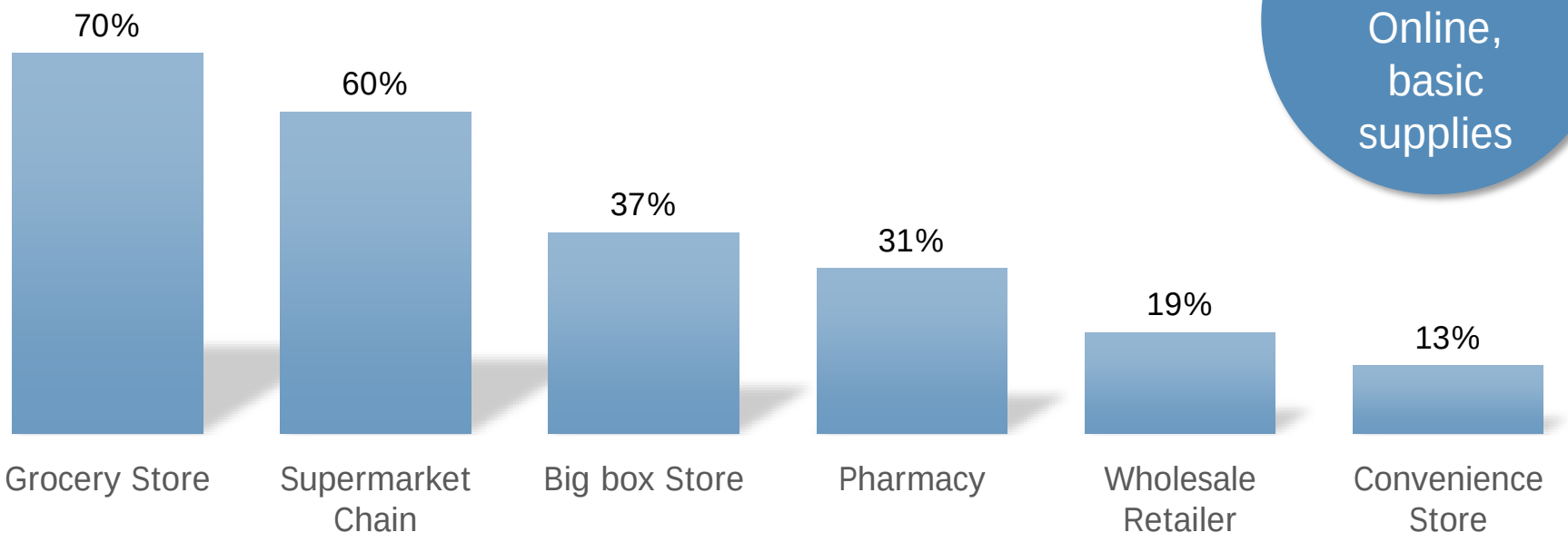
Pre-COVID-19 Shopping Patterns

These slides summarize research in progress that is subject to change as the analyses are refined and more data are collected

These results are the tip of the iceberg...

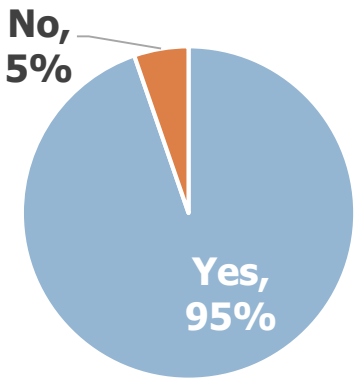
Retail Outlets

Places where regularly shopped before crisis

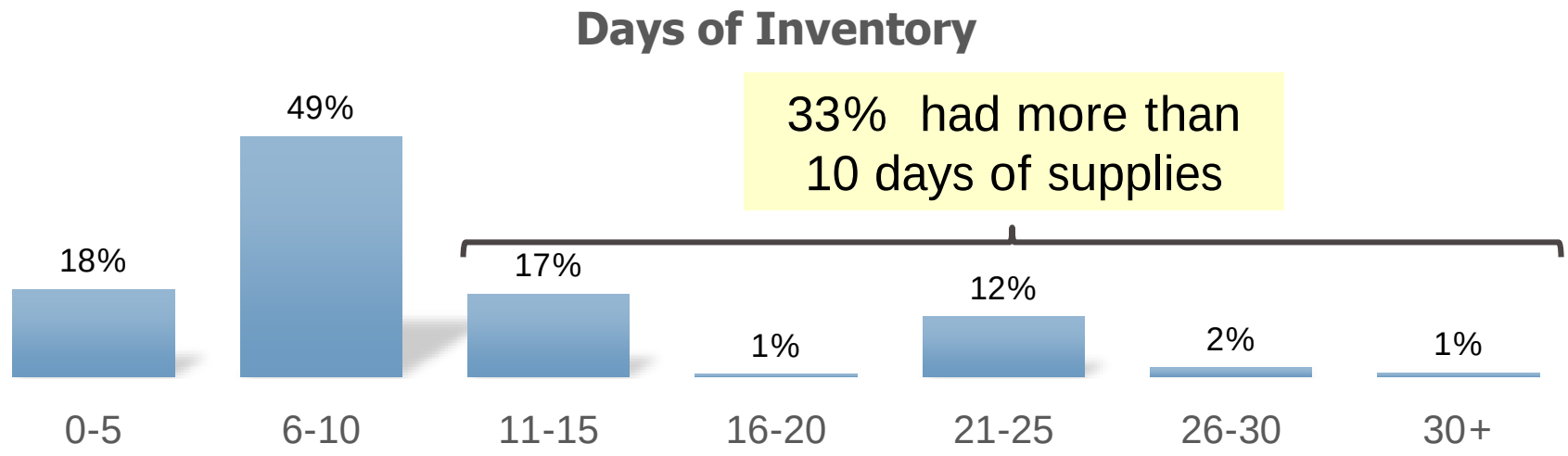


31% Online, basic supplies

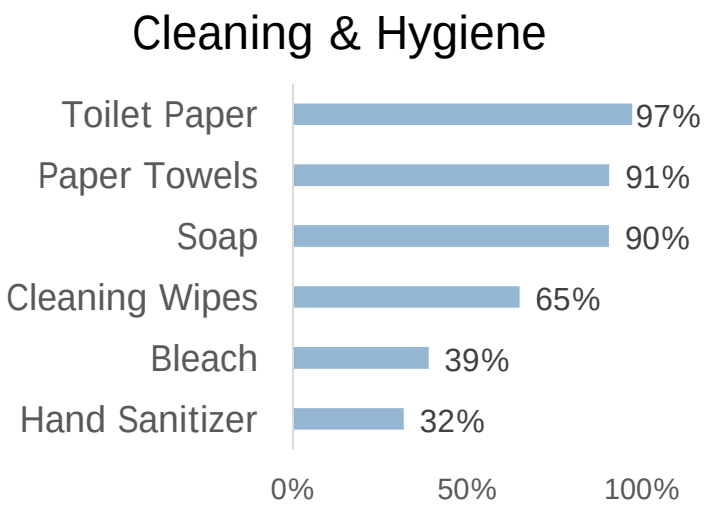
Will return to these places when crisis is over?

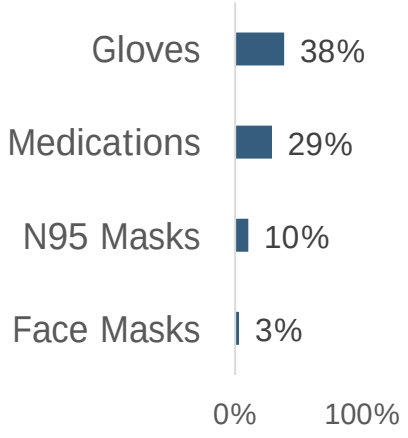


Inventory of Basic Supplies



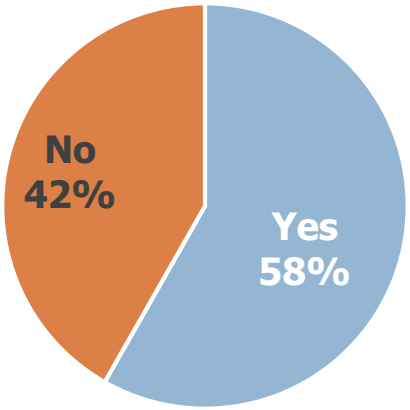
Items Regularly Bought



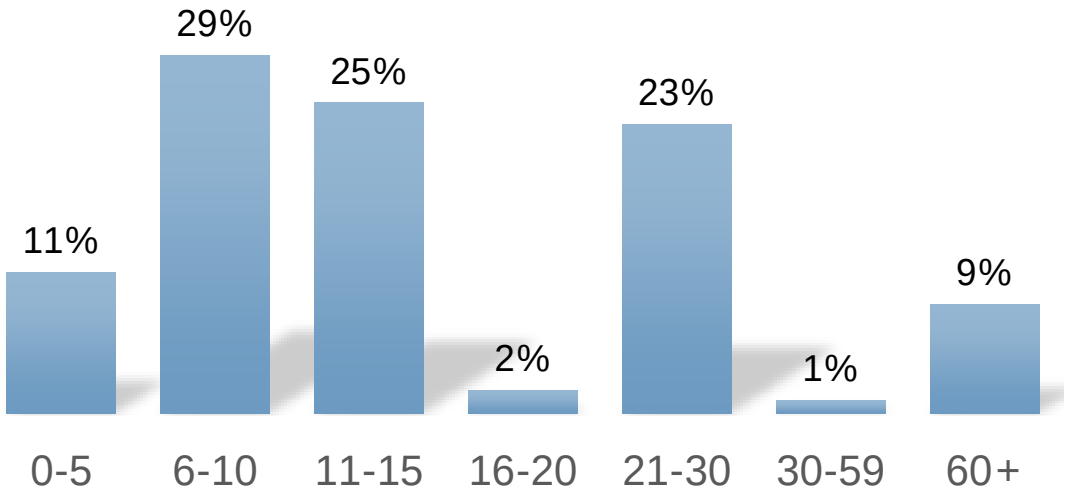


Stocks of Basic Emergency Supplies

In normal times, do you have basic supplies stored for emergencies in your home?

