Household Income, Pandemic-Related Income Loss, and the Probability of Anxiety and Depression

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Abstract
We use data from the Household Pulse Survey that the US Census Bureau conducted from April 2020 to February 2021 to estimate the probability of symptoms of anxiety and depression among adult Americans. Lack of viable instruments prevent ruling out exogeneity, but the magnitude and strength of association between mental disease and, both, 2019 household income and pandemic-related employment income loss warrant serious attention. Our results stress the importance of policy support to the socially vulnerable in an economic emergency, including cash transfers such as those offered by the 2020 CARES Act or the 2021 America Rescue Plan.

Keywords Covid 19 · Pandemic · Income · Anxiety · Depression

JEL Classification I14 · I18 · I12

Introduction
What are the effects on the mental condition of American adults of the loss of employment income that resulted from the Covid-19 pandemic? To what extent their prior financial condition, as reflected in their 2019 household income, predisposed their psychological response? These are the questions that guided the work reported in this paper.

We use data from the Household Pulse Survey (HPS), conducted by the US Census Bureau (CB) from April 2020 to March 2021, to estimate binary response models of the probability of symptoms of anxiety and depression among adult Americans. As a check, we also tried ordered probit specifications. In all cases, we control

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for several sociodemographic characteristics. Lack of viable instruments in the data prevents us from ruling out exogeneity due to potential reverse causality and/or omitted predictors.

As shown in Fig. 1, in 2019, about 5% of American adults suffered from systematic symptoms of depression according to data from the Centers for Disease Control and Prevention (CDC’s) National Health Interview Survey (NHIS). In contrast, during the pandemic period covered by the HPS (from April 2020 to March 2021), the prevalence of these symptoms increased dramatically to nearly 20%. These figures reveal the gravity of the mental health crisis facing the country. The magnitude and strength of association that this paper documents between these symptoms of mental disease and, both, 2019 household income and pandemic-related employment income loss warrant serious attention.

Treasury secretary, Janet Yellen, has acknowledged that, as a result of the pandemic: “We have experienced a tragic loss of lives over the last year—and also the loss of jobs and livelihoods. By nearly every measure—health, income, wealth, or job loss—lower-income populations have been the hardest hit, with women and people of color facing the worst outcomes.” Indeed, the sanitary emergency caused devastating employment and income losses in the USA. The unemployment rate climbed to 14.8% in April 2020 and remains at 6.1% one year later. Labor force

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1 There are slight differences in the phrasing of the mental health questions between the NHIS and the HPS.

2 Yellen (2021).
participation dropped from 63.3% in February 2020 to 60.2% in April 2020 and it has been stagnant around 61.5 in the first three months of 2021. The per capita annual gross domestic product in the USA dropped from $58,113 in 2019 to $55,810 in 2020 (at constant 2012 prices).

Using the first 90 days of the HPS data, Donnelly and Farina (2021) estimate the effects of differing safety-net policies across US states, find that these effects interact with the level of 2019 household income, and argue that vigorous welfare state policies contribute to significantly lowering the adverse impact of employment income loss on mental health. Our results also stress the importance and urgency of vigorous policy assistance to the socially vulnerable in the face of the sanitary emergency and related economic slump, from programs that expand employment to cash transfers such as those offered by the 2020 CARES Act or the 2021 America Rescue Plan.

“Literature Review” section of this paper samples recent empirical works with a narrow focus on the direction of causality between income and mental health. “Data” section describes the data set analyzed. “Models” section refers the models estimated. “Results” section presents the results. “Final Remarks” section offers concluding remarks.

Literature Review

Koford and Cseh (2015), using the 1994–2008 longitudinal Health and Retirement study panel, find that, adjusting for individual heterogeneity, there is no evidence of a decrease in wage income resulting from depressive symptoms. Grossman (2015, 2008) review the literature on the connection between schooling (a robust correlate of income) and overall health, particularly physical and cognitive abilities. These papers summarize studies that find suggestive but not conclusive evidence of causality running in both directions.

Ratcliffe (2015) identifies a positive correlation between local house prices and mental health status in the UK, which she attributes to wealth in the form of house values as a proxy for overall local “economic opportunities” such as employment and income, rather than a narrowly defined “wealth effect” on mental health.

Using data from the 2006 and 2011–2012 Spanish Health Survey, which permits them to contrast pre-crisis and crisis economic conditions, Urbanos-Garrido and Lopez-Valcarcel (2015) estimate a significant negative effect of unemployment, especially if prolonged, on self-reported symptoms of anxiety and mental stress, and speculate about the potential reverse feedback on the economy.

While the slope from unemployment to illness and disability is slippery, chronic mental disability—often the result of prolonged stress and/or trauma—impairs the ability to find and retain employment. Zagorsky (1999) documents the way in which

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3 U.S. Bureau of Labor Statistics (2021).
4 U.S. Bureau of Economic Analysis (2021).
legal limitations imposed on welfare policies to pressure the working poor to seek employment fail in the face of this reality.

Das et al. (2008) point out that “Unlike studies in high-income countries, in low-income countries the correlation between mental health and levels of income or consumption is not strong.” However, using country-wide consumption spending per capita and schooling measures, both robust correlates of income, they find a significant association between them and mental health in five developing countries.

A number of studies document the relation between, not just the level of income, but its distribution, on overall health. For example, Weich et al. (2002) exploited British data on local income distribution and overall health status to find that greater dispersion in income predicted overall health adjusting for individual sociodemographic characteristics. More recently, Zimmerman and Bell (2006), drawing data from the CB and state sources, find that higher income inequality predicts poor general health, adjusting for individual sociodemographic characteristics and other covariates.

Stansfeld and Candy (2006) conducted a survey of the empirical literature on the effects of economic and psychosocial stressors on mental health, based on cross-sectional and longitudinal data from industrialized countries covering the 1994–2005 period, a period of rapid economic growth in the countries included, and found broad agreement across studies on the adverse impact of job insecurity on mental health.

In sum, adverse changes in economic conditions accompany a deterioration of measures of general health and of mental health in particular. Though not conclusive, most evidence points to a strong causal mechanism going from wealth, income, employment, and consumption to mental health; much less evidence exists about the strength of the reverse causal mechanism.

Data

The data set used in this study is drawn from the HPS conducted 25 times by the CB from the April 23–May 5, 2020, “week” to the February 17–March 1, 2021, “week.” The HPS was designed to capture the way in which “people’s lives have been impacted by the coronavirus pandemic.” At the time this paper was written, the data collection for the survey had already been extended beyond its third phase. Phase 1 stretched from April 23, 2020, to July 21, 2020. Phase 2 went from August 19, 2020, and ended October 26, 2020. Phase 3 “began on October 28, 2020, and ran until December 21, 2020. After a two-week break, Phase 3 resumed on January 6, 2021 and will run through March 2021.”

