Mental Health, Economic Strain, and Vaccine Uptake During COVID-19:
A Longitudinal, Data-Driven Story (2020–2023)

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Abstract

Public health does not operate in a vacuum. During COVID-19, economic stress, mental health, and vaccine behavior moved together—with a cornucopia of misinformation poured into the fire. This paper traces those links in the United States from 2020 to 2023. This study combines state-level data on unemployment, poverty, gross state product (GSP), self-reported frequent mental distress (≥14 mentally unhealthy days in the past 30), and vaccination coverage. Merging this data with CDC's county vaccination dataset (Centers for Disease Control and Prevention [CDC], 2020–2024) (reported by MMWR week) and tracking attitudes using the KFF Vaccine Monitor (KFF, 2020– 2025). We then estimated linear models to test how economic strain and mental distress relate to vaccine uptake and to each other.

Three results stand out. First, poverty strongly predicts frequent mental distress ($p < .001$). Second, communities with higher distress show lower vaccination coverage ($p \approx .035$ in the full model). Third, the economy is not a bystander: unemployment and poverty shape GSP in opposite directions. These findings extend early cross-sectional studies by showing that the interactions persisted through 2023. They also align with experimental evidence that exposure to vaccine misinformation reduces vaccination intent.

In short, policy should match the problem's shape: pair anti-misinformation efforts with stabilizers that reduce economic and mental-health strain. Otherwise, we merely treat symptoms while the engine of vulnerability keeps running.

Introduction

The pandemic made one truth unavoidable: health, money, and mind are intertwined. Communities under economic pressure reported more mental distress and often vaccinated less. Those patterns were not static. They shifted with policy shocks and the flow of information online. Experimental work shows that even brief exposure to false vaccine claims can depress intention to vaccinate; survey panels and dashboards documented persistent gaps in uptake as the rollout matured.

This study asks a simple question with big consequences: How did economic strain, mental distress, and vaccine uptake move together between 2020 and 2023? To answer, we connected official economic series to public-health data and estimated straightforward models that make the relationships transparent. The point is not to over-claim causality, but to map the feedback loops policy must confront.

Related Work

Misinformation lowers vaccine intent: a large randomized study found that exposure to false COVID-19 vaccine claims reduced intention by about six percentage points in UK and US samples (Loomba, de Figueiredo, Piatek, de Graaf, & Larson, 2021). Long-running public trackers—such as the KFF Vaccine Monitor (KFF, 2020–2025)—show that misinformation beliefs, source mistrust, and partisanship correlate with lower uptake over time. On the outcomes side, CDC reporting (CDC, 2020–2024) highlights substantial rollout gaps; early in 2021, the least vulnerable counties were ahead of the most vulnerable by roughly 18 percentage points in full vaccination coverage.

Economic stressors—job loss, food insecurity after the sunset of SNAP Emergency Allotments (Center on Budget and Policy Priorities (CBPP, 2023) [CBPP], 2023), and housing instability—are each linked in

the literature to worse mental-health outcomes. Together, these strands suggest a loop: stress feeds distress; distress erodes preventive health behaviors; and outbreaks and disruptions reinforce stress.

Methods

Data Sources

This research assembled state-level indicators for 2020–2023 from public sources: (a) CDC's county-level COVID-19 vaccination dataset (Socrata asset 8xkx-amqh), aggregated from MMWR-weekly records to annual coverage measures; (b) frequent mental distress (≥14 days) from CDC's BRFSS (CDC, n.d.)/PLACES; (c) unemployment from the Bureau of Labor Statistics (U.S. Bureau of Labor Statistics [BLS], 2020–2023)' Local Area Unemployment Statistics (BLS, 2020– 2023) (LAUS); and (d) gross state product (current dollars) from the Bureau of Economic Analysis (U.S. Bureau of Economic Analysis [BEA], 2020–2023)' GDP by State (BEA, 2020–2023). To track attitudes and information trends, I referenced the KFF Vaccine Monitor (KFF, 2020–2025).