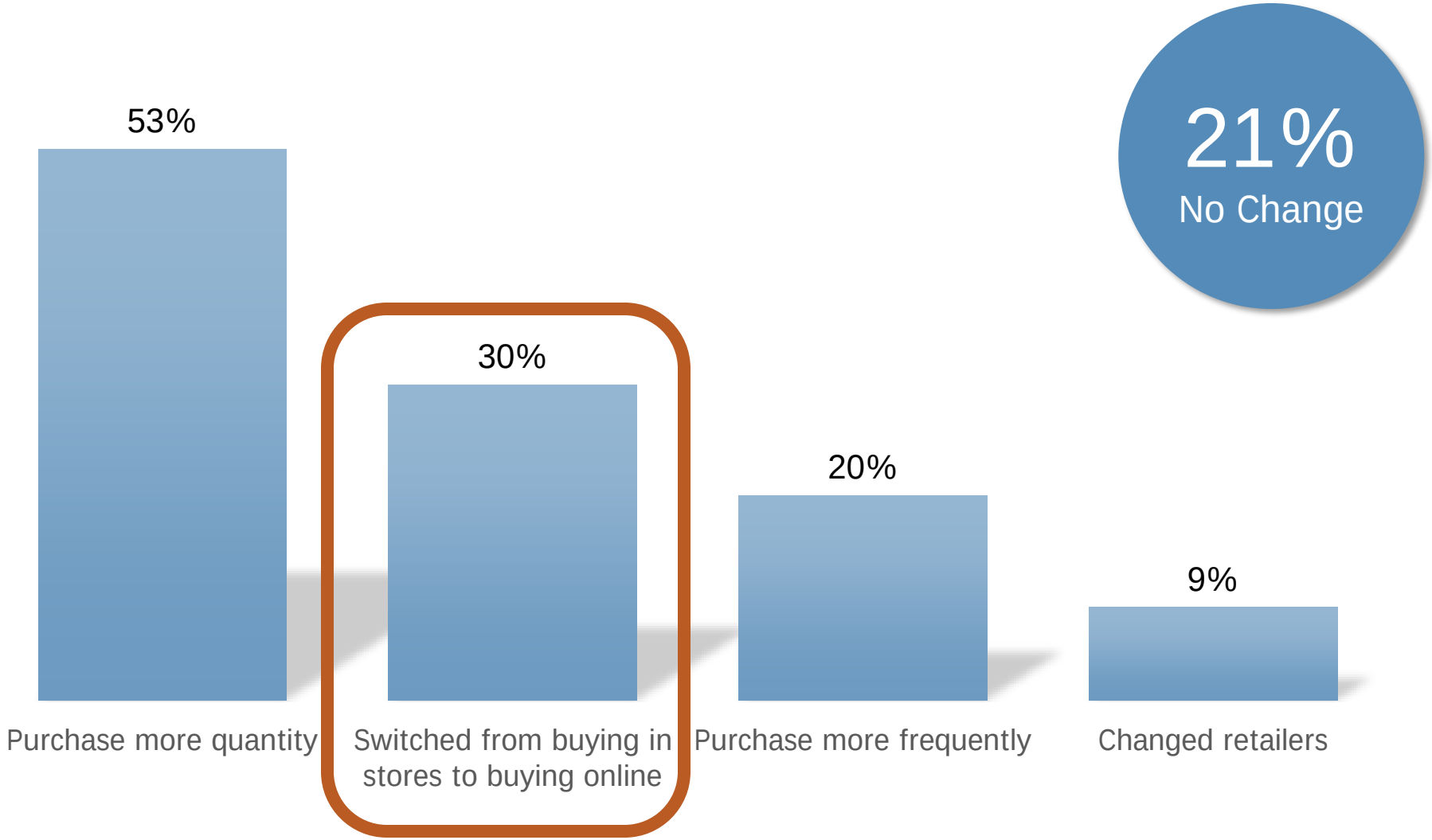


How many days do they last?