5 Census Bureau (2020–1): “Phase 1 of the Household Pulse Survey was collected and disseminated on a weekly basis. Phase 2 had a two-week collection and dissemination period, and Phase 3 continues this two-week collection and dissemination approach. Despite going to a two-week collection period, the Household Pulse Survey continues to call these collection periods “weeks” to maintain continuity.”
The survey’s 25-“week” public use micro-data sets were pooled into a single and complete data set (the missing values were removed) containing nearly 1.8 million unweighted observations. On average, each reported “week” contained over 70,000 observations treated here as unique, though a small number of them were given by repeated respondents.

In response to the questions “Over the last 7 days, how often have you been bothered by …,” respectively, (1) “Feeling nervous, anxious, or on edge?” (2) “Not being able to stop or control worrying?” (3) “Having little interest or pleasure in doing things?” (4) “Feeling down, depressed, or hopeless?” … the possible mutually exclusive answers were (1) “Not at all,” (2) “Several days,” (3) “More than half the days,” (4) “Nearly every day,” and not answered or missing. In the main models used in this paper to estimate the probability of anxiety and depression, we recoded the response variables as binary, with \( A = 0 \) if “not at all” or “several days,” and \( A = 1 \) otherwise. Given the fuzzy semantic similarity of terms such as “several days,” “nearly half the days,” and “nearly every day,” a binary recoding permits to capture the systematic prevalence of these symptoms. However, for comparison purposes, some of the estimates reported in the next section used the full range of values of the response variables.

While the anxiety and depression measures used here are not proper records of clinical diagnoses but self-reported symptoms, Das et al. (2009) note that “mental health measures collected from surveys are highly correlated with clinical diagnoses of psychiatric disorders such as depression. In addition, associations between mental health and sociodemographic correlates are similar across [several] countries, suggesting stability in what is being measured.”

The predictors of interest were self-reported 2019 pretax household income and pandemic-related loss of household income. The former responded to the question “In 2019 what was your total household income before taxes?” The answer categories were: (1) “Less than $25,000,” (2) “$25,000–$34,999,” (3) “$35,000–$49,999,” (4) “$50,000–$74,999,” (5) “$75,000–$99,999,” (6) “$100,000–$149,999,” (7) “$150,000–$199,999,” (8) “$200,000 and above,” and unanswered or missing. The latter required a “Yes” or “No” answer to the question “Have you, or has anyone in your household experienced a loss of employment income since March 13, 2020?”

The survey also contained data on a host of covariates used in some or all of the estimated models, namely sociodemographic variables such as age, gender (man or woman), ethnicity (Hispanic or not), race (White, Black, Asian, or Other), marital status (married, widow, divorced, separated, or never married), survey week (one of 25 possible), and state.

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6 Similar results (not reported) were obtained recoding “Not at all” as \( A = 0 \) and \( A = 1 \) otherwise.

7 Gilbody et al. (2007) and Kroenke et al. (2003) offer a technical rationale for the binary recoding of the responses.

8 Das et al. (2009), p. 33.
Models

To estimate the probability of anxiety or depression linked to pandemic-related income loss, we started with the following linear models:

\[
A_i = a_{10} + a_{11} L_i + a_{12} S_i + u_i, \\
A_j = a_{20} + a_{21} L_i + a_{22} Y_i + a_{23} S_j + u_{2i},
\]

where \( A_i \) is the probability of the \( i \)th respondent experiencing anxiety or depression; the \( a \)'s are constant coefficients; \( L_i \) is the probability of the \( i \)th respondent’s household suffering from employment income loss during the Covid-19 pandemic period; \( Y \) is the 2019 annual pretax household income; \( S \) denotes a list of sociodemographic covariates (age, gender, race, Hispanic ethnicity, and marital status); and the \( u \)'s are zero-mean constant-variance Gaussian error terms.10

We also estimated two baseline probit models of the type:

\[
A_i = \Phi(a_{30} + b_{31} L_i + b_{32} S_i + u_{3i}), \\
A_j = \Phi(a_{40} + a_{41} L_i + a_{42} Y_i + b_{43} S_j + u_{4i}),
\]

where the transformation function \( \Phi \) is the cumulative standard normal density.

The lack of viable instruments in the data set prevents us from ruling out the potential endogeneity of both employment income loss and 2019 income. Though we found no satisfactory resolution of these issues within the confines of the survey data, the strength and magnitude of the reported measures of association deserve public attention.

Also reported are ordered probit models of the type:

\[
A_{40} = \Phi[a_{501} - (a_{51} L_i + b_{52} S_j + u_{5i})], \\
A_{11} = \Phi[a_{502} - (a_{51} L_i + b_{52} S_j + u_{5i})] - \Phi[a_{501} - (a_{51} L_i + b_{52} S_j + u_{5i})], \\
A_{12} = \Phi[a_{503} - (a_{51} L_i + b_{52} S_j + u_{5i})] - \Phi[a_{502} - (a_{51} L_i + b_{52} S_j + u_{5i})], \\
A_{13} = 1 - \Phi[a_{503} - (a_{51} L_i + b_{52} S_j + u_{5i})]; \\
A_{21} = \Phi[a_{601} - (a_{61} L_i + a_{62} Y_i + b_{63} S_j + u_{6i})], \\
A_{22} = \Phi[a_{602} - (a_{61} L_i + a_{62} Y_i + b_{63} S_j + u_{6i})] - \Phi[a_{601} - (a_{61} L_i + a_{62} Y_i + b_{63} S_j + u_{6i})], \\
A_{23} = \Phi[a_{603} - (a_{61} L_i + a_{62} Y_i + b_{63} S_j + u_{6i})] - \Phi[a_{602} - (a_{61} L_i + a_{62} Y_i + b_{63} S_j + u_{6i})], \\
A_{31} = 1 - \Phi[a_{603} - (a_{61} L_i + a_{62} Y_i + b_{63} S_j + u_{6i})],
\]

where \( A_{ij} \) denotes the probability of the \( i \)th respondent experiencing the \( j \)th symptom level of anxiety or depression.

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9 Note that the household income loss variable in the NPS data set relates to “loss of employment income since March 13, 2020,” not necessarily to other forms of income (e.g., financial losses). Neither does it imply necessarily that the income loss (or lack thereof) was a direct result of the Covid-19 pandemic. However, given the overall content of the questionnaire, it is likely that the respondents viewed the question as related to the pandemic. Only in this sense do we refer in this paper to “pandemic-related” employment income loss.

10 It is known that predicted values of these models may fall outside of the \([0, 1]\) interval. Aside from their being easier to interpret, in large samples, average marginal effects across linear, logit, and probit models tend to be close.
The parameters of the linear models were estimated with R using its base ordinary least squares `lm` algorithm (the `sandwich` packaged was used to adjust the standard errors for heteroskedasticity) while those of the binary probit models were obtained by the R stats `glm` maximum-likelihood algorithm. The `arm` package was used to estimate the ordered probits. Data cleaning and manipulation were assisted by the R packages `readr`, `stargazer`, and the suit of packages `tidyverse`. The marginal effects of the probit models were computed by the R package `margins`. Pseudo R square statistics were generated by the R package `DescTools`. R code and output files are available upon request.