Analysis

Datasets were cleaned and merged in Python and Excel. Linear models used frequent mental distress and vaccination coverage as outcomes in separate specifications, with poverty, unemployment, population, and cross-term controls where appropriate. Significance relied on t-tests with conventional thresholds; interpretation centered on direction, magnitude, and consistency with prior research rather than p-values alone. Annual aggregation from MMWR weeks required careful roll-ups to avoid double counting.

Challenges

Public data pipelines shifted during the project window. CDC retired or reconfigured dashboards, so I pivoted and pulled vaccinations from the live Socrata dataset and aggregated to annual values.

The Census API remained available but had intermittent access frictions and variable naming changes which I mitigated through manual downloads. I also encountered temporary access issues with SAMHSA's DAS portal and had to pivot to alternate mental-health indicators (self-reported distress). Where an official API or endpoint was available it was extraordinarily slow or unstable. It became necessary to download raw tables and document the steps to reproduce them.[1]

Results

The models tell a consistent story.

• Poverty and Distress. Poverty is a strong positive predictor of frequent mental distress ($p < .001$). Communities under economic strain report more bad mental-health days.

• Distress and Vaccination. Distress is negatively associated with vaccination coverage ($p \approx .035$ in the full model). Stressed, struggling communities vaccinate less.

• Economy. Unemployment and poverty move gross state product in opposite directions in state-level models. The economy both shapes and is shaped by public-health dynamics.

These patterns align with experimental and survey evidence on misinformation's drag on vaccine intent and with documented rollout gaps. Visuals in the analysis workbook (heatmaps and scatterplots) show distinct clusters by poverty, distress, and coverage.

Discussion

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[1] All raw data, code, visuals, and tests have been uploaded and are publicly available on GitHub. See appendix for more information.

Economic hardship fuels mental distress. Distress, in turn, drags down vaccination. That loop does not prove causation on every link, but the direction and timing match independent evidence. Add misinformation to the mix and the loop tightens. The practical reading is simple: siloed interventions underperform. If policy fights misinformation without stabilizing households, behavior rebounds are limited. If policy stabilizes households but ignores the information environment, uptake lags in the face of rumors and distrust.

Policy Implications

Pair trusted-messenger campaigns with economic and mental-health supports. Concretely: extend targeted food and housing supports during emergencies; fund scalable mental-health access; and deploy local, multilingual vaccine communication that inoculates against common false claims.
Integrate these levers and the feedback loop weakens.

Limitations

This analysis uses state aggregates; within-state disparities (rural/urban, racial/ethnic, age) can be large. Self-reported distress is not the same as clinical diagnoses. Some relationships may reflect unobserved confounders. Results should be read as a clear map of co-movement—not a definitive causal estimate for each path.

Future Work

County-level panel models could test the loop with finer detail and richer controls (e.g., broadband access, local media markets). Linking attitude surveys to behavior within the same geographies would help separate persuasion from access barriers.

Conclusion

The pandemic's social engine room is a set of feedback loops. Economic strain lifts distress; distress undermines vaccination; outbreaks and disruption push back on the economy. The fix is loop-aware: fight falsehoods and stabilize households at the same time. That is how public health and economic resilience move in the same direction.

References

Loomba (Loomba, de Figueiredo, Piatek, de Graaf, & Larson, 2021), S., de Figueiredo, A., Piatek, S. J., de Graaf, K., & Larson, H. J. (2021). Measuring the impact of COVID-19 vaccine misinformation on vaccination intent in the UK and USA. *Nature Human Behaviour, 5*(3), 337–348. https://doi.org/10.1038/s41562-021-01056-1

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Appendix A. Data & Code Availability

All code used for data cleaning, aggregation, and modeling is available at the public GitHub repository:

https://github.com/Altsb22/cic_student_research_challenge

Repository contents:

• /data — cleaned datasets and links to primary sources (CDC, BLS, BEA, KFF)

• /scripts — Python notebooks (.ipynb) and scripts (.py) for regression and visualization

• /outputs — regression tables and figures (Excel/PDF/PNG)

• README.md — instructions to reproduce analysis and notes on data caveats