The role of financial stress in mental health trajectories during COVID-19

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Article

Keywords:

Posted Date: June 7th, 2022

DOI: https://doi.org/10.21203/rs.3.rs-1725147/v1

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Abstract

Using longitudinal data before and during the first six months of the pandemic for a representative sample of Dutch households, we examined the role of financial stress in mental health trajectories during the COVID-19 pandemic. Also, we examined possible relations of financial stress and mental health with households’ income, financial buffers, and debts. The data revealed that average mental health did not change during the first six months of the pandemic but showed considerable underlying heterogeneity. Results showed that financial stress trajectories significantly explained the heterogeneity in mental health trajectories. While income did not explain financial stress, debts and insufficient buffers related to increased financial stress, which was in turn negatively related to mental health. We discuss the implications of our findings for mental health care and financial security policy and provide suggestions for future research.

Introduction

On 11 March 2020, the World Health Organization (WHO) declared COVID-19 a pandemic. Health authorities quickly realized that the pandemic posed a physical and mental health threat. On 18 March 2020, the WHO wrote, “this time of crisis is generating stress throughout the population” and called upon policymakers, health care professionals, and the general population to “support mental and psychosocial wellbeing in different target groups during the outbreak.” Based on experience with previous pandemics, such as the Spanish flu (1918–1920), the Asiatic flu (1956–1957), the Severe Acute Respiratory Syndrome (SARS, 2002–2003), the “Swine” flu (2009), and Ebola (2013–2014), researchers proposed that the mental health consequences of the COVID-19 crisis were likely to be present for a long time and peak later than the actual pandemic. They called upon the research community to study the mental health effects of COVID-19.

COVID-19 and mental health

Studies of the development of mental health and wellbeing during the pandemic have found mixed results. Some studies observed negative mental health outcomes, whereas others reported positive aspects of the pandemic or found no evidence of changes in mental health outcomes during the pandemic. Robinson et al. observed a high degree of unexplained heterogeneity in mental health responses to COVID-19. The most reported symptoms have been post-traumatic stress, depression, and anxiety. Other reported symptoms include insomnia and loneliness.

Scholars have proposed three potential pathways by which the pandemic may affect mental health: the disease itself, the quarantine measures, and the economic consequences of the pandemic. As for the first pathway, the disease (threat) itself may directly affect mental health. People may fear that they or their significant others may be infected. Those who caught the disease may suffer from post-infection consequences, such as fatigue and pain and may fear being a burden to their environment. The second pathway acknowledges that measures to contain the disease, such as quarantine and social distancing, may affect mental health by reducing opportunities for physical and mental health activities, such as recreational activities and routines. The third pathway assumes that mental health may suffer from the economic consequences of the pandemic. In the current study, we focus on this economic pathway, particularly the potential role of financial stress in explaining mental health trajectories.

Research suggests that socio-economically disadvantaged groups are more vulnerable to decreasing mental health during the pandemic, although the evidence is mixed. Notably, Pijpker et al. found no differences in mental health between low and high socioeconomic status respondents in a sample of the Dutch population. The literature suggests that the three pathways mentioned above play a role in the adverse mental health consequences for socio-economically disadvantaged groups. First, low socioeconomic status is associated with a higher chance of COVID-19 infection, resulting in higher mental distress. Low-income jobs are less likely to be executed from home, so they are most affected by the lockdown and social distancing measures. This may also result in an increased level of role conflicts having to combine work and family obligations. Third, socio-economically disadvantaged and financially vulnerable groups are more likely to suffer from the economic consequences of the pandemic. They are more likely to work in sectors that suffered most from COVID-19, such as restaurants, travel, entertainment, and certain retail branches. Also, workers most likely to be affected by unemployment are less educated and have fewer financial resources. An empirical study among people across the European Union in the first six months of the pandemic showed high job insecurity among those with temporary contracts. Also, the unemployed had difficulty making ends meet, and people with low job insecurity had considerable mental health issues. A cross-sectional study among 1,441 US citizens in the first two months of the pandemic showed that financial stressors and low assets were associated with higher odds of depression. Financial stressors were defined as losing a job, a member of the household losing a job, having financial problems, and having difficulty paying rent. Assets included social assets (education and marital status), physical assets (homeownership), and financial assets (household income and household savings).
Entrepreneurs, particularly self-employed, are another group that suffered from the economic consequences of the pandemic. They experienced a higher loss of working hours than others during the pandemic\textsuperscript{37,38}. Several studies indicate that self-employed are susceptible to mental health problems due to the economic consequences of the pandemic\textsuperscript{26,39,40}.

Financial stress and health

Research on the relationship between the economic situation of households and mental and physical health has a long history. In the 1980s, Rose and Marmot followed more than 17,000 municipal officials in London. Their well-known \textit{Whitehall Studies} showed that lower-paid civil servants were more likely to develop cardiovascular disease than their colleagues with higher positions\textsuperscript{41}. Since then, studies have shown the relationship between poverty and many different types of physical and mental conditions, such as diabetes, cancer, chronic lung disease, schizophrenia, depression, substance use, and anxiety disorders\textsuperscript{42–44}.

There is also evidence that stress plays a mediating role in the relationship between poverty and health\textsuperscript{45}. Poor households often have fewer resources (for example, financial buffers and social support) to deal with life events. This lack of resources may result in stress and health problems\textsuperscript{46,47}. Debt is also associated with stress and mental problems\textsuperscript{48}. Income fluctuations cause uncertainty and, therefore, stress\textsuperscript{49,50}. Having a financial buffer to deal with setbacks reduces stress and increases financial wellbeing\textsuperscript{51}. Simonse et al. supported these notions by showing that low income, a sufficient financial buffer, and debts are positively related to financial stress\textsuperscript{52}.

Gaps in the literature and the current study

Although the evidence is mixed, most studies have found that mental health declined during the COVID-19 pandemic. Research also indicated a high degree of unexplained heterogeneity in mental health trajectories. Many studies on COVID-19 and mental health cannot adequately examine these trajectories because these studies have cross-sectional designs. When studies used longitudinal designs, data collections (understandably) started only after the pandemic outbreak. The current study examined mental health trajectories by including data collected before and after the pandemic outbreak; this was possible by connecting long-running data on mental health to an ongoing data collection on financial stress\textsuperscript{53}. The current study specifically focused on how financial