**Results**

Table 1 shows the summary statistics descriptive of the complete sample (no missing values), with a total of 1,765,787 observations. A column in the table shows the sample share of respondents for each response category. Another column in this table shows the person weight supplied by the CB, an estimate of the number of observations in the US adult population that each responding observation represents. Also shown are the relative frequencies in the sample of the various response categories given to the survey questions on the anxiety and depression symptoms of interest as well as estimates of these relative frequencies consistent with the CB’s person weights.

To simplify computation, the estimation procedures on the complete data set did not use the CB’s person weights. The reader may add caution in interpreting the results as younger people, women, non-Hispanics, Whites, married, divorced, and widow persons, people with college and graduate degrees, people living in the Western states, people with 2019 household incomes of $75,000 or above, and people fortunate to stay employed during the Covid emergency were oversampled. However, a few tests were run on weighted (pseudo) random subsamples of the complete data, and the results obtained were largely consistent with those from the complete, unweighted sample.

Tables 2, 3, 4, and 5 show the average marginal effects of the main predictors on the probability of each of the four anxiety and depression symptoms under linear and probit model specifications, with and without 2019 household income as a predictor, as well as their corresponding standard errors. The conventional “goodness-of-fit” statistics of the respective models are also shown.

Table 6 shows the estimated coefficients (and their standard errors) of the ordered probit models as well as their goodness-of-fit statistics. Table 7 shows the coefficients, standard errors, and goodness-of-fit statistics of kin linear models, though treating the symptoms as cardinal numerical variables with values ranging over the four answers in the survey. As in the case of dichotomous dependent variable models, the linear coefficients offer good approximations to the average marginal effects (not reported) of the probit models. These results are highly consistent with those obtained under the dichotomous variable specification discussed above.

Preponderant statistical evidence indicates that, conditional on the premises of the model and on all other predictors being constant, on average, the Covid-related
### Table 1 Descriptive statistics

| Variable                      | Sample mean | Sample st. dev. | CB weighted mean | CB weighted st. dev. |
|-------------------------------|-------------|-----------------|------------------|----------------------|
| Birth year                    | 1968.116    | 15.534          | 1968.24          | 16.76247             |

| Variable         | Response          | Sample share (%) | CB person weight (%) |
|------------------|-------------------|------------------|----------------------|
| Gender           | Men               | 40.70            | 48.00                |
|                  | Women             | 59.30            | 52.00                |
| Ethnicity        | Not Hispanic      | 91.60            | 84.60                |
|                  | Hispanic          | 8.40             | 15.40                |
| Race             | White             | 83.70            | 77.70                |
|                  | Black             | 6.90             | 11.10                |
|                  | Asian             | 4.70             | 5.40                 |
|                  | Other             | 4.70             | 5.80                 |
| Marital status   | Married           | 58.90            | 57.60                |
|                  | Widow             | 5.20             | 4.40                 |
|                  | Divorced          | 15.50            | 12.20                |
|                  | Separate          | 1.70             | 2.10                 |
|                  | Never married     | 18.80            | 23.70                |
| Schooling        | Less than high school | 0.50 | 2.10                  |
|                  | Some high school  | 1.10             | 4.80                 |
|                  | High school graduate or equivalent | 10.50 | 28.90           |
|                  | Some college      | 20.90            | 20.80                |
|                  | Associate’s degree| 10.50            | 9.80                 |
|                  | Bachelor’s degree | 30.00            | 18.70                |
|                  | Graduate degree   | 26.50            | 15.00                |
| Household income (2019) | Less than $25,000 | 9.90 | 14.20                |
|                  | $25,000–$34,999   | 8.40             | 11.10                |
|                  | $35,000–$49,999   | 10.90            | 12.80                |
|                  | $50,000–$74,999   | 17.50            | 18.00                |
|                  | $75,000–$99,999   | 14.80            | 13.60                |
|                  | $100,000–$149,999 | 18.60 | 15.40                |
|                  | $150,000–$199,999 | 9.00  | 7.10                 |
|                  | $200,000 and above | 10.80 | 7.90                 |
| Loss of employment income (since 3/13/2020) | No | 61.80 | 53.60 |
|                  | Yes               | 38.20            | 46.40                |
| Anxiety          | No                | 68.50            | 66.50                |
|                  | Yes               | 31.50            | 33.50                |
| Worrying         | No                | 77.00            | 73.90                |
|                  | Yes               | 23.00            | 26.10                |
| Disinterest      | No                | 79.40            | 75.60                |
|                  | Yes               | 20.60            | 24.40                |
| Depressive mood  | No                | 81.10            | 77.60                |
|                  | Yes               | 18.90            | 22.40                |
| Predictor                                      | Linear w/o 2019 income | Linear w/2019 income | Probit w/o 2019 income | Probit w/2019 income |
|------------------------------------------------|------------------------|----------------------|------------------------|----------------------|
|                                                | AME (Robust SE)        | AME (SE)             | AME                    | AME                  |
| Loss of employment income (since 3/13/2020)   | 0.134                  | 0.124                | 0.133                  | 0.122                |
|                                                | (0.001)***             | (0.001)***           | (0.001)***             | (0.001)***           |
| 2019 Hshold income: $25,000–$34,999           | −0.051                 | −0.048               | −0.051                 | −0.048               |
|                                                | (0.002)***             | (0.002)***           | (0.002)***             | (0.002)***           |
| 2019 Hshold income: $35,000–$49,999          | −0.068                 | −0.064               | −0.068                 | −0.064               |
|                                                | (0.001)***             | (0.002)***           | (0.002)***             | (0.002)***           |
| 2019 Hshold income: $50,000–$74,999          | −0.087                 | −0.083               | −0.087                 | −0.083               |
|                                                | (0.001)***             | (0.001)***           | (0.001)***             | (0.001)***           |
| 2019 Hshold income: $75,000–$99,999          | −0.108                 | −0.103               | −0.108                 | −0.103               |
|                                                | (0.001)***             | (0.001)***           | (0.001)***             | (0.001)***           |
| 2019 Hshold income: $100,000–$149,999        | −0.124                 | −0.118               | −0.124                 | −0.118               |
|                                                | (0.001)***             | (0.001)***           | (0.001)***             | (0.001)***           |
| 2019 Hshold income: $150,000–$199,999        | −0.135                 | −0.130               | −0.135                 | −0.130               |
|                                                | (0.002)***             | (0.002)***           | (0.002)***             | (0.002)***           |
| 2019 Hshold income: $200,000 and above       | −0.147                 | −0.142               | −0.147                 | −0.142               |
|                                                | (0.002)***             | (0.002)***           | (0.002)***             | (0.002)***           |
| Birth year                                     | 0.004                  | 0.005                | 0.005                  | 0.005                |
|                                                | (0.000)***             | (0.000)***           | (0.000)***             | (0.000)***           |
| Woman                                          | 0.075                  | 0.069                | 0.077                  | 0.071                |
|                                                | (0.001)***             | (0.001)***           | (0.001)***             | (0.001)***           |
| Black                                           | −0.043                 | −0.057               | −0.039                 | −0.052               |
|                                                | (0.001)***             | (0.001)***           | (0.001)***             | (0.001)***           |
| Asian                                           | −0.079                 | −0.075               | −0.076                 | −0.072               |
|                                                | (0.002)***             | (0.002)***           | (0.001)***             | (0.001)***           |
Table 2 (continued)