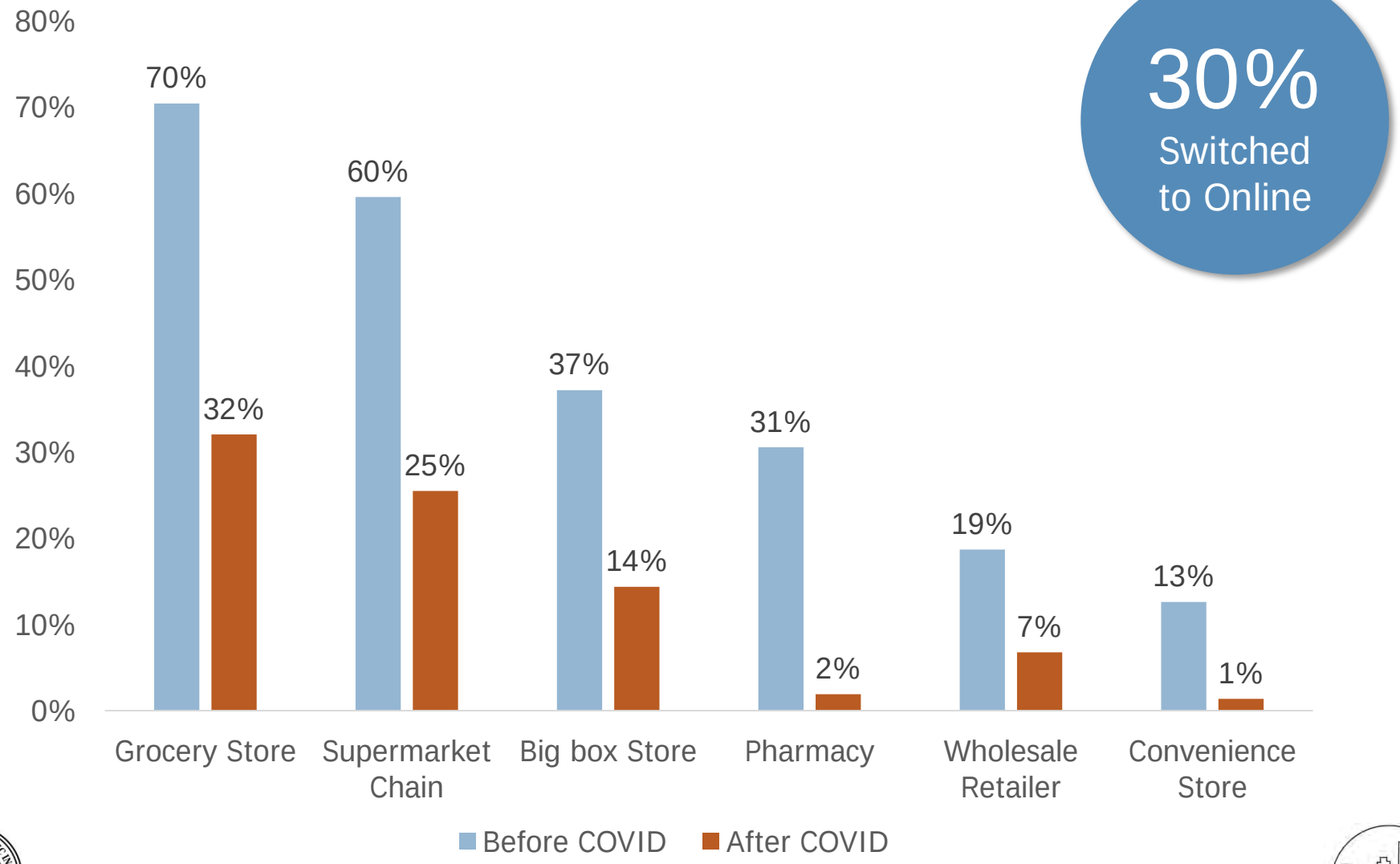


COVID-19 Related Shopping Patterns

Changes in Shopping Habits



Changes in Shopping Habits



30%
Switched to Online

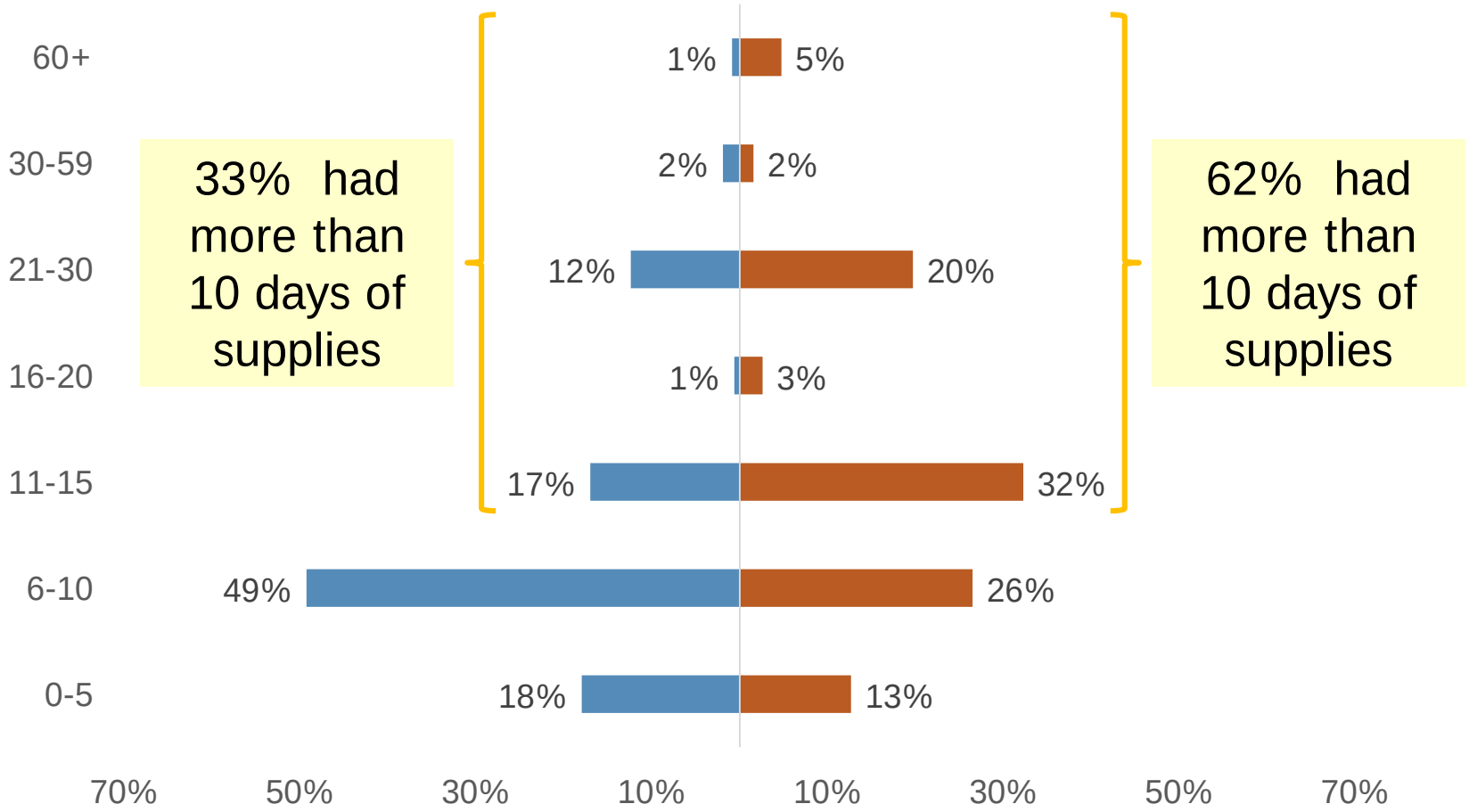
Changes in Days of Inventory

Mean: 11.53
St.Dev.: 10.07

BEFORE COVID

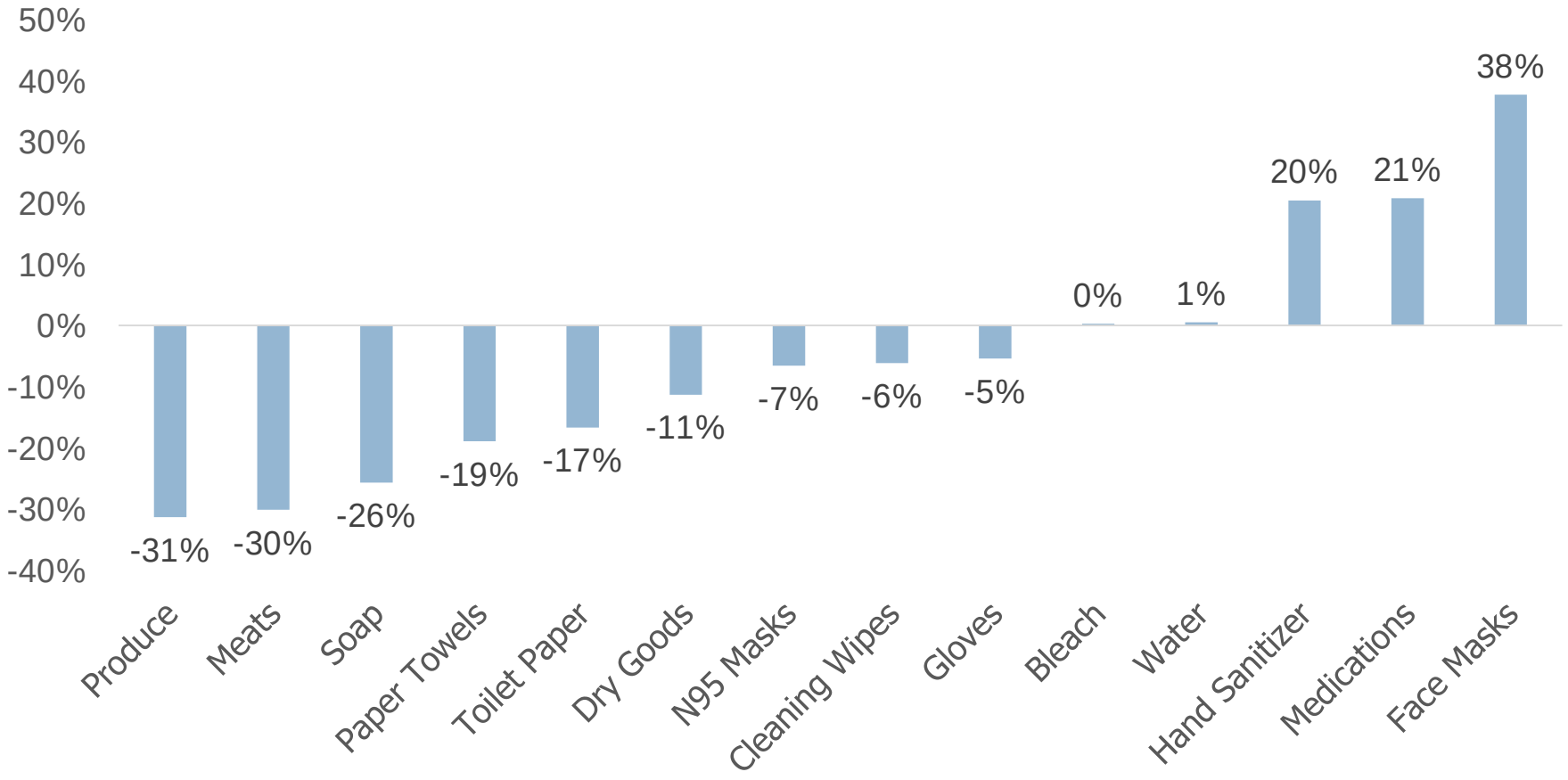
AFTER COVID

Mean: 18.59
St.Dev.: 16.86

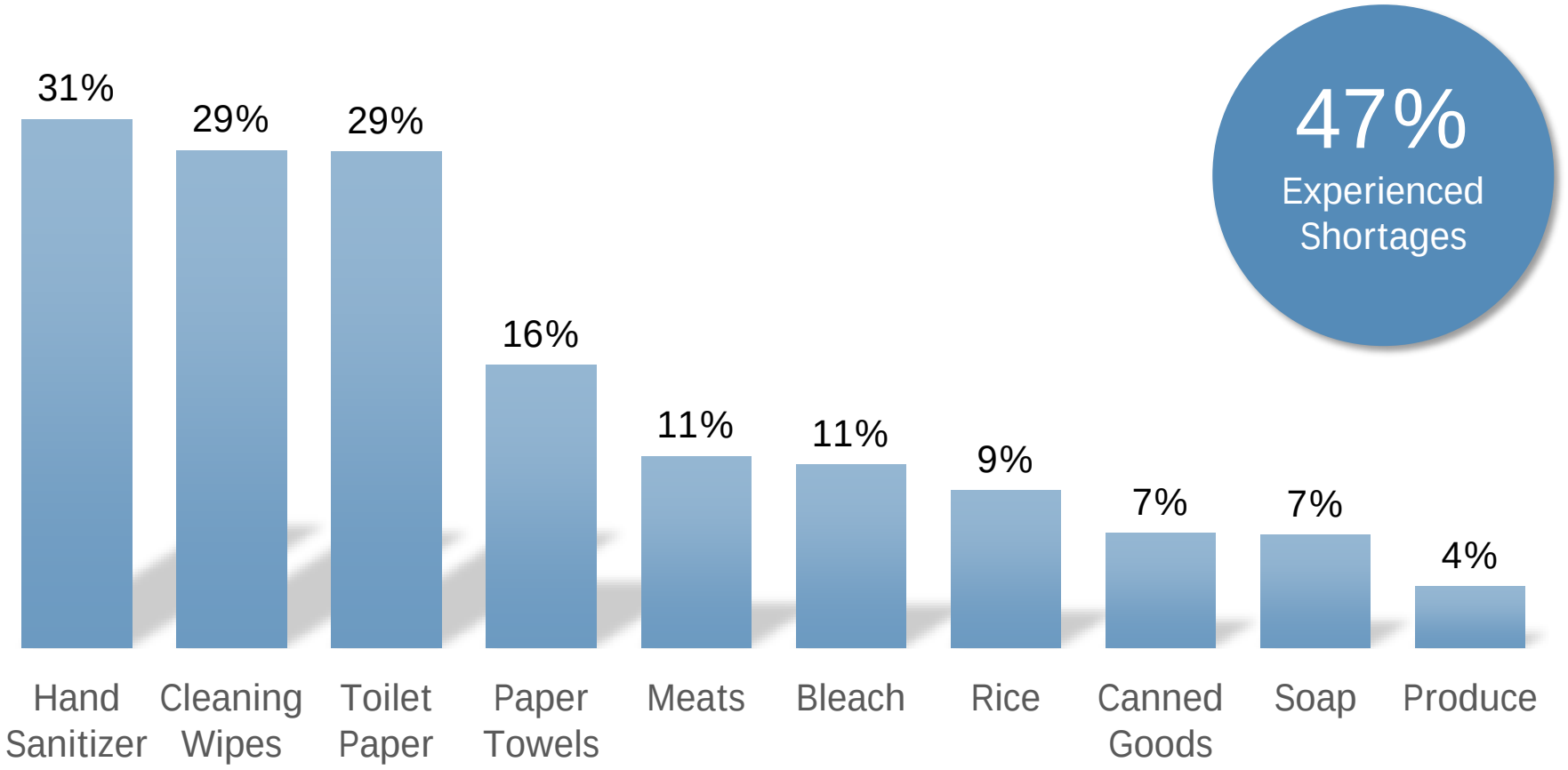


Changes in Shopping (After minus Before)

Change in Supplies Purchased



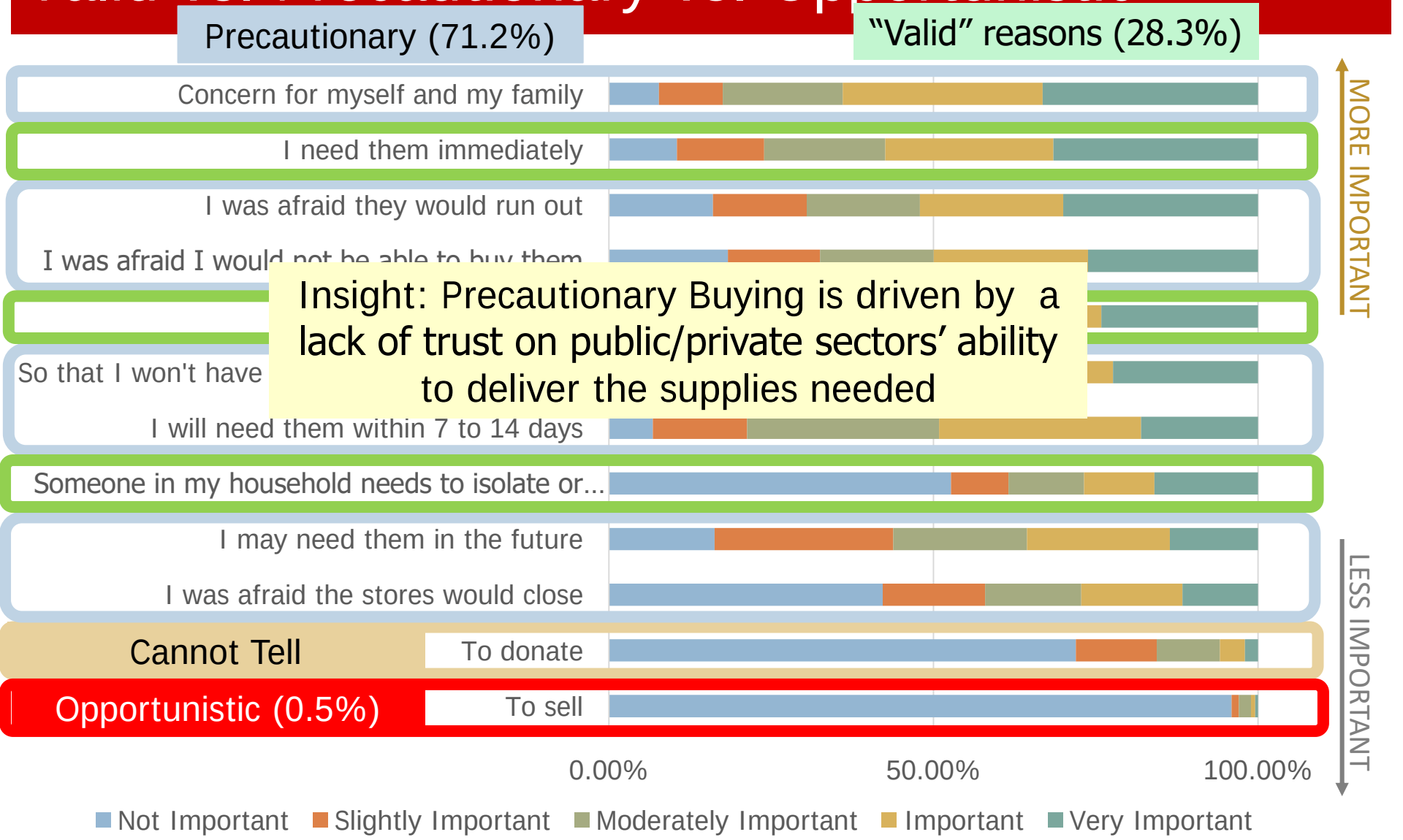
Shortages



What products could you not buy or could not buy the desired quantity?

