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Solitude's Shadow: The Mental Health Maze in COVID
Effects of Social Isolation During the COVID-19 Pandemic on Mental Health

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Abstract

The COVID-19 pandemic coincided with increases in social isolation and declines in mental health. To investigate the correlation between these trends, we obtained 74,612 responses to the Census Bureau Household Pulse Survey from October 14-26, 2020, detailing the impacts of the COVID-19 pandemic on daily life. After aggregating the data and using survey responses from people 60 years and younger, we fit a logistic regression model to test if changes to social activities resulted in mental health issues. We performed backward selection at α = 0.20 and discovered a model correlating fewer trips to stores, less public transit, vacation cancellations, and changes in children's education to mental health issues. Despite outperforming an intercept-only model, a chi-squared goodness-of-fit test revealed a poor fit possibly explained by aggregated groups with small sample sizes. Fewer trips to stores [OR = 3.17, 95% CI: (3.04, 3.30)], less public transit [OR = 1.46, 95% CI: (1.39, 1.53)], vacation cancellations [OR = 2.07, 95% CI: (1.97, 2.17)], and changes in children's education [OR = 2.51, 95% CI: (2.40, 2.61)] all resulted in statistically significant probability increases of mental health issues. Additionally, we discovered isolation in more activities resulted in a higher probability of reporting mental health issues. We determined that survey respondents who were isolated in social activities due to the COVID-19 pandemic had higher probabilities of mental health issues.

Introduction

The COVID-19 pandemic, beyond its substantial mortality impact worldwide, has resulted in considerable negative psychological effects. Between Mar. 2020 and Sept. 2022, over 41% the U.S. adults reported experiencing elevated psychological distress, surpassing levels typically associated with clinical disorders. This underscores extensive mental health challenges induced by the pandemic [1].

Young adults were especially impacted by social isolation and reported an increase of feeling loneliness[2]. This observed increase in loneliness underscores the need to consider demographic factors such as age in developing mental health strategies [3,4].

The *Household Pulse Survey* (HPS) by the U.S. Census Bureau were distributed to track how COVID-19 affected daily life. These datasets consisted of randomly selected participants completing a 50-question online survey about the COVID-19 pandemic's impact on lifestyle choices, providing snapshots of how changing behavior due to COVID-19 correlates with mental health issues.

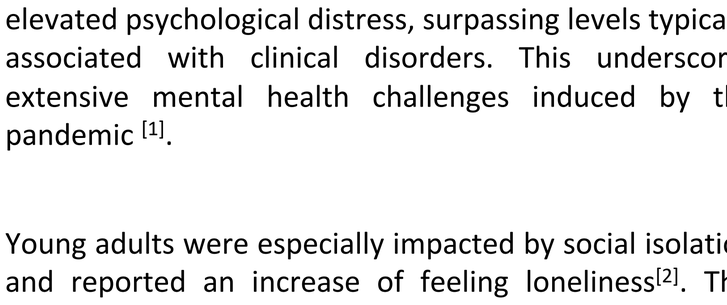

Figure 1. Background of the study. *Household Pulse Survey* data is applied for investigations into the correlation between social isolation and mental health issues.

Methods

The survey responses for the HPS dataset we used in our analysis is derived from October 14-26, 2020 – a time range in line with the start of the pandemic's peak and one of the few in the survey that involved questions related to mental health treatment.

The focus of this analysis is to determine how social behavior changed in response to the pandemic, which we could perform with the 150 variables being tracked by the survey. In the end, we created an initial logistic regression model consisting of:

- **Predictors:** Age, work-from-home (telework) status, changes to children's education format, changes to shopping/spending habits, taking fewer trips, cancelling planned trips, taking fewer transit rides
- **Outcome:** Sum of scores from 1-4 about 4 variables asking if anxious, worried, disinterested, or depressed
  - Score of ≤ 4: No mental health issues
  - Score of ≥ 5: Mental health issues recorded

To further fine-tune our model, we removed participants that were at least 60 years old, as those above this cutoff were less likely to report mental health issues. Performing backward selection based on α = 0.20 resulted in removal of non-significant variables like WFH status and spending/shopping habits. We also performed data aggregation to reduce computational complexity in regards to our dataset consisting of 74,000+ responses.

Question:
How has the coronavirus pandemic affected how the children in this household received education for the 2020 – 2021 school year? Select all that apply.
Options:
❑ Classes normally taught in person at the school were canceled ❑ Classes normally taught in person moved to a distance-learning format using online resources, either self-paced or in real time ❑ Classes normally taught in person moved to a distance-learning format using paper materials sent home to children ❑ Classes normally taught in person changed in some other way -- Please specify: ❑ There was no change because schools did not close

Table 1. Example of an HPS survey question used in our analysis.