| Predictor         | Linear w/o 2019 income AME (Robust SE) | Linear w/2019 income AME (SE) | Probit w/o 2019 income AME | Probit w/2019 income AME |
|-------------------|----------------------------------------|-------------------------------|----------------------------|--------------------------|
| Other races       | 0.032                                  | 0.022                         | 0.030                      | 0.021                    |
|                   | (0.002)***                             | (0.002)***                    | (0.002)***                 | (0.002)***               |
| Hispanic          | 0.001                                  | −0.011                        | 0.001                      | −0.011                   |
|                   | (0.001)                                | (0.001)***                    | (0.001)                    | (0.001)***               |
| Widow             | 0.046                                  | 0.011                         | 0.047                      | 0.013                    |
|                   | (0.002)***                             | (0.002)***                    | (0.002)***                 | (0.002)***               |
| Divorced          | 0.079                                  | 0.046                         | 0.082                      | 0.048                    |
|                   | (0.001)***                             | (0.001)***                    | (0.001)***                 | (0.001)***               |
| Separate          | 0.119                                  | 0.081                         | 0.115                      | 0.077                    |
|                   | (0.003)***                             | (0.003)***                    | (0.003)***                 | (0.003)***               |
| Never married     | 0.062                                  | 0.028                         | 0.056                      | 0.024                    |
|                   | (0.001)***                             | (0.001)***                    | (0.001)***                 | (0.001)***               |
| Residual standard error or Residual deviance | 0.442                         | 2037882                      | 2026139                    |
| Adjusted $R^2$ or Nagelkerke pseudo $R^2$ | 0.070                                  | 0.077                         | 0.099                      | 0.108                    |
| Percent of “correctly” (fittedPr(A=1)> .5) predicted observations | 0.696                                  | 0.703                         | 0.704                      |

Signif. codes: ***$p<.001$, **$p<.01$, *$p<.05$
| Predictor                                      | Linear w/o 2019 income | Linear w/2019 income | Probit w/o 2019 income | Probit w/2019 income |
|-----------------------------------------------|------------------------|----------------------|------------------------|----------------------|
|                                               | AME (Robust SE)        | AME (SE)             | AME (SE)               | AME (SE)             |
| Loss of employment income (since 3/13/2020)   | 0.124                  | 0.112                | 0.123                  | 0.110                |
|                                               | (0.001)***             | (0.001)***           | (0.001)***             | (0.001)***           |
| 2019 Household income: $25,000–$34,999        | −0.056                 | −0.052               | −0.052                 | −0.052               |
|                                               | (0.001)***             | (0.002)***           | (0.002)***             | (0.002)***           |
| 2019 Household income: $35,000–$49,999        | −0.081                 | −0.074               | −0.074                 | −0.074               |
|                                               | (0.001)***             | (0.001)***           | (0.001)***             | (0.001)***           |
| 2019 Household income: $50,000–$74,999        | −0.104                 | −0.096               | −0.096                 | −0.096               |
|                                               | (0.001)***             | (0.001)***           | (0.001)***             | (0.001)***           |
| 2019 Household income: $75,000–$99,999        | −0.129                 | −0.121               | −0.121                 | −0.121               |
|                                               | (0.001)***             | (0.001)***           | (0.001)***             | (0.001)***           |
| 2019 Household income: $100,000–$149,999      | −0.148                 | −0.139               | −0.139                 | −0.139               |
|                                               | (0.001)***             | (0.001)***           | (0.001)***             | (0.001)***           |
| 2019 Household income: $150,000–$199,999      | −0.161                 | −0.153               | −0.153                 | −0.153               |
|                                               | (0.001)***             | (0.001)***           | (0.001)***             | (0.001)***           |
| 2019 Household income: $200,000 and above     | −0.175                 | −0.170               | −0.170                 | −0.170               |
|                                               | (0.001)***             | (0.001)***           | (0.001)***             | (0.001)***           |
| Birth year                                    | 0.003                  | 0.003                | 0.003                  | 0.003                |
|                                               | (0.000)***             | (0.000)***           | (0.000)***             | (0.000)***           |
| Woman                                         | 0.064                  | 0.065                | 0.065                  | 0.065                |
|                                               | (0.001)***             | (0.001)***           | (0.001)***             | (0.001)***           |
| Black                                         | 0.009                  | −0.008               | 0.009                  | −0.007               |
|                                               | (0.001)***             | (0.001)***           | (0.001)***             | (0.001)***           |
| Asian                                         | −0.025                 | −0.020               | −0.022                 | −0.017               |
|                                               | (0.001)***             | (0.001)***           | (0.001)***             | (0.001)***           |
Table 3 (continued)

| Predictor    | Linear w/o 2019 income | Linear w/2019 income | Probit w/o 2019 income | Probit w/2019 income |
|--------------|------------------------|----------------------|------------------------|----------------------|
|              | AME (Robust SE)        | AME (SE)             | AME (SE)               | AME (SE)             |
| Other races  | 0.047                  | 0.035                | 0.043                  | 0.032                |
| Hispanic     | (0.001)***             | (0.001)***           | (0.001)***             | (0.001)***           |
| Widow        | 0.051                  | 0.009                | 0.054                  | 0.012                |
| Divorced     | (0.001)***             | (0.001)***           | (0.002)***             | (0.002)***           |
| Separate     | 0.125                  | 0.079                | 0.119                  | 0.072                |
| Never married| 0.059                  | 0.019                | 0.052                  | 0.014                |
| Residual standard error or Residual deviance | 0.404 | 0.401 | 1767407.000 | 1747167.000 |
| Adjusted R squared or Nagelkerke pseudo R squared | 0.061 | 0.073 | 0.092 | 0.109 |
| Percent of “correctly” (fittedPr(A=1)> .5) predicted observations | 0.770 | 0.776 | 0.775 |