Manifestations of Disaster Related Buying Behaviors

Valid vs. Precautionary vs. Opportunistic

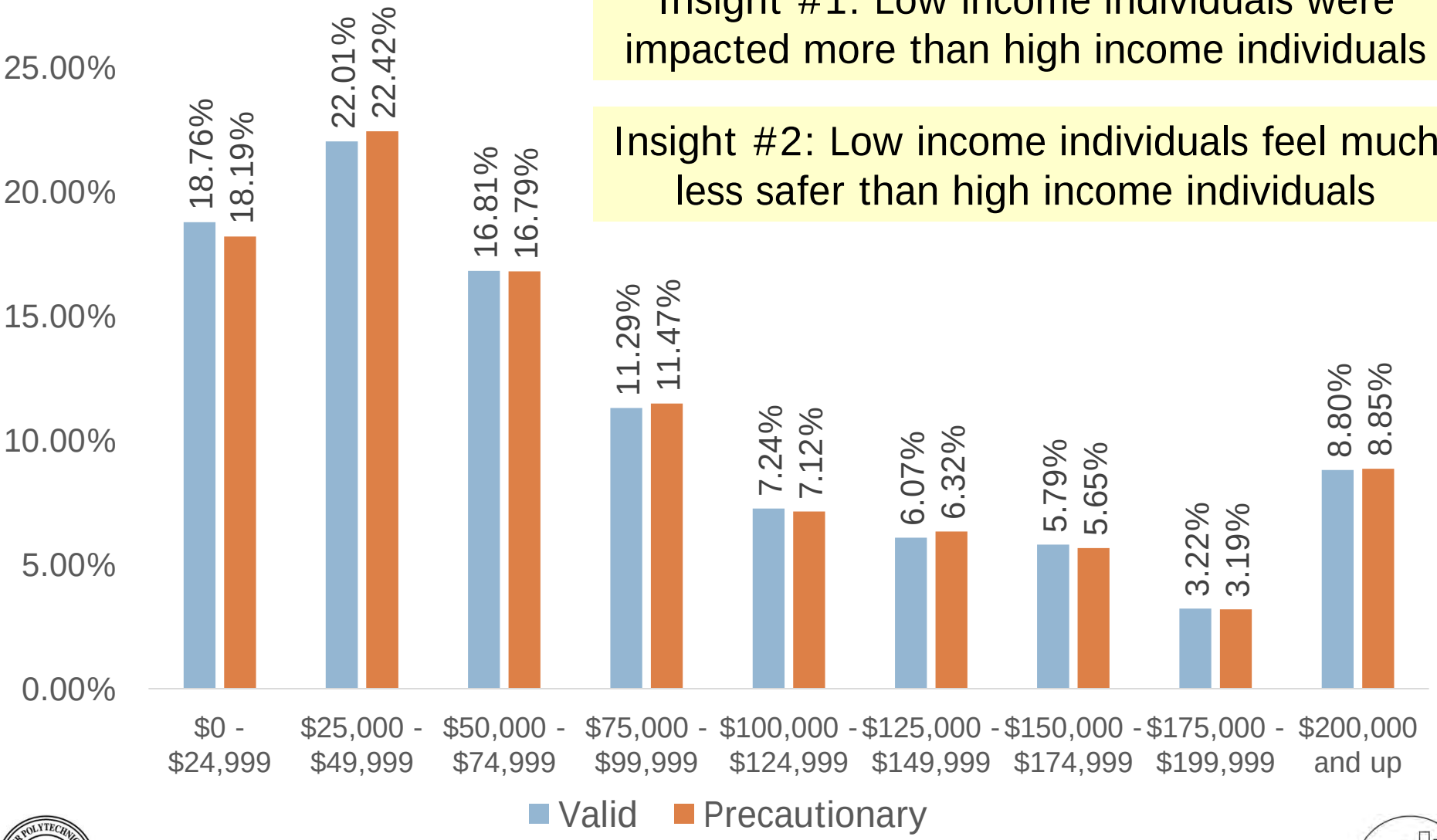


Insight: Precautionary Buying is driven by a lack of trust on public/private sectors' ability to deliver the supplies needed

"Valid" and "Precautionary" vs. Income

Insight #1: Low income individuals were impacted more than high income individuals

Insight #2: Low income individuals feel much less safer than high income individuals



Why Do We B

Key Insight: If the average of opportunistic purchases is larger than about 142 times the average for precautionary purchases, opportunistic purchases will be the majority of all purchases

- Assume that:
  - We take for granted that "valid" purchases are OK
  - We focus on hand sanitizer bottles…
  - The percent of people with precautionary and opportunistic buying behavior is equal to the breakdown of reasons

Average number of hand sanitizer bottles per person:		Contribution to the overall average of purchases (percent X class average)			Total for US (millions)
Precautionary (71.2%)	Opportunistic (0.5%)	Precautionary	Opportunistic	Overall average	
1	1	0.712	0.005	0.717	237.3
1	5	0.712	0.025	0.737	243.9

Exaggeration?

He Has 17,700 Bottles of Hand Sanit Nowhere to Sell Them

Amazon cracked down on coronavirus price gouging. Now, while the rest of the world searches, some sellers are holding stockpiles of sanitizer and masks.

An Amazon merchant, Matt Colvin, with an overflow stock of cleaning and sanitizing supplies
Strickland for The New York Times

The New York Times

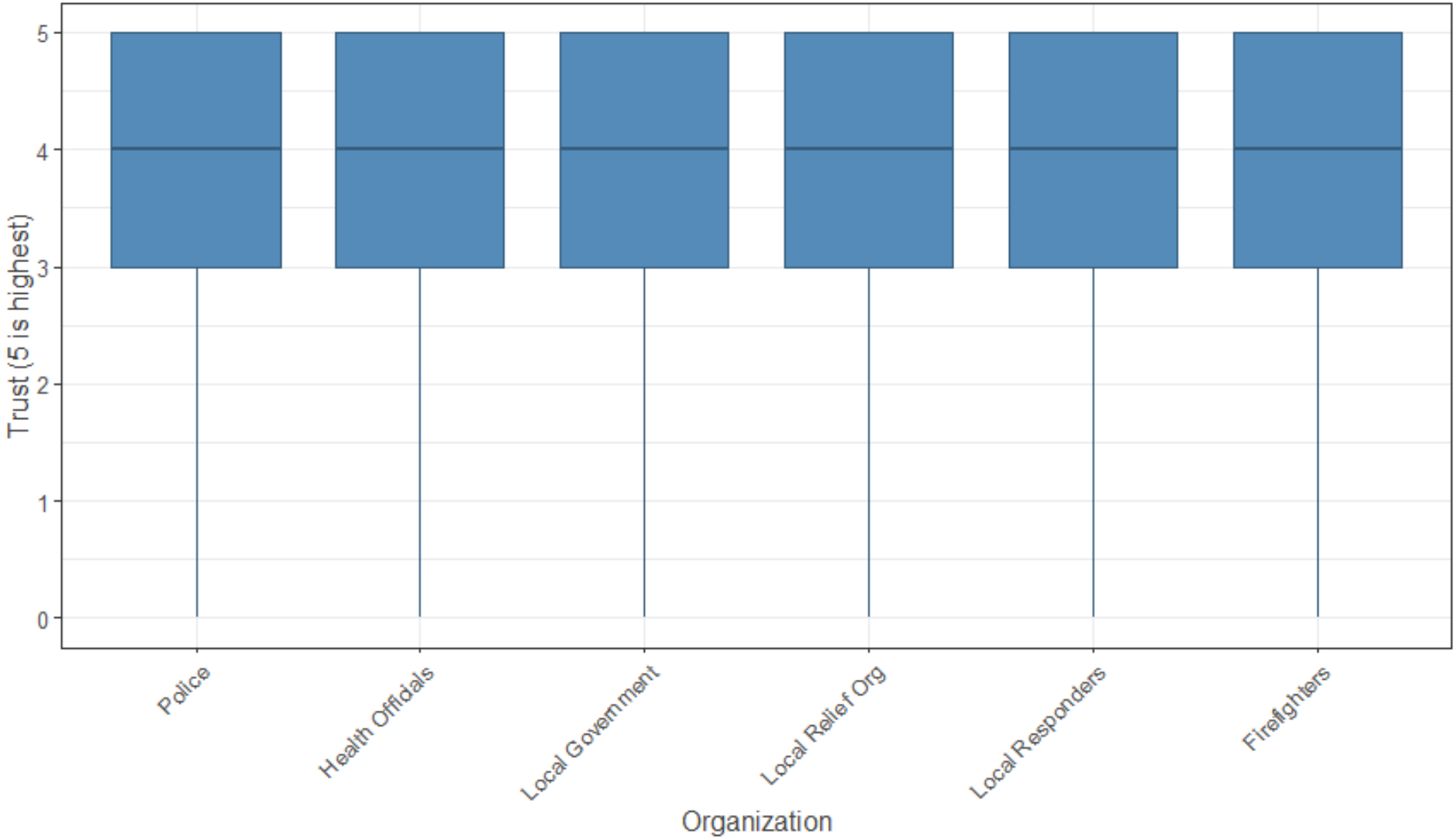
The Man With 17,700 Bottles of Hand Sanitizer Just Donated Them

A Tennessee man had planned to sell his stockpile at marked-up prices online. Now he is under investigation for price gouging.

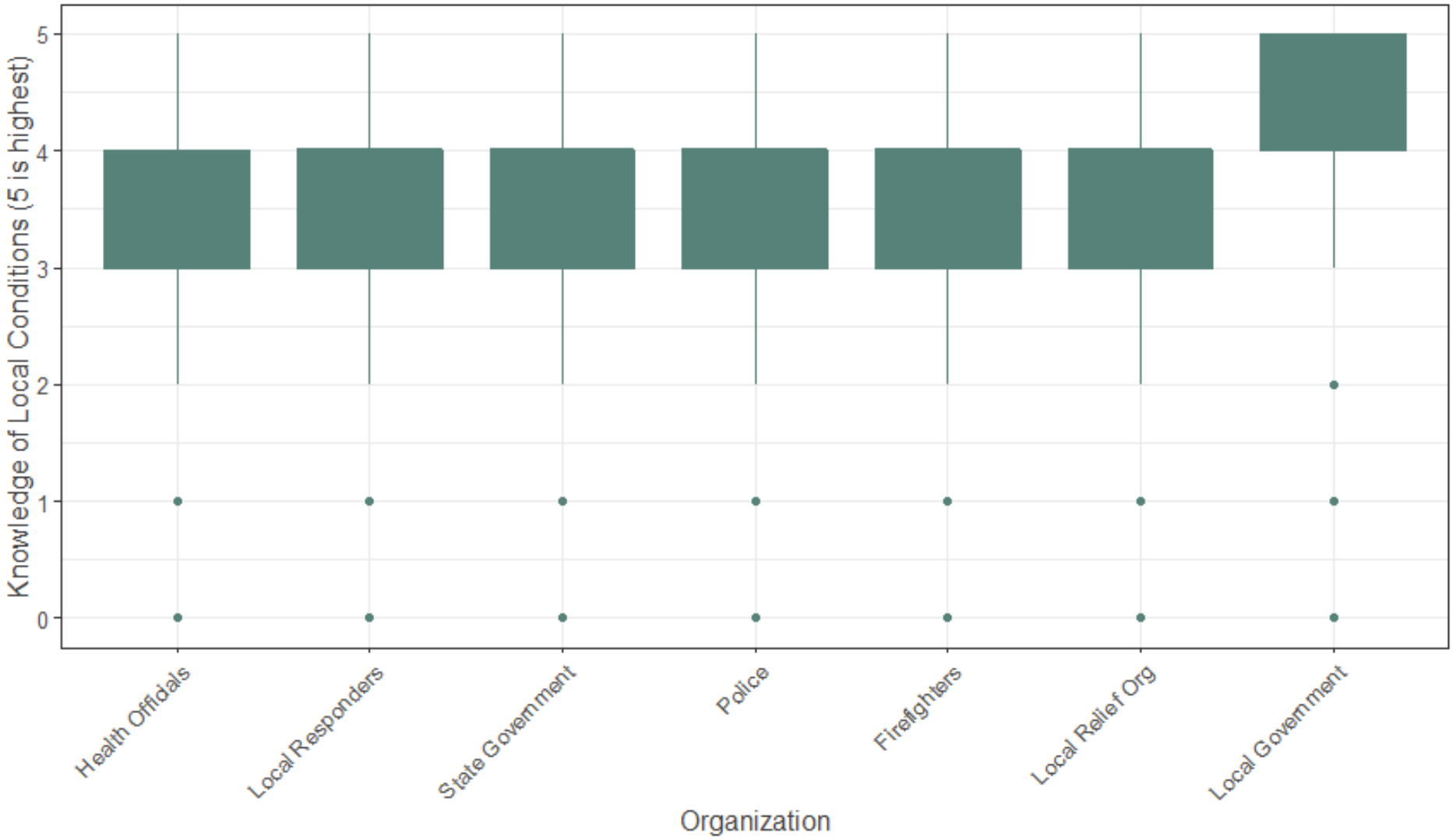
Matt Colvin, a Tennessee man who stockpiled hand sanitizer and wipes, says he has donated what he bought. He faces an investigation on price-gouging charges. Doug Strickland for The New York Times