Results

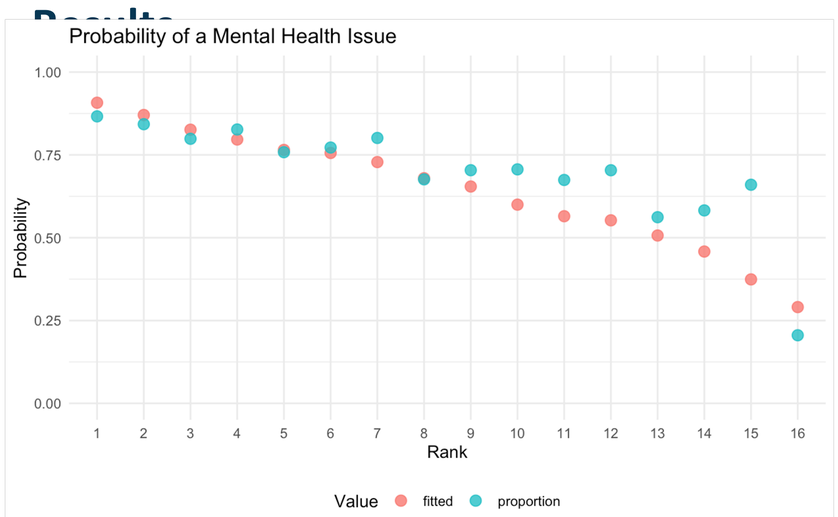

Figure 3. Scatterplot of the fitted values and the actual values for each activity combination group. The points are ranked from highest to lowest probability of having a mental health issue by the the fitted values.

	Odds Ratio	Std.Error	p-value	2.5%	97.5%
Intercept	0.41	1.02	0.00e+00	0.39	0.43
Fewer Trips to Store	3.17	1.02	0.00e+00	3.04	3.30
Fewer Trips on Transit	1.46	1.02	3.94e-53	1.39	1.53
Remote Learning	2.07	1.03	1.41e-180	1.97	2.17
Canceled Vacation	2.51	1.02	0.00e+00	2.40	2.61

Table 2. Summary of the best-fitted model. The table shows the odds ratios of the model and their standard errors, *p*-values and 95% confidence intervals. All the confidence intervals are narrow and the *p*-values < 0.05, which show the results are accurate and the coefficients are statistically significant.

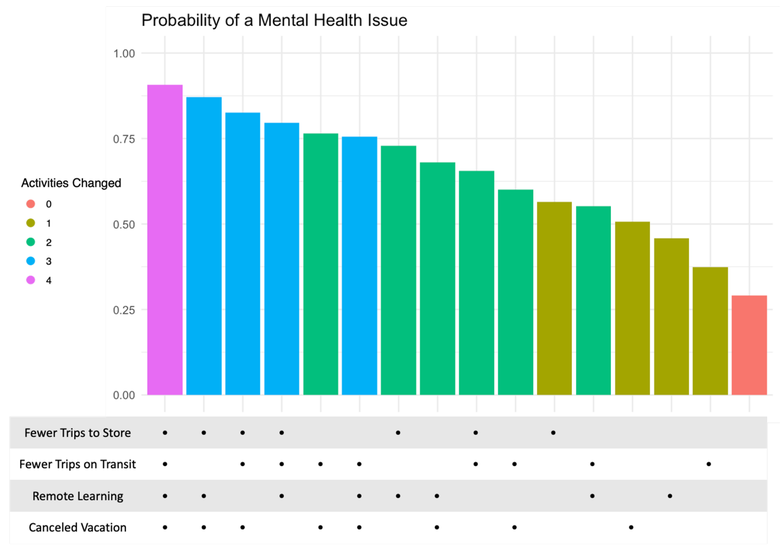

Figure 4. The fitted probability for each activity group. This chart shows the fitted probability of having a mental health issue for the different groups in the data. Below is a table that shows which activities the individual changed.

The results indicated that maintaining regular activities, such as trips to the store, correlates with lower probabilities of mental health issues, highlighting the benefits of regular routines. Additionally, reduced social and physical activities, such as fewer trips or commuting, are associated with increased mental health issues, emphasizing the importance of regular engagement in daily activities for mental well-being.

Limitations

- Poor model fit
  - Chi-squared residual deviance test: The model does not fit data and there is still some bias not explained by model. (*p*-value residual deviance : 1.36e-212)
- Missing data
  - Many individuals did not answer questions so there was an assumption that they were not experiencing a mental health issue or their behavior did not change due to COVID-19

Conclusion

Canceling trips and fewer trips to the store were associated with higher probabilities of mental health issues for individuals and families.

Those who were isolated in more activities had a higher probability of having a mental health issue. Taking fewer trips to the store increased the odds of having a mental health issue by a factor of 3.17.

While the model is not the best fit, it appears to model the data well and it reveal trends in the relationship between isolation and mental health issues.

Future directions include exploring more variables in the dataset to find a better-fitting model and imputing missing data rather than assuming no change in behavior or mental health when encountering a blank answer.

References

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