Signif. codes: ***p < .001, **p < .01, *p < .05
| Predictor                          | Linear w/o 2019 income | Linear w/2019 income | Probit w/o 2019 income | Probit w/2019 income |
|-----------------------------------|------------------------|----------------------|------------------------|----------------------|
|                                   | AME (Robust SE)        | AME (SE)             | AME (SE)               | AME (SE)             |
| Loss of employment income (since 3/13/2020) | 0.105 (0.001)***       | 0.091 (0.001)***     | 0.104 (0.001)***       | 0.089 (0.001)***     |
| 2019 Hshold income: $25,000–$34,999 | −0.058 (0.001)***      | −0.052 (0.001)***    | −0.052 (0.001)***      | −0.052 (0.001)***    |
| 2019 Hshold income: $35,000–$49,999 | −0.083 (0.001)***      | −0.075 (0.001)***    | −0.075 (0.001)***      | −0.075 (0.001)***    |
| 2019 Hshold income: $50,000–$74,999 | −0.113 (0.001)***      | −0.103 (0.001)***    | −0.103 (0.001)***      | −0.103 (0.001)***    |
| 2019 Hshold income: $75,000–$99,999 | −0.141 (0.001)***      | −0.131 (0.001)***    | −0.131 (0.001)***      | −0.131 (0.001)***    |
| 2019 Hshold income: $100,000–$149,999 | −0.163 (0.001)***      | −0.154 (0.001)***    | −0.154 (0.001)***      | −0.154 (0.001)***    |
| 2019 Hshold income: $150,000–$199,999 | −0.178 (0.001)***      | −0.170 (0.001)***    | −0.170 (0.001)***      | −0.170 (0.001)***    |
| 2019 Hshold income: $200,000 and above | −0.196 (0.001)***      | −0.191 (0.001)***    | −0.191 (0.001)***      | −0.191 (0.001)***    |
| Birth year                        | 0.002 (0.000)***       | 0.002 (0.000)***     | 0.002 (0.000)***       | 0.002 (0.000)***     |
| Woman                             | 0.024 (0.001)***       | 0.016 (0.001)***     | 0.016 (0.001)***       | 0.016 (0.001)***     |
| Black                             | 0.012 (0.001)***       | −0.008 (0.001)***    | 0.012 (0.001)***       | −0.008 (0.001)***    |
| Asian                             | −0.022 (0.001)***      | −0.016 (0.001)***    | −0.020 (0.001)***      | −0.014 (0.001)***    |
### Table 4 (continued)

| Predictor     | Linear w/o 2019 income | Linear w/2019 income | Probit w/o 2019 income | Probit w/2019 income |
|---------------|-------------------------|----------------------|------------------------|----------------------|
|               | AME (Robust SE)         | AME (SE)             | AME (SE)               | AME (SE)             |
| Other races   | 0.045                   | 0.032                | 0.042                  | 0.029                |
|               | (0.001)***              | (0.001)***           | (0.001)***             | (0.001)***           |
| Hispanic      | 0.018                   | 0.002                | 0.017                  | 0.002                |
|               | (0.001)***              | (0.001)***           | (0.001)***             | (0.001)***           |
| Widow         | 0.082                   | 0.034                | 0.088                  | 0.040                |
|               | (0.001)***              | (0.001)***           | (0.002)***             | (0.002)***           |
| Divorced      | 0.095                   | 0.049                | 0.097                  | 0.052                |
|               | (0.001)***              | (0.001)***           | (0.001)***             | (0.001)***           |
| Separate      | 0.133                   | 0.082                | 0.128                  | 0.075                |
|               | (0.002)***              | (0.002)***           | (0.002)***             | (0.002)***           |
| Never married | 0.089                   | 0.044                | 0.083                  | 0.039                |
|               | (0.001)***              | (0.001)***           | (0.001)***             | (0.001)***           |
| Residual standard error or Residual deviance | 0.389 | 0.386 | 1670722.000 | 1646995.000 |
| Adjusted $R^2$ or Nagelkerke pseudo $R^2$ | 0.048 | 0.065 | 0.075 | 0.099 |
| Percent of “correctly” (fittedPr(A=1)> .5) predicted observations | 0.794 | 0.801 | 0.801 | 0.800 |

Signif. codes: *** $p < .001$, ** $p < .01$, * $p < .05$
| Predictor                                      | Linear w/o 2019 income AME (Robust SE) | Linear w/2019 income AME (SE) | Probit w/o 2019 income AME (SE) | Probit w/2019 income AME (SE) |
|-----------------------------------------------|----------------------------------------|-------------------------------|--------------------------------|-----------------------------|
| Loss of employment income (since 3/13/2020)   | 0.102 (0.001)***                      | 0.089 (0.001)***              | 0.101 (0.001)***               | 0.087 (0.001)***            |
| 2019 Hshold income: $25,000–$34,999           | −0.062 (0.001)***                     | −0.056 (0.001)***             |                                |                             |
| 2019 Hshold income: $35,000–$49,999           | −0.088 (0.001)***                     | −0.079 (0.001)***             |                                |                             |
| 2019 Hshold income: $50,000–$74,999           | −0.115 (0.001)***                     | −0.105 (0.001)***             |                                |                             |
| 2019 Hshold income: $75,000–$99,999           | −0.141 (0.001)***                     | −0.130 (0.001)***             |                                |                             |
| 2019 Hshold income: $100,000–$149,999         | −0.161 (0.001)***                     | −0.150 (0.001)***             |                                |                             |
| 2019 Hshold income: $150,000–$199,999         | −0.175 (0.001)***                     | −0.165 (0.001)***             |                                |                             |
| 2019 Hshold income: $200,000 and above        | −0.188 (0.001)***                     | −0.181 (0.001)***             |                                |                             |
| Birth year                                    | 0.003 (0.000)***                      | 0.003 (0.000)***              | 0.003 (0.000)***               | 0.003 (0.000)***            |
| Woman                                         | 0.026 (0.001)***                      | 0.018 (0.001)***              | 0.028 (0.001)***               | 0.021 (0.001)***            |
| Black                                          | −0.007 (0.001)***                     | −0.026 (0.001)***             | −0.005 (0.001)***              | −0.022 (0.001)***           |
| Asian                                          | −0.024 (0.001)***                     | −0.019 (0.001)***             | −0.022 (0.001)***              | −0.017 (0.001)***           |
### Table 5 (continued)

| Predictor            | Linear w/o 2019 income | Linear w/2019 income | Probit w/o 2019 income | Probit w/2019 income |
|----------------------|------------------------|----------------------|------------------------|----------------------|
|                      | AME (Robust SE)        | AME (SE)             | AME (SE)               | AME (SE)             |
| Other races          | 0.040                  | 0.027                | 0.036                  | 0.024                |
|                      | (0.001)***             | (0.001)***           | (0.001)***             | (0.001)***           |
| Hispanic             | 0.011                  | −0.004               | 0.010                  | −0.004               |
|                      | (0.001)***             | (0.001)***           | (0.001)***             | (0.001)***           |
| Widow                | 0.076                  | 0.030                | 0.082                  | 0.036                |
|                      | (0.001)***             | (0.001)***           | (0.002)***             | (0.001)***           |
| Divorced             | 0.089                  | 0.046                | 0.092                  | 0.049                |
|                      | (0.001)***             | (0.001)***           | (0.001)***             | (0.001)***           |
| Separate             | 0.137                  | 0.088                | 0.131                  | 0.080                |
|                      | (0.002)***             | (0.002)***           | (0.002)***             | (0.002)***           |
| Never married        | 0.088                  | 0.044                | 0.079                  | 0.038                |
|                      | (0.001)***             | (0.001)***           | (0.001)***             | (0.001)***           |
| Residual standard error or Residual deviance | 0.376 | 0.373 | 1583254.000 | 1556316.000 |
| Adjusted \( R^2 \) or Nagelkerke pseudo \( R^2 \) squared | 0.053 | 0.069 | 0.084 | 0.107 |
| Percent of “correctly” (fittedPr(A=1)> .5) predicted observations | 0.811 | 0.818 | 0.817 |