Opinion of Responding Organizations and Willingness to Change Behavior

Most Trustworthy Organizations

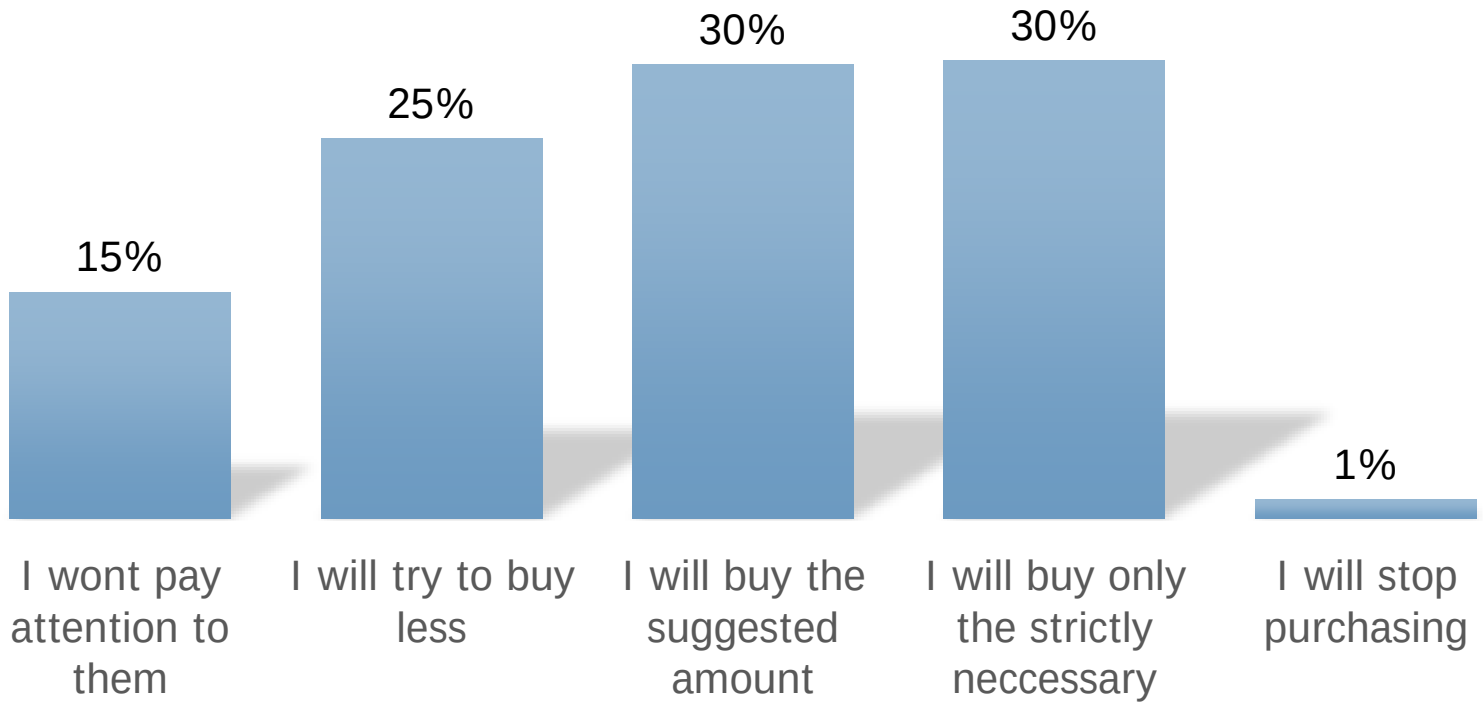


Most Knowledgeable Organizations



Willingness to Change

If the group that you trust the most asked that you limit your purchases, how likely are you to reduce your purchases?



Key Insights from USA Results

Key Results

- Massive changes in purchasing behavior took place, though some of them may be transient
- American households' increase of stocks of basic supplies had negative impacts on the supplies available to the response
- Low-income households declared larger numbers of "valid" and "precautionary" reasons
  - They faced larger problems / felt less secure than wealthier households
- Precautionary/Opportunistic buying was a major contributor to the crisis of critical supplies reaching disaster responders
  - Opportunistic buying seem to be a major contributor to the crisis
- Local responders, firefighters, local governments are ideally positioned to convince people to reduce precautionary buying

International Perspective on Purchasing Behaviors of Critical Supplies during the COVID-19 Pandemic

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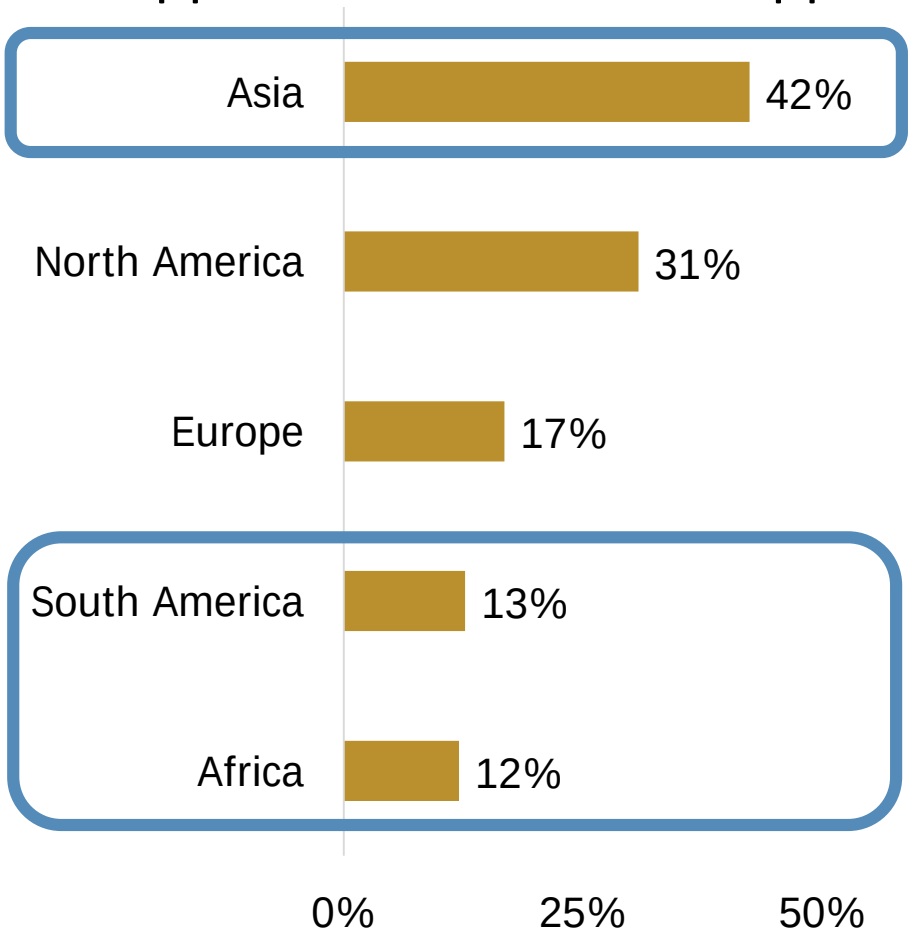
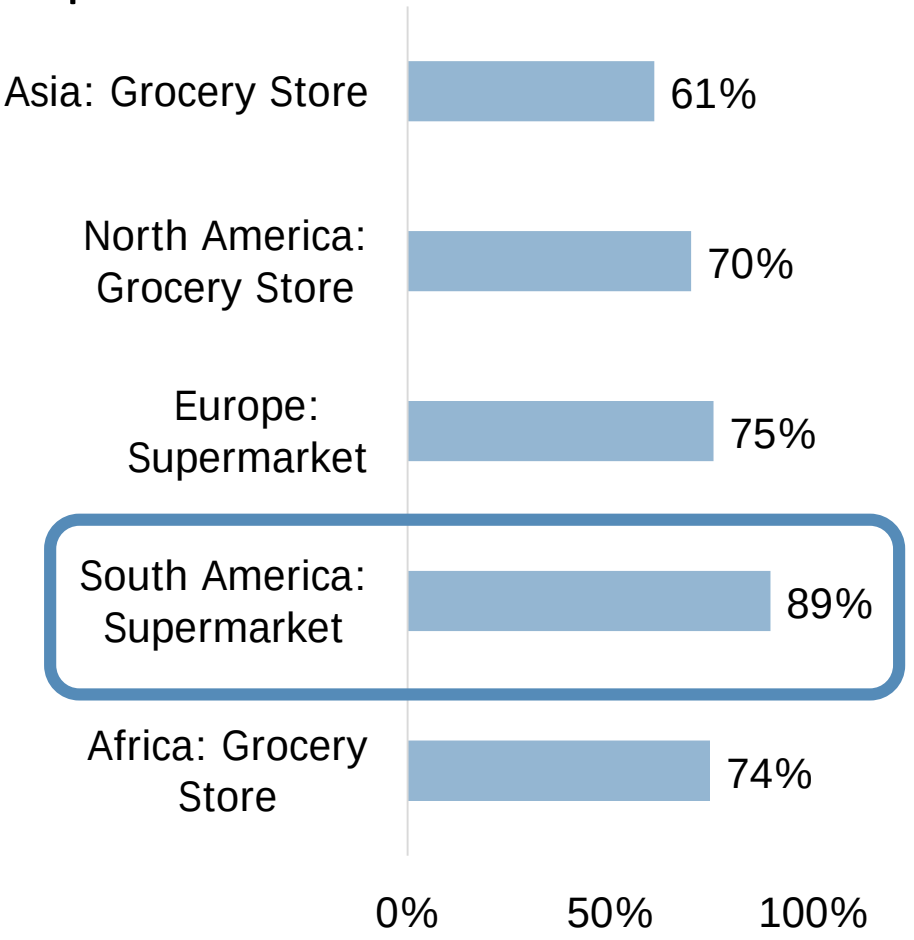
Pre-Covid Shopping Habits

