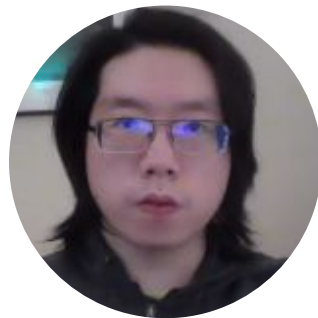# COVID-19 Behavioral Changes

Meet the team!

Marie Brodsky
Mathematics, Computer Science
Freshman

Liron Karpati
Mathematics, Psychology
Freshman

Joey Kim
Physics, Math
Freshman

Amanda Liu
Computer Science
Freshman

1.

Getting to Know the Data

Age, Wealth, Sex, and Location

Where Does the Data Come From?

▷ UMD National Center for Smart Growth

▷ 26 questions asking about:
  ○ **socio-demographic characteristics** of the respondents
  ○ **commute pattern** before and after the lockdown
  ○ weekly physical activity and **exercise patterns**
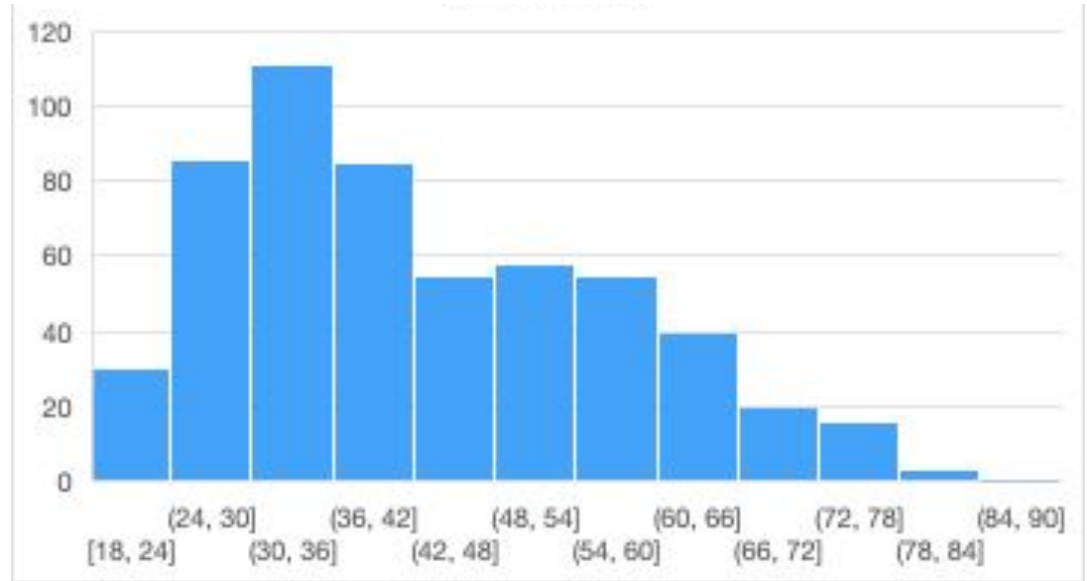 ○ **grocery shopping patterns** during the lockdown

How was the Data Collected?

▷ Distributed via:
  ○ random email lists
  ○ social media posts
  ○ hard-copy flyers in international airports

▷ Scale:
  ○ April 10th, 2020 → July 8th, 2020
 ○ 564 cleaned observations

Visualizing the Demographics (Age)

➢ Right skewed

➢ Over representing 24-42 year olds

➢ Have a spectrum of ages

Visualizing the Demographics (Wealth)

➤ Average ZIP code Adjusted Gross Income as estimate of respondent's wealth

➤ Median:

  ○ This data: 77k
  ○ U.S.: 68k in 2019

➤ Mean:

  ○ 94.5k
  ○ U.S.: 72k in 2014

➤ Sample population over-representing wealthier people
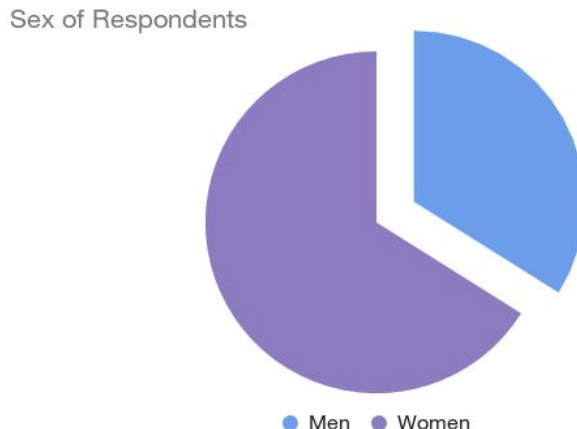
Histogram of Avg. AGI
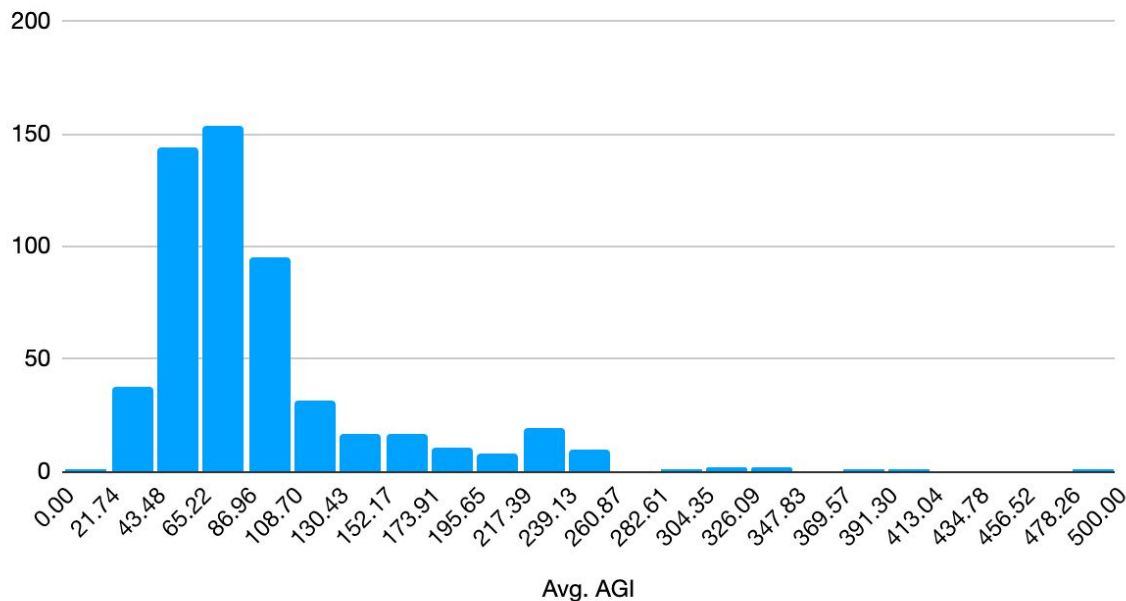
Visualizing the Demographics (Sex)

189 Male

368 Female

We noted that this imbalance could make our analysis of shifting gender roles during the pandemic more complex.

Sex of Respondents

● Men ● Women

Visualizing the Demographics (Location)

[USDA Economic Research Service Data](#)

Code	Description
Metro counties:	
1	Counties in metro areas of 1 million population or more
2	Counties in metro areas of 250,000 to 1 million population
3	Counties in metro areas of fewer than 250,000 population
Nonmetro counties:	
4	Urban population of 20,000 or more, adjacent to a metro area
5	Urban population of 20,000 or more, not adjacent to a metro area
6	Urban population of 2,500 to 19,999, adjacent to a metro area
7	Urban population of 2,500 to 19,999, not adjacent to a metro area
8	Completely rural or less than 2,500 urban population, adjacent to a metro area
9	Completely rural or less than 2,500 urban population, not adjacent to a metro area

Rural - Urban Continuum Codes

Every respondent was from an urban region

Majority in Code 1

How did we begin?

Choosing guiding questions

Analysis Questions

▷ Were women and men unequally **burdened with childcare** with the onset of the pandemic?

▷ **Does having kids predict changes** in behavior pre and post COVID?

▷ How do **demographic factors** like location, age, and wealth predict behavior changes over the pandemic?

▷ What were the main **textual reasons provided** for going out during the pandemic?

Variable Relationships:

Shopping Behavior

▷ Rural vs urban locations vs. Shopping Behavior

▷ Average incomes of respondents' zip codes vs. Shopping Behavior

▷ Age vs. Shopping Behavior

Changes in Physical Activity

▷ Age vs Difference in Physical Exercise

▷ Number of kids vs. Difference in Physical Exercise

▷ Parental Role vs. Difference in Physical Exercise

Finding Location-Related Data

Converting Zip Codes to FIPS Codes ([dataset](#))

Rural-Urban Continuum Codes ([dataset](#))

Average Adjusted Gross Incomes ([dataset](#))

The original zip codes of respondents can be used to extrapolate deeper understanding.

However, we can only rely on this data for a general estimate.