Signif. codes: ***\( p < .001 \), **\( p < .01 \), *\( p < .05 \)
Table 6  Ordered probit models of the probability of symptom (ordinal variable, 4 levels)

| Predictor                                      | Anxiety W/o 2019 income Coefficient (SE) | Anxiety W/2019 income Coefficient (SE) | Worrying W/o 2019 income Coefficient (SE) | Worrying W/2019 income Coefficient (SE) | Disinterest W/o 2019 income Coefficient (SE) | Disinterest W/2019 income Coefficient (SE) | Depressive mood W/o 2019 income Coefficient (SE) | Depressive mood W/2019 income Coefficient (SE) |
|------------------------------------------------|----------------------------------------|----------------------------------------|------------------------------------------|------------------------------------------|---------------------------------------------|---------------------------------------------|-----------------------------------------------|-----------------------------------------------|
| Loss of employment income (since 3/13/2020)   | 0.402 (0.002)***                      | 0.379 (0.002)***                      | 0.439 (0.002)***                      | 0.403 (0.002)***                      | 0.385 (0.002)***                            | 0.343 (0.002)***                            | 0.395 (0.002)***                             | 0.355 (0.002)***                             |
| 2019 Hshold income: $25,000–$34,999           | −0.117 (0.003)***                     | −0.137 (0.003)***                     | −0.140 (0.003)***                     | −0.156 (0.003)***                     | −0.157 (0.003)***                           | −0.157 (0.003)***                           | −0.157 (0.003)***                            | −0.157 (0.003)***                            |
| 2019 Hshold income: $35,000–$49,999           | −0.155 (0.002)***                     | −0.203 (0.002)***                     | −0.209 (0.002)***                     | −0.228 (0.002)***                     | −0.228 (0.002)***                           | −0.228 (0.002)***                           | −0.228 (0.002)***                            | −0.228 (0.002)***                            |
| 2019 Hshold income: $50,000–$74,999           | −0.202 (0.002)***                     | −0.279 (0.002)***                     | −0.299 (0.002)***                     | −0.314 (0.002)***                     | −0.314 (0.002)***                           | −0.314 (0.002)***                           | −0.314 (0.002)***                            | −0.314 (0.002)***                            |
| 2019 Hshold income: $75,000–$99,999           | −0.256 (0.002)***                     | −0.362 (0.002)***                     | −0.397 (0.002)***                     | −0.404 (0.002)***                     | −0.404 (0.002)***                           | −0.404 (0.002)***                           | −0.404 (0.002)***                            | −0.404 (0.002)***                            |
| 2019 Hshold income: $100,000–$149,999         | −0.288 (0.002)***                     | −0.425 (0.002)***                     | −0.479 (0.002)***                     | −0.471 (0.002)***                     | −0.471 (0.002)***                           | −0.471 (0.002)***                           | −0.471 (0.002)***                            | −0.471 (0.002)***                            |
| 2019 Hshold income: $150,000–$199,999         | −0.311 (0.003)***                     | −0.480 (0.003)***                     | −0.546 (0.003)***                     | −0.529 (0.003)***                     | −0.529 (0.003)***                           | −0.529 (0.003)***                           | −0.529 (0.003)***                            | −0.529 (0.003)***                            |
| Predictor                  | Anxiety W/o 2019 income Coefficient (SE) | Anxiety W/2019 income Coefficient (SE) | Worrying W/o 2019 income Coefficient (SE) | Worrying W/2019 income Coefficient (SE) | Disinterest W/o 2019 income Coefficient (SE) | Disinterest W/2019 income Coefficient (SE) | Depressive mood W/o 2019 income Coefficient (SE) | Depressive mood W/2019 income Coefficient (SE) |
|---------------------------|------------------------------------------|----------------------------------------|------------------------------------------|----------------------------------------|--------------------------------------------|---------------------------------------------|---------------------------------------------|---------------------------------------------|
| 2019 Household income:    |                                          |                                        |                                          |                                        |                                            |                                            |                                            |                                            |
| $200,000 and above        | −0.347                                   | −0.555                                 | −0.639                                   | −0.597                                 |                                            |                                            |                                            |                                            |
| Birth year                | 0.014                                    | 0.015                                  | 0.011                                    | 0.012                                  | 0.008                                      | 0.009                                       | 0.010                                      | 0.010                                      |
|                           | (0.002)***                              | (0.000)***                             | (0.000)***                               | (0.000)***                             | (0.000)***                                | (0.000)***                                 | (0.000)***                                | (0.000)***                                |
| Woman                     | 0.212                                    | 0.203                                  | 0.209                                    | 0.194                                  | 0.085                                      | 0.065                                       | 0.117                                      | 0.100                                      |
|                           | (0.001)***                              | (0.001)***                             | (0.001)***                               | (0.001)***                             | (0.001)***                                | (0.001)***                                 | (0.001)***                                | (0.001)***                                |
| Black                     | 0.033                                    | 0.028                                  | 0.082                                    | 0.075                                  | 0.078                                      | 0.071                                       | 0.073                                      | 0.065                                      |
|                           | (0.003)***                              | (0.003)***                             | (0.003)***                               | (0.003)***                             | (0.003)***                                | (0.003)***                                 | (0.003)***                                | (0.003)***                                |
| Asian                     | 0.203                                    | 0.205                                  | 0.049                                    | 0.049                                  | 0.061                                      | 0.060                                       | 0.120                                      | 0.122                                      |
|                           | (0.002)***                              | (0.002)***                             | (0.002)***                               | (0.002)***                             | (0.002)***                                | (0.002)***                                 | (0.002)***                                | (0.002)***                                |
| Other races               | 0.041                                    | 0.007                                  | 0.043                                    | −0.014                                 | 0.052                                      | −0.014                                      | 0.009                                      | −0.053                                      |
|                           | (0.002)***                              | (0.002)***                             | (0.002)***                               | (0.002)***                             | (0.002)***                                | (0.002)***                                 | (0.002)***                                | (0.002)***                                |
| Hispanic                  | 0.012                                    | −0.008                                 | 0.071                                    | 0.040                                  | 0.056                                      | 0.019                                       | 0.037                                      | 0.002                                      |
|                           | (0.002)***                              | (0.002)***                             | (0.002)***                               | (0.002)***                             | (0.002)***                                | (0.002)***                                 | (0.002)***                                | (0.002)***                                |
| Widow                     | 0.157                                    | 0.106                                  | 0.176                                    | 0.095                                  | 0.233                                      | 0.141                                       | 0.244                                      | 0.157                                      |
|                           | (0.002)***                              | (0.002)***                             | (0.002)***                               | (0.002)***                             | (0.002)***                                | (0.002)***                                 | (0.002)***                                | (0.002)***                                |
| Divorced                  | −0.141                                   | −0.094                                 | −0.182                                   | −0.109                                 | −0.211                                     | −0.128                                      | −0.211                                     | −0.132                                     |
|                           | (0.002)***                              | (0.002)***                             | (0.002)***                               | (0.002)***                             | (0.002)***                                | (0.002)***                                 | (0.002)***                                | (0.002)***                                |
| Separate                  | −0.076                                   | −0.098                                 | −0.080                                   | −0.117                                 | 0.013                                      | −0.029                                       | −0.016                                     | −0.055                                     |
|                           | (0.002)***                              | (0.002)***                             | (0.002)***                               | (0.002)***                             | (0.002)***                                | (0.002)***                                 | (0.002)***                                | (0.002)***                                |
| Predictor       | Anxiety         | Worrying       | Disinterest     | Depressive mood |
|-----------------|-----------------|----------------|-----------------|-----------------|
|                 | W/o 2019 income | W/2019 income | W/o 2019 income | W/2019 income   | W/o 2019 income | W/2019 income |
|                 | Coefficient (SE)| Coefficient (SE) | Coefficient (SE) | Coefficient (SE) | Coefficient (SE) | Coefficient (SE) |
| Never married   | −0.025          | −0.008         | −0.056          | −0.031          | −0.076          | −0.047          | −0.087          | −0.060          |
|                 | (0.003)***      | (0.003)***     | (0.003)***      | (0.003)***      | (0.003)***      | (0.003)***      | (0.003)***      | (0.003)***      |
| **Intercepts**  |                 |                |                 |                 |                 |                 |                 |                 |
| From “not at all” to “several days” | 27.584          | 28.266         | 21.253          | 22.457          | 14.949          | 16.416          | 18.986          | 20.252          |
|                 | (0.000)***      | (0.000)***     | (0.000)***      | (0.000)***      | (0.000)***      | (0.000)***      | (0.000)***      | (0.000)***      |
| From “several days” to “more than half the days” | 28.548          | 29.234         | 22.164          | 23.378          | 15.871          | 17.351          | 19.942          | 21.221          |
|                 | (0.001)***      | (0.001)***     | (0.001)***      | (0.001)***      | (0.001)***      | (0.001)***      | (0.001)***      | (0.001)***      |
| From “more than half the days” to “nearly every day” | 29.010          | 29.698         | 22.627          | 23.846          | 16.400          | 17.889          | 20.397          | 21.684          |
|                 | (0.001)***      | (0.001)***     | (0.001)***      | (0.001)***      | (0.001)***      | (0.001)***      | (0.001)***      | (0.001)***      |
| Residual deviance | 4403055          | 4391653        | 4090335         | 4062395         | 4003198         | 3965799         | 3900084         | 3867629         |
| Akaike Inf. Criterion | 4403083          | 4391695        | 4090363         | 4062437         | 4003226         | 3965841         | 3900112         | 3867671         |
Table 7 Linear models of the symptoms (treated as cardinal variables with 4 possible values)