Preferred Retailers for Basic Supplies

Percentage of Consumers that shopped online for basic supplies

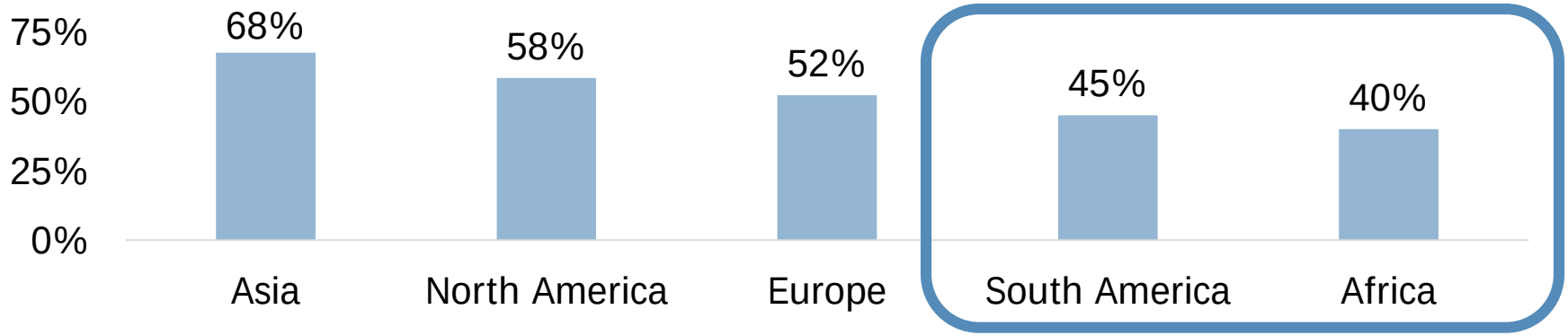


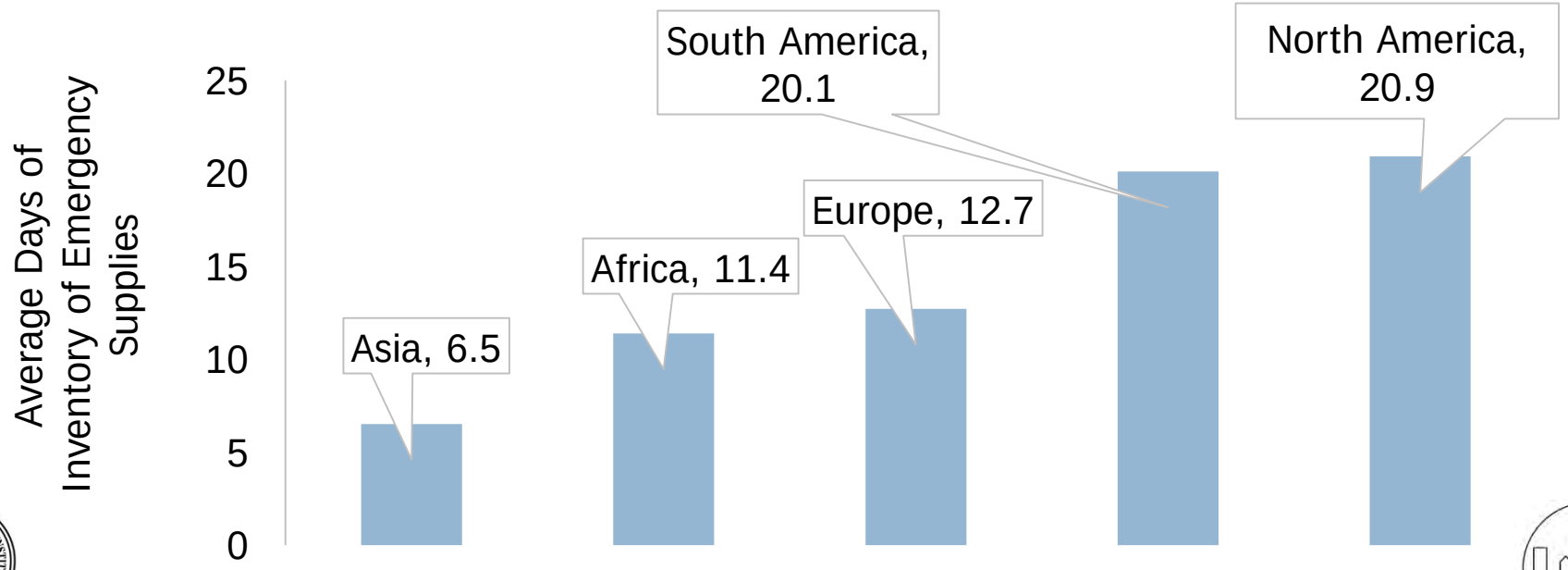
Top retailers before crisis



Stocks of Basic Emergency Supplies

Percentage of population that stores basic supplies for emergencies

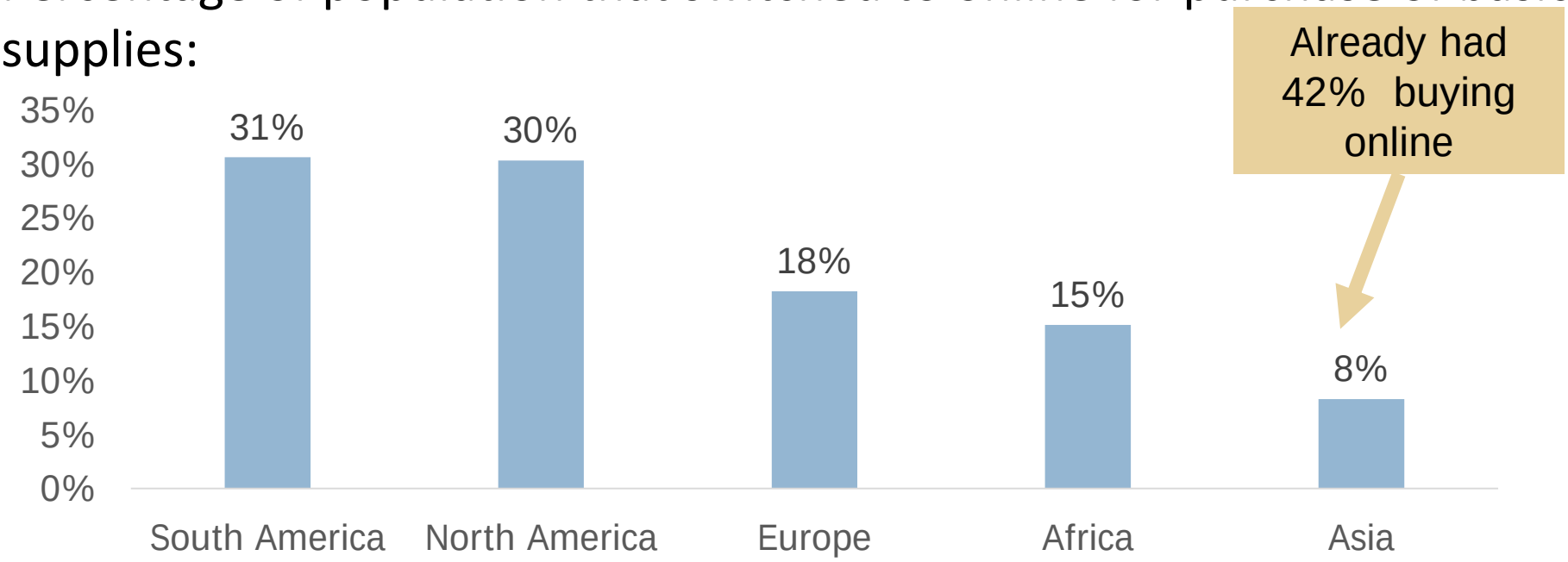




Changes in Shopping Habits due to COVID-19

Switched to Online

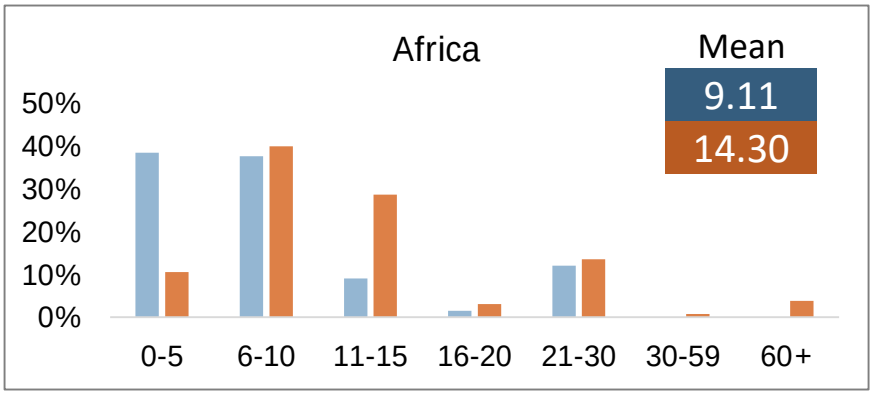
Percentage of population that switched to online for purchase of basic supplies:



Top Countries:

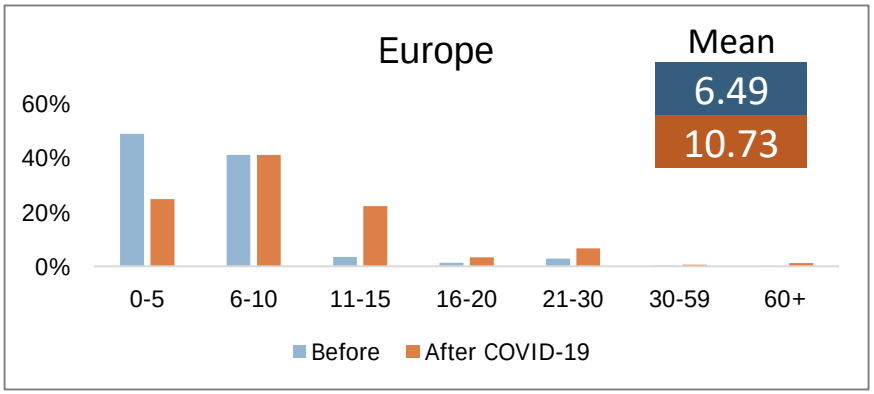
Country	Switched to Online
Chile	42%
Mexico	35%
Nepal	35%
Peru	34%
Brazil	33%
United States of America	30%
Italy	29%