*FIPS (Federal Information Processing Series)

13

Changes in Fitness Behavior

Problems with the data set:

▷ **Questions asked about "exercise before" vs. "exercise/after" differed**
▷ **"Exercise before" was in times per week, "exercise after" was in minutes per week and times per week**

How we remedied the problems

▷ **Initially tried generating a general fitness formula (not-reliable)**
▷ **Recoded the exercise data to all be in units of times per week**
▷ **Four levels**
  ○ **Level 1: No exercise**
  ○ **Level 2: 1-2 days/week**
  ○ **Level 3: 3-4 days/week**
  ○ **Level 4: 5+ days/week**

Results

Understanding we gained from the data

Question:

Is having kids a predictor of the choice whether to do online grocery shopping during the pandemic?

Difference in proportion
(children & shopping)

n = ?		Fraction tried online shopping
No children	333	0.4294
At least one child	218	0.5046

One-tailed z-test for difference in proportion given group sizes → p-value = 0.0416 < 0.05

Statistically Significant Result

Here, we found the proportion of people with and without children who had tried online shopping…

Applying a one-tailed z-test for difference in proportion in our analysis.

Question:

Is average income of a respondent's zip code related to choice of online grocery shopping during the pandemic?

Approach #1 - Dividing by Group
(income & shopping)

Group	Tried	Did Not
Mean	91.44300	97.52600
SD	55.38300	62.54000
SEM	3.50273	3.64122
N	250	295

Unpaired t-test for difference in means between zip code AGIs of groups which did and did not try online shopping

Result: p-value > 0.05, insignificant difference

Approach #2 - Correlation Test
(income & shopping)

Point-Biserial Correlation →
hypothesis test with one continuous
and one dichotomous variable

(in our case, wealth and a binary value
for online shopping)

Result: p-value > 0.05,
insignificant difference

Question:

What are the main reasons given for going out during the pandemic?

Text Analysis

|	Mentions
Friends/social	68
Family/parents/elderly	45
Food/grocery/restaurant	44
Shopping/store	38
Work	35
Walk/outside/exercise	31
Doctor/medical/appointments	20
Hardware/supplies/car	18

Looking at groups of words mentioned over 5 times throughout the textual data...

Unsurprising results, but ambiguous categories

Visualizing the Exercise Change

We plot how people changed their exercise behaviors
- ❖ Negative = Decrease
- ❖ Positive = Increase

- ❖ **Most** people changed exercise frequency very little
- ❖ People changed in both directions

Chart Title
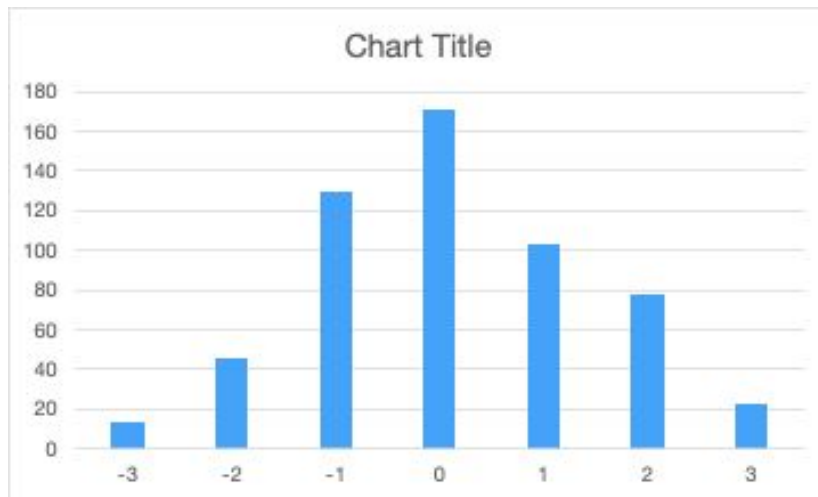
Question:

Do gender roles affect the time parents have for self-care activities such as exercise?

Results:

We grouped participants with children by female and male. We then calculated the average of their recoded* exercise level before and after the pandemic.

Average Re-coded* Exercise Level

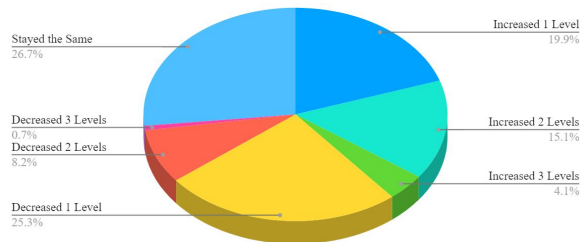|	Before COVID-19	After COVID-19
Father	2.53	2.69
Mother	2.41	2.60

These results indicate that both mothers and fathers exercised slightly more after COVID-19. On average, fathers exercised more than mothers.
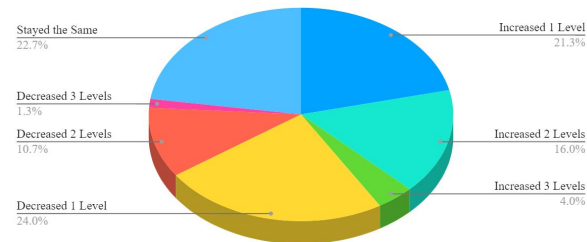
Results:

We grouped participants with children by female and male. We then calculated the change in their recoded* exercise level before and after the pandemic. We displayed the percentage of change in each level in a pie chart for both groups.