| Predictor                                      | Anxiety W/o 2019 income | Anxiety W/2019 income | Worried W/o 2019 income | Worried W/2019 income | Disinterested W/o 2019 income | Disinterested W/2019 income | Depressive mood W/o 2019 income | Depressive mood W/2019 income |
|------------------------------------------------|--------------------------|------------------------|--------------------------|------------------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|
| Constant                                       | −22.830                  | −23.400                | −15.500                  | −16.490                | −10.050                       | −11.150                       | −12.890                       | −13.840                       |
|                                                | (0.111)***               | (0.111)***             | (0.105)***               | (0.104)***             | (0.100)***                    | (0.099)***                    | (0.099)***                    | (0.099)***                    |
| Loss of employment income (since 3/13/2020)   | 0.372                    | 0.349                  | 0.377                    | 0.342                  | 0.315                         | 0.276                         | 0.318                         | 0.282                         |
|                                                | (0.002)***               | (0.002)***             | (0.002)***               | (0.002)***             | (0.001)***                    | (0.001)***                    | (0.001)***                    | (0.001)***                    |
| 2019 Household income: $25,000–$34,999         | −0.119                   |                       | −0.139                   |                       | −0.140                         |                       | −0.154                         |                       |
|                                                | (0.004)***               |                       | (0.003)***               |                       | (0.003)***                    |                       | (0.003)***                    |                       |
| 2019 Household income: $35,000–$49,999         | −0.157                   |                       | −0.200                   |                       | −0.204                         |                       | −0.220                         |                       |
|                                                | (0.003)***               |                       | (0.003)***               |                       | (0.003)***                    |                       | (0.003)***                    |                       |
| 2019 Household income: $50,000–$74,999         | −0.202                   |                       | −0.268                   |                       | −0.283                         |                       | −0.295                         |                       |
|                                                | (0.003)***               |                       | (0.003)***               |                       | (0.003)***                    |                       | (0.003)***                    |                       |
| 2019 Household income: $75,000–$99,999         | −0.253                   |                       | −0.339                   |                       | −0.362                         |                       | −0.367                         |                       |
|                                                | (0.003)***               |                       | (0.003)***               |                       | (0.003)***                    |                       | (0.003)***                    |                       |
Table 7 (continued)

