Persistence of Anxiety and Depression in US Adults by COVID-19 Vaccination Status, 2020-2023

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BACKGROUND

- We aimed to: 1) characterize the cohort prevalence and persistence of moderate to severe anxiety symptoms and depression symptoms from July 2020 to July 2023; 2) explore the association between demographic characteristics and symptom persistence during this period; 3) assess how moderate to severe anxiety symptoms and depression symptoms impact COVID-19 vaccination, including both the primary series and subsequent booster doses.

METHODS

- **Eligibility**: We included participants 1) who completed at least one of 3 follow-up assessments between July and December 2023 to confirm their number of COVID-19 vaccine doses by July 2023; and 2) who completed at least one of 14 follow-up assessments between July 2020 and July 2023, during which we evaluated their anxiety symptoms and depression symptoms.

- Between December 2020 and December 2023, participants prospectively reported their COVID-19 vaccination details, including manufacturer, dates, doses received, vaccine trial participation, and booster uptake over 13 follow-up assessments. We defined two **outcomes**: 1) whether participants had ever received any COVID-19 vaccination by each follow-up assessment, and 2) the total number of vaccine doses received by July 2023.

- From July 2020 to July 2023, participants completed the Generalized Anxiety Disorder 7-item (GAD-7) and the Patient Health Questionnaire 8-item (PHQ-8) during each of 14 follow-up assessments. Scores ≥ 10 on the GAD-7 and PHQ-8 were considered indicative of **moderate to severe anxiety symptoms and depression symptoms**, respectively.

- Missing GAD-7 and PHQ-8 scores were imputed. Ten imputations were conducted for each missing score, with a weight of 0.1 assigned to each imputation and weighted scores summed, providing an unbiased estimator for the missing values.

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High levels of anxiety and depression symptoms have persisted throughout the COVID-19 pandemic and may contribute to low COVID-19 vaccine uptake.

- We used **Latent Class Growth Analysis** (LCGA) modeling to identify trajectories of GAD-7 and PHQ-8 across 14 time points from July 2020 to July 2023. The LCGA employed cubic trends and explored the trajectories ranging from 2 to 4 classes using a zero-inflated Poisson (ZIP) model.

- We presented **prevalence of moderate to severe anxiety symptoms and depression symptoms stratified by ever/never received a COVID-19 vaccine** as of each follow-up assessment between May 2021 and July 2023, when vaccines were widely available in the US.

- From May 2021 to July 2023, we examined **associations between moderate to severe anxiety symptoms and depression symptoms and total number of COVID-19 vaccine doses** with Pooled Poisson Generalized Estimating Equation (GEE) models using 10 copies of imputed data. Models were adjusted for age, gender, healthcare access barriers, number of comorbidities, and time since May 2021.

RESULTS

- Among 4,851 eligible cohort participants, **15.9% and 19.3%** of participants reported experiencing moderate to severe anxiety symptoms and depression symptoms for **at least 7 out of 14 follow-up assessments** between July 2020 and July 2023, respectively. According to LCGA model, **25.6% and 25.7%** of participants had **persistently high trajectory of GAD-7 and PHQ-8 scores** over 36 months.

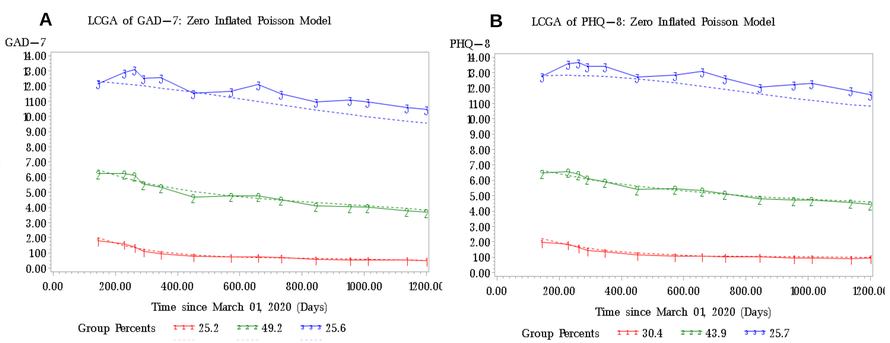

Figure 1: Latent class growth analysis (LCGA) model: GAD-7 and PHQ-8 scores trajectories, July 2020 to July 2023, the CHASING COVID Cohort, the United States (N=4,851)

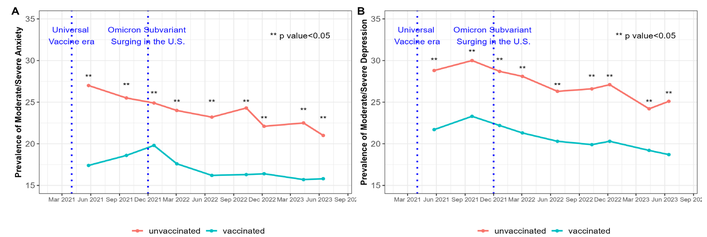

Figure 2: Cohort Prevalence of Moderate to Severe Anxiety Symptoms and Depression Symptoms by Ever/Never Received a COVID-19 Vaccination at each follow-up, May 2021 to July 2023, the CHASING COVID Cohort, the United States (N=4,851)

- Participants who were <40 years, women, Hispanic, didn't have a college degree, had a household annual income less than $50k, had greater barriers to healthcare access, and had children <18 years in household, were **more likely to experience persistent symptoms**.

- Since May 2021, the difference in the prevalence of moderate to severe anxiety symptoms and depression symptoms by vaccination status were sustained throughout the follow up period.

- Between May 2021 and July 2023, participants with moderate to severe anxiety symptoms and depression symptoms had **a lower respective rate** [0.95 (95% CI: 0.94 – 0.97) and 0.95 (95% CI: 0.93 – 0.96)] of **receiving one additional COVID-19 vaccine dose** every 3 months, compared to those without anxiety symptoms and depression symptoms, respectively.

CONCLUSIONS

- A substantial minority (at least 1 in 6) had persistent symptoms of anxiety and depression in the cohort. Young adults, women, and those facing socioeconomic challenges may need access to mental health support.

- Moderate to severe mental health symptoms may be a barrier to future COVID-19 vaccination. Additional research is needed to determine if offering tailored support to those with mental health disorders could help remove barriers to COVID-19 vaccine uptake.

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