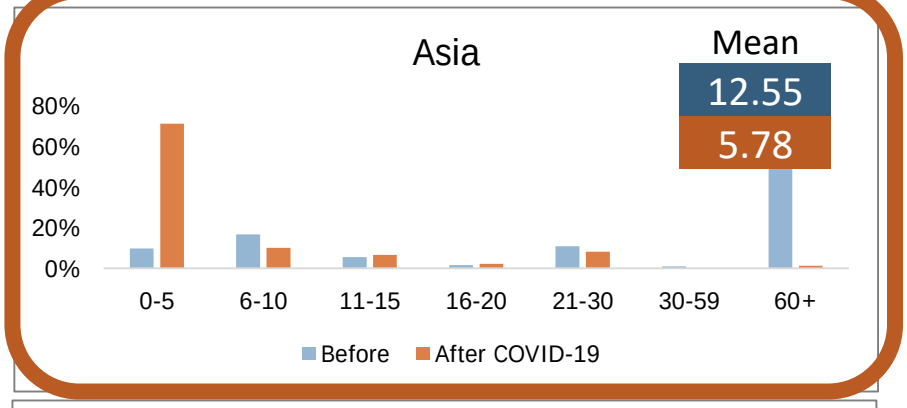
Days of Inventory of Basic Supplies

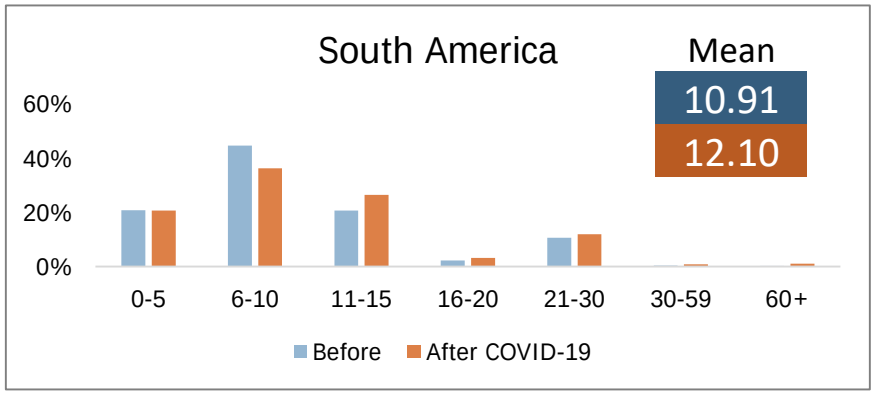


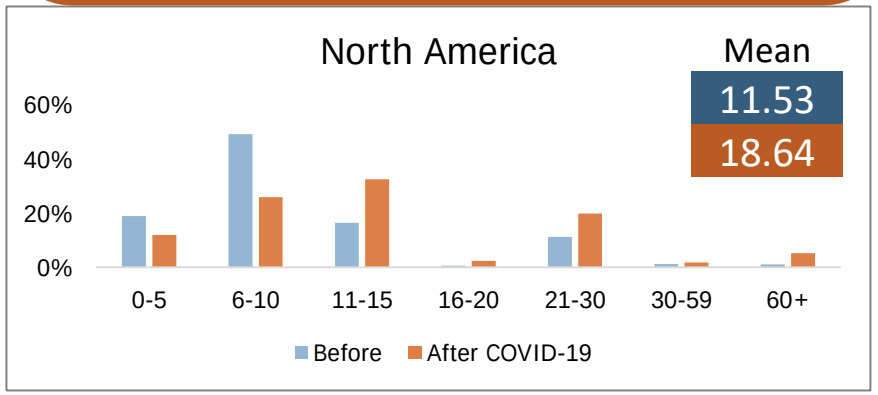
Before COVID-19
After COVID-19

2.4
Days
Average
Increase

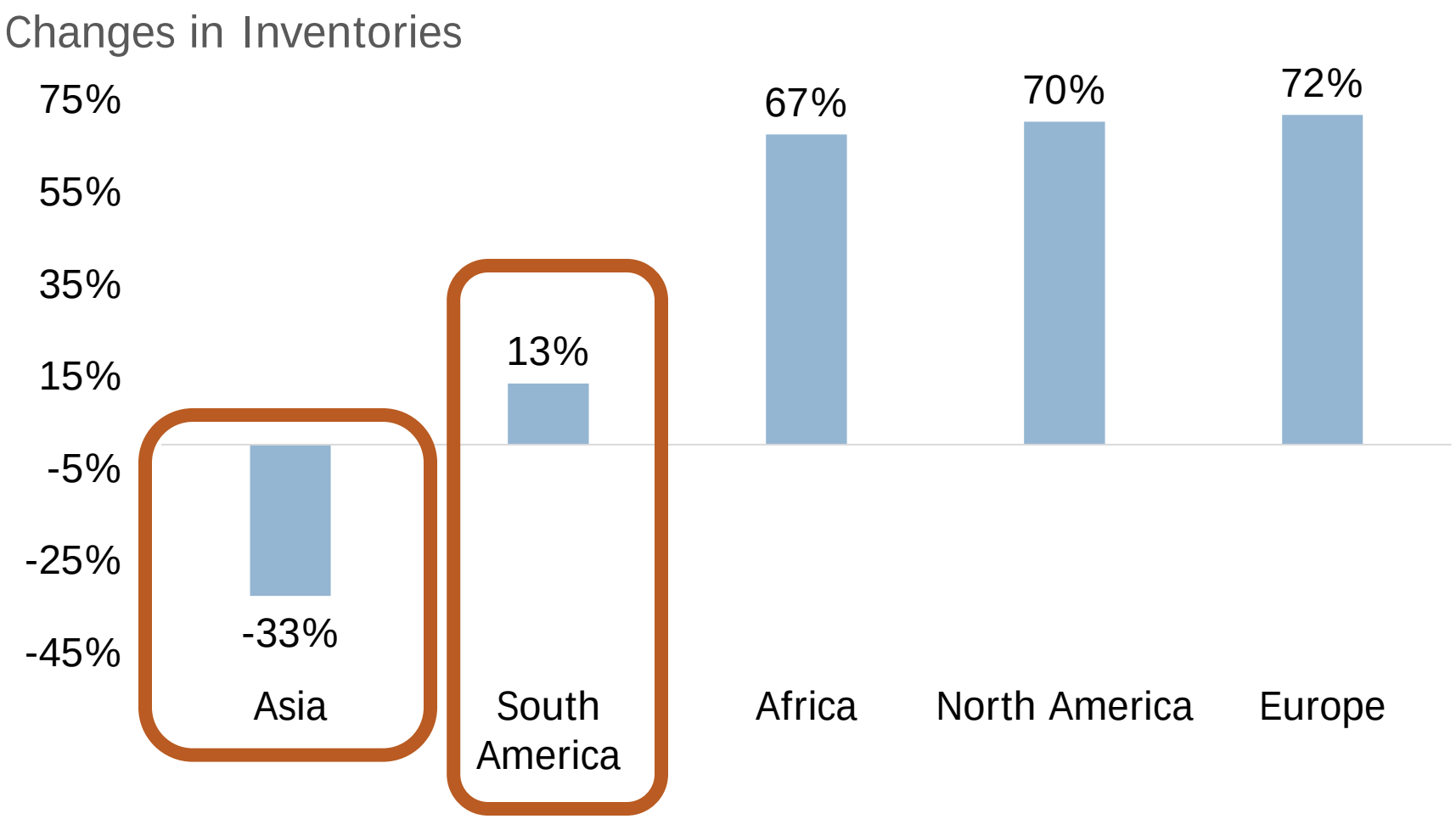




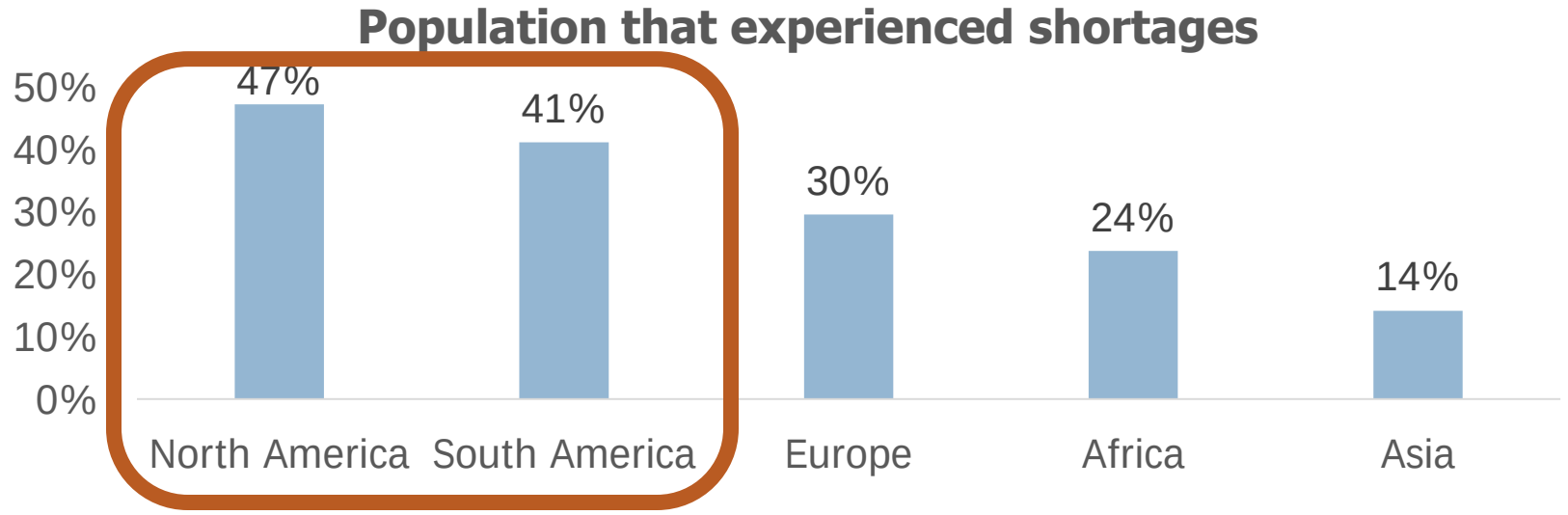




Days of Inventory of Basic Supplies



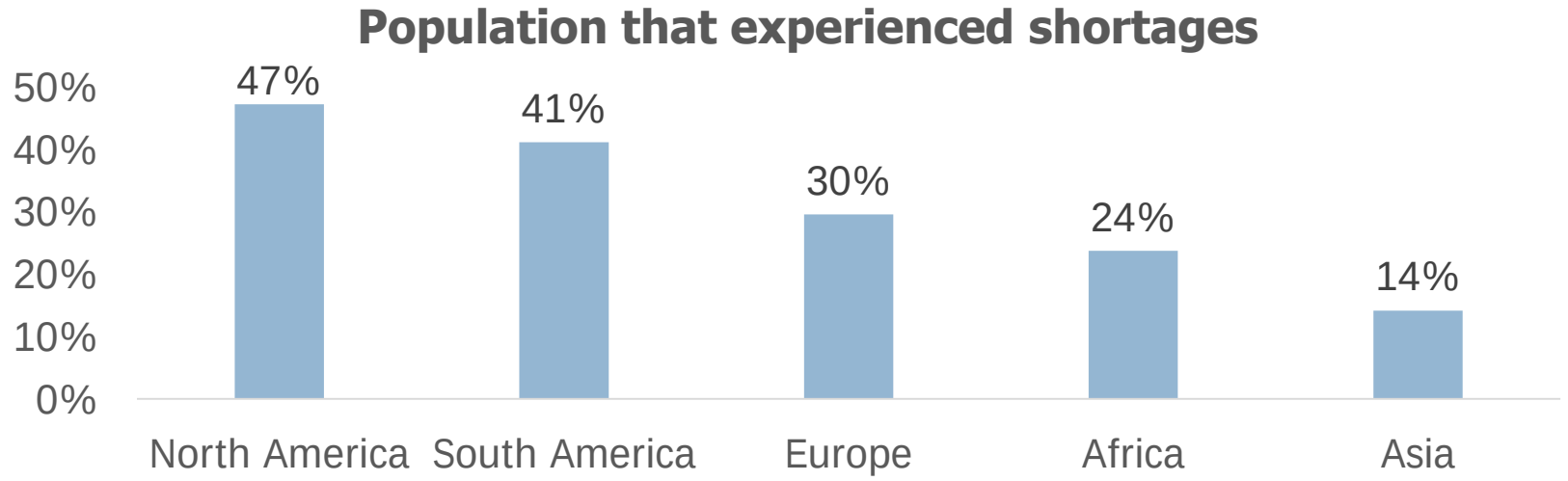
Shortages



What products could you not buy or could not buy the desired quantity?

	Hand Sanitizer	Face Masks	Toilet Paper	Gloves	Cleaning Wipes	Paper Towels	Meats
Africa	17%	16%	5%	9%	9%	4%	5%
Asia	16%	19%	14%	13%	4%	12%	16%
Europe	17%	20%	12%	15%	5%	5%	5%
North America	31%	22%	29%	14%	29%	17%	11%
South America	29%	28%	9%	17%	10%	7%	9%

Shortages



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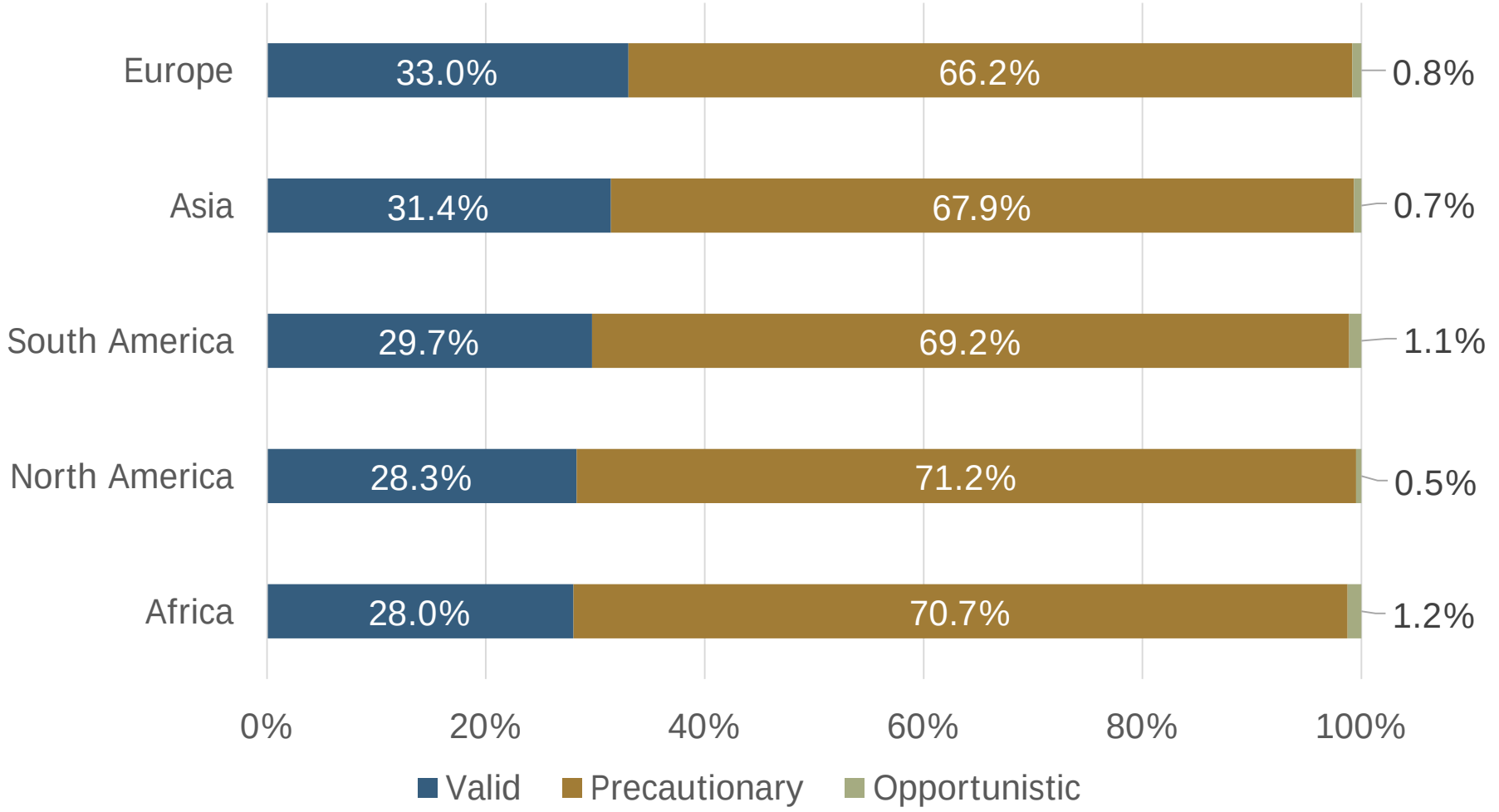
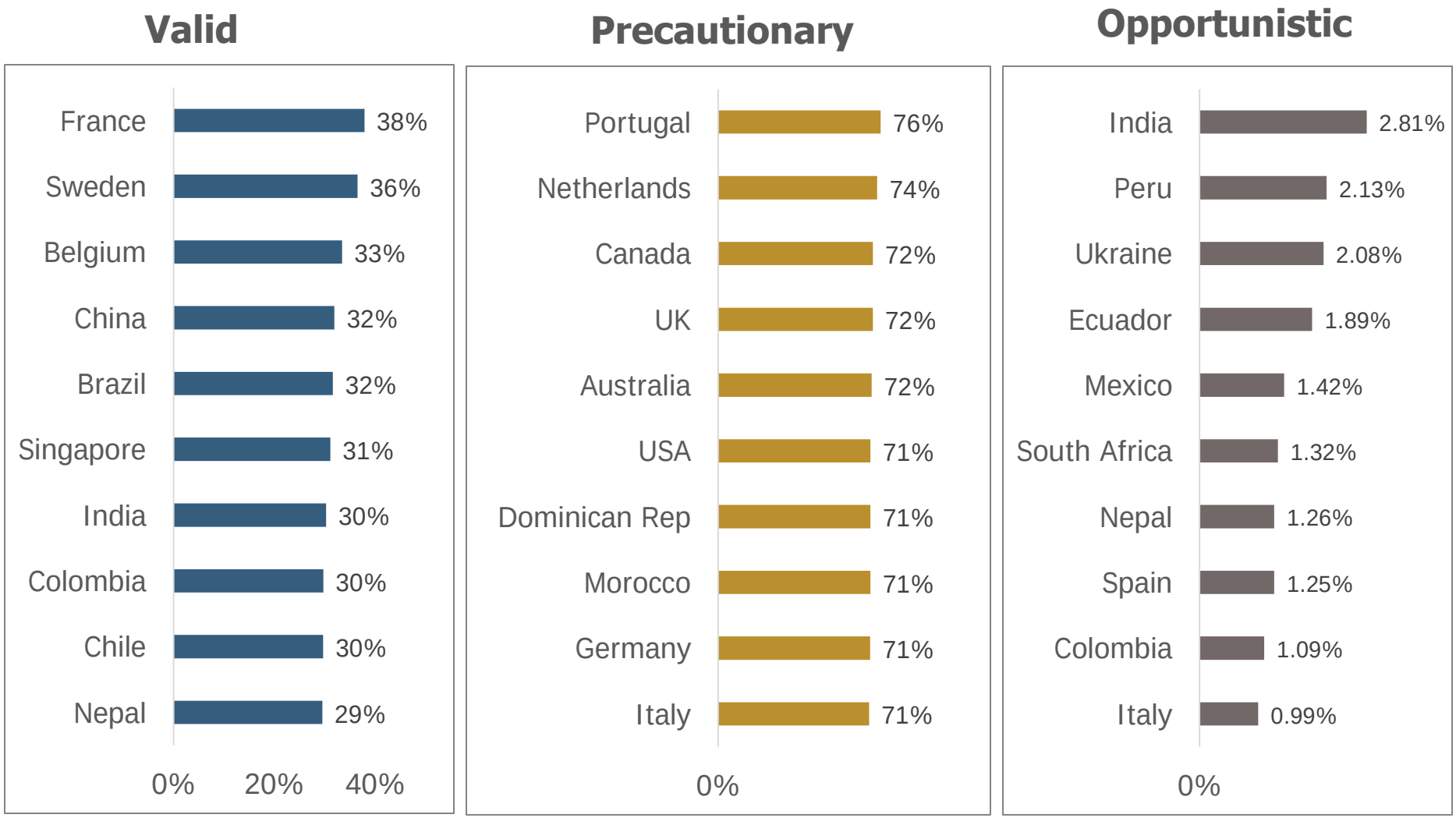
North America	31%	22%	29%	14%	29%	17%	11%
South America	29%	28%	9%	17%	10%	7%	9%

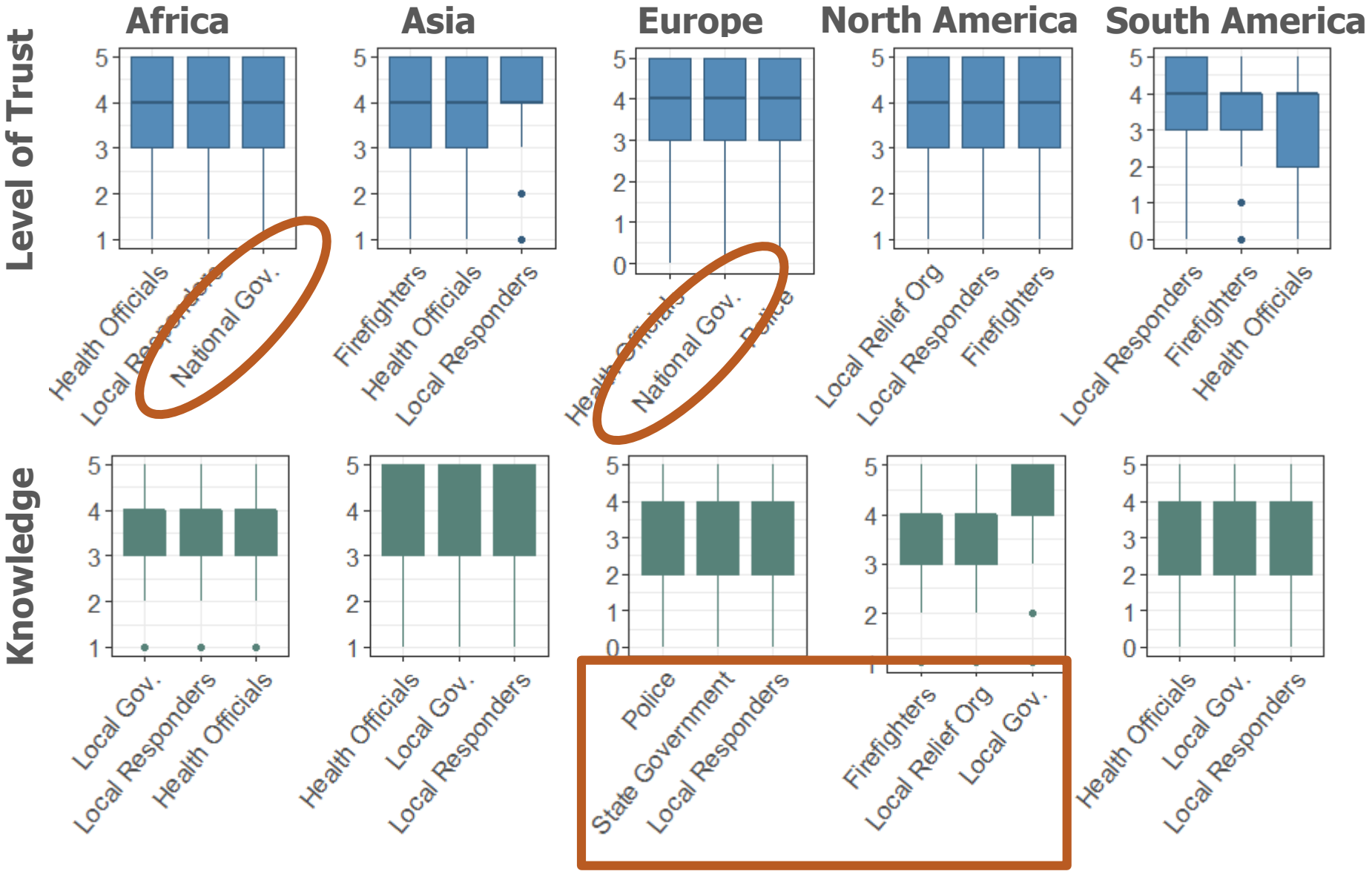
Valid vs. Precautionary vs. Opportunistic



Top Countries by Reason



Opinion of Organizations



Key International Results

- There are great similarities in changes in shopping behaviors worldwide:
  - Purchases of basic supplies online increased significantly in all regions (Asia already had high penetration)
  - Households increased their stocks of basic supplies in most regions, while China decreased their stocks
  - Distribution of Precautionary/Opportunistic motives was consistent thought all regions
  - Local responders, firefighters, local governments are ideally position to convince people to reduce precautionary buying
- Shortages were more pronounced in the Americas

Concluding Remarks

Key Findings

- Disaster Related Buying Behaviors (AKA Panic Buying) creates tremendous challenges to disaster response, supply chains, and freight systems
  - Artificially increases demand, removes critical supplies from the locations that need them the most, etc.
  - It is important to mitigate their effects
- The increases in demand are so high that it become impossible for supply chains to satisfy the demand
- There are multiple motivations behind
  - Valid, in response to a need
  - Precautionary, out of concerns about availability
  - Opportunistic, to benefit from the crisis

Many Similarities in the Results

- Breakdown of Reasons
  - Valid → 27% to 38%
  - Precautionary → 62% to 72%
  - Opportunistic → 0.1% to 2.8%
- Potential Role of Local Actors as Influencers of Behavior Changes
  - Perceived as trustworthy and knowledgeable
  - They could help mitigate the sharp rise of demand

What Could Be Done?

- It depends on the "reasons"…
  - Precautionary Buying…
    - Appeal to citizens to do what is right…
    - Engage local responders, relief groups… health officials…
  - Opportunistic Buying…
    - Must be prevented…
- Ration critical supplies…
- Establish Public-Private Collaboration Agreements
  - To be activated in case of disasters of a certain size
  - Companies in possession of critical supplies agree to sell them (at a preset price) to the emergency response agencies to support the response and the victims

Our partners

- Brazil: R. da Silva Lima, C. Barbieri, H. Yoshizaki
- China: Y. Wu
- Colombia: V. Cantillo
- Ecuador: C. Pérez
- France: J. González-Feliú, L. van Wassenhove
- India: P. Sahu
- Italy: E. Marcucci, V. Gatta, M. Le Pira
- Nepal: S. Pokharel
- Peru / Chile : W. Yushimito, M. Chong
- South Africa: M. Zuidgeest, J. Joubert
- Spain: L. dell'Ollio
- Sweden: I. Sánchez-Díaz
- Ukraine: A. Rossolov
- Uruguay: M. Tanco
- At RPI: Sofía Pérez, Diana Ramírez

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Thanks!


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