| Predictor                  | Anxiety W/o 2019 income | Anxiety W/2019 income | Worrying W/o 2019 income | Worrying W/2019 income | Disinterest W/o 2019 income | Disinterest W/2019 income | Depressive mood W/o 2019 income | Depressive mood W/2019 income |
|----------------------------|-------------------------|-----------------------|--------------------------|------------------------|-----------------------------|---------------------------|--------------------------------|-------------------------------|
|                            | Coefficient (Robust SE) | Coefficient (Robust SE) | Coefficient (Robust SE) | Coefficient (Robust SE) | Coefficient (Robust SE) | Coefficient (Robust SE) | Coefficient (Robust SE) | Coefficient (Robust SE) |
| 2019 Hhold income: $100,000–$149,999 | −0.285 (0.003)*** | −0.391 (0.003)*** | −0.425 (0.003)*** | −0.419 (0.003)*** |
| 2019 Hhold income: $150,000–$199,999 | −0.308 (0.004)*** | −0.433 (0.003)*** | −0.472 (0.003)*** | −0.461 (0.003)*** |
| 2019 Hhold income: $200,000 and above | −0.339 (0.004)*** | −0.483 (0.003)*** | −0.530 (0.003)*** | −0.503 (0.003)*** |
| Birth year                 | 0.013 (0.000)***       | 0.013 (0.000)***      | 0.009 (0.000)***       | 0.006 (0.000)***       | 0.007 (0.000)***          | 0.007 (0.000)***          | 0.008 (0.000)***              | 0.008 (0.000)***            |
| Woman                      | 0.181 (0.001)***       | 0.171 (0.001)***      | 0.162 (0.001)***       | 0.147 (0.001)***       | 0.061 (0.001)***          | 0.045 (0.001)***          | 0.081 (0.001)***             | 0.065 (0.001)***            |
| Black                      | 0.034 (0.003)***       | 0.029 (0.003)***      | 0.072 (0.003)***       | 0.065 (0.002)***       | 0.044 (0.002)***          | 0.060 (0.002)***          | 0.064 (0.002)***             | 0.056 (0.002)***            |
| Asian                      | 0.195 (0.003)***       | 0.196 (0.003)***      | 0.057 (0.003)***       | 0.058 (0.002)***       | 0.068 (0.002)***          | 0.061 (0.002)***          | 0.104 (0.003)***             | 0.105 (0.003)***            |
| Other races                | 0.045 (0.003)***       | 0.012 (0.003)***      | 0.050 (0.003)***       | 0.001 (0.003)***       | 0.061 (0.003)***          | −0.001 (0.003)***         | 0.019 (0.003)***             | −0.033 (0.003)***           |
Table 7 (continued)

| Predictor     | Anxiety W/o 2019 income | Anxiety W/2019 income | Worrying W/o 2019 income | Worrying W/2019 income | Disinterest W/o 2019 income | Disinterest W/2019 income | Depressive mood W/o 2019 income | Depressive mood W/2019 income |
|---------------|-------------------------|-----------------------|--------------------------|------------------------|-----------------------------|---------------------------|-----------------------------|-------------------------------|
|               | Coefficient (Robust SE) | Coefficient (Robust SE) | Coefficient (Robust SE) | Coefficient (Robust SE) | Coefficient (Robust SE) | Coefficient (Robust SE) | Coefficient (Robust SE) | Coefficient (Robust SE) |
| Hispanic      | 0.009                   | −0.010                | 0.058                    | 0.030                  | 0.054                       | 0.013                      | 0.029                       | −0.001                      |
| Widow         | 0.155                   | 0.104                 | 0.165                    | 0.092                  | 0.205                       | 0.125                      | 0.214                       | 0.138                        |
| Divorced      | −0.130                  | −0.085                | −0.154                   | −0.090                 | −0.170                      | −0.099                     | −0.166                      | −0.099                       |
| Separate      | −0.073                  | −0.093                | −0.080                   | −0.109                 | −0.003                      | −0.036                     | −0.028                      | −0.059                       |
| Never married | −0.029                  | −0.013                | −0.057                   | −0.035                 | −0.066                      | −0.041                     | −0.077                      | −0.052                       |
| Residual stand- | 1.016                   | 1.012                 | 0.961                    | 0.953                  | 0.920                       | 0.909                      | 0.911                       | 0.902                        |
| Adjusted R squared | 0.104                   | 0.110                 | 0.094                    | 0.110                  | 0.072                       | 0.093                      | 0.080                       | 0.099                        |

Signif. codes: ***p < .001, **p < .01, *p < .05
loss of employment income translates into a substantial increase in the probability of these symptoms. In the dichotomous response models, the increase in the probability of anxiety is of 12 percentage points, excessive worrying 11 percentage points, and disinterest and depressive mood of 9 percentage points each. Also, on average, in the dichotomous response specification, the negative fixed marginal effects of the highest 2019 household income category ($200,000 or above) are, respectively, on the probability of anxiety 14 percentage points, on excessive worrying 17 percentage points, on disinterest 19 percentage points, and on depressive mood 18 percentage points. As a rule, the decrease in probability associated with increasing household income categories is progressive: the higher the income the lower the probability of anxiety and depression. All these results are highly statistically significant and, with minor differences, robust to different specifications and inclusion of covariates.

The portions of the total response variations around their unconditioned means that our models manage to “explain” range between 6 and 8 percentage points. On the full sample, the residual standard errors of the linear probability models are, respectively, 0.44 probability (adjusted $R^2$: 0.08) for anxiety, 0.4 (adjusted $R^2$: 0.08) for excessive worrying, 0.39 (adjusted $R^2$: 0.07) for disinterest, and 0.37 ($R^2$: 0.07) for depressive mood. For the probit models, the Nagelkerke pseudo $R^2$ squared statistics ranged from 0.08 and 0.11 across the various symptoms; roughly equal for both model specifications.

Though the focus of this paper is on the relationship between mental health, pandemic-related employment income loss and 2019 household income, it is of notice that—among the covariates—age and gender proved to be significant predictors of the probability of anxiety and depression. The models predict a strong positive association between the prevalence of these symptoms and age. Also, women exhibit a significantly higher probability of experiencing the four symptoms reported. Finally, race, Hispanic ethnicity, and marital status did not exhibit the same regularity as predictors of anxiety and depression. The policy implications of these results should be apparent.

**Final Remarks**

The loss of income associated with the Covid-19 pandemic is having a devastating effect on the mental health of adult Americans. This effect varies with the preexisting financial condition of households, as captured by their 2019 household income.

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11 The exception to this lack of regularity in marital status was the case of divorced people, who were predicted to have a higher probability of suffering from all four symptoms.

12 Using the CDC’s 2019 NHIS, we estimated linear and probit models of the probability of three systematic self-reported symptoms of anxiety and depression without adjusting for endogeneity. The estimated marginal effects of previous 2018 household income on mental health are highly significant but smaller than those reported in this paper for the pandemic period; ranging (on average) from $-0.05$ to $-0.09$. To the extent the CDC and CB’s surveys are comparable (again, there are minor differences in the phrasing of the mental health questions and the CDC’s household income higher category is $100,000 or above), the pandemic has substantially increased the (absolute value) of the previous-year household income (negative) effect on mental health. The respective R code and output files of these regressions are available upon request.
category, but is robust to the inclusion of a host of sociodemographic characteristics. The mental condition of American adults during the period of the Covid-19 pandemic deteriorated gravely. One can only speculate about the cumulative mental health impact of the prolonged emergency.

This paper cannot establish the exogeneity of previous household income and employment income loss. More conclusive evidence regarding the effect of employment income loss during the pandemic will become possible once panel or repeated cross-sectional data are made available.

To conclude, we insist that—in light of the dramatic increase in the prevalence of mental illness during the pandemic—the size and strength of these effects highlights the importance and urgency of a vigorous policy intervention in favor of those who experienced drastic loss of income during the Covid-19 pandemic and were already in a vulnerable financial condition in the runup to the pandemic. After all, as Fisher (1906) noted: “a healthy body is absolutely essential for receiving and enjoying the income from external wealth. [...] The true ‘wealth of nations’ is the health of its individuals.”

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