These results **do not** indicate a clear relationship (chi-squared test p > 0.624) between gender of parent and change in time for self-care activities like exercise due to COVID-19.

Mothers' Change in Exercise: Pre-COVID vs. Post-COVID

Stayed the Same
26.7%

Increased 1 Level
19.9%

Increased 2 Levels
15.1%

Increased 3 Levels
4.1%

Decreased 1 Level
25.3%

Decreased 2 Levels
8.2%

Decreased 3 Levels
0.7%

Fathers' Change in Exercise: Pre-COVID vs. Post-COVID

Stayed the Same
22.7%

Increased 1 Level
21.3%

Increased 2 Levels
16.0%

Increased 3 Levels
4.0%

Decreased 1 Level
24.0%

Decreased 2 Levels
10.7%

Decreased 3 Levels
1.3%

Question:

Does age or having kids predict changes in physical activity?

Results:

We calculated the spearman's rho correlation coefficient for (age vs. exercise change) & (# of kids vs. exercise change)
- ❖ Age vs. Exercise Change: ρ = -0.02319923
- ❖ # of Kids vs. Exercise Change: ρ = 0.04225109

*In both cases the p-value was large, indicating no statistical significance

These results indicate that there is **no** linear relationship between these variables. With more time we would look for more complex relations like a quadratic relationship.

Conclusions and Future Research

Analysis Questions

▷ Were women and men unequally **burdened with childcare** with the onset of the pandemic?

▷ **Does having kids predict changes** in behavior pre and post COVID?

▷ How do **demographic factors** like location, age, and wealth predict behavior changes over the pandemic?

▷ What were the main **textual reasons provided** for going out during the pandemic?

Recap of Results

Shopping Behavior

❖ Those with children were more likely to try online grocery shopping

❖ Income (as predicted by ZIP code) did not have a strong relationship to grocery shopping behavior

Exercise Behavior

❖ Weekly exercise frequency remained stable (even under different identification factors: age, gender role, etc.)

❖ Both parental gender roles and # of children had no relation to change in exercise

❖ We observe a slight increase in average exercise frequency for those with children during the pandemic

Relating our Findings to Quality of Life

Quality of Life (WHOQOL Definition): "individual's perception of their position in life in the context of the culture and value systems in which they live and in relation to their goals, expectations, standards and concerns"

❖ No subjective well being questions
❖ Having children increases personal responsibility (online grocery shopping and slight increase in exercise)
❖ The difference in shopping behavior indicates that people are more concerned for their children than themself (suggesting parental stress may result not only from child care but also concern for child well-being)
❖ Lack of exercise change suggests a need for better public education on the close relationship between psychological and physical health

Biased Data →
Ideas for Possible Survey Improvements

▷ Almost all zip codes of respondents **in urban areas**, most in counties with over 1 million residents

▷ **Median income** in survey zip codes way **above US median** so actively seek **more diverse economic backgrounds**

▷ Survey design **didn't ask the same questions** for before and after

▷ **Ambiguous categories**
  ○ E.g. exercising 1-3 days or 3-5 days, overlap

Future Questions...

▷ What kinds of work do parents do and do differences in work lead to differences in parenting during COVID?

▷ Does psychological wellbeing change with relation to life habits (like exercise)?

✲✲ Although cliche, more data and more **representative** data!

References

▷ UMD National Center for Smart Growth, "Behavior Changes During COVID-19" survey
▷ https://www.who.int/tools/whoqol
▷ https://academic.oup.com/aje/article/164/6/586/129897

External datasets:

▷ USDA Economic Research Service -- Rural-Urban Continuum Codes:
https://www.ers.usda.gov/data-products/rural-urban-continuum-codes/
▷ IRS Income by Zip Code from Data World
https://data.world/jonloyens/irs-income-by-zip-code
▷ Zip Code to FIPS (Federal Information Processing Series)
https://www.kaggle.com/danofer/zipcodes-county-fips-crosswalk

Thank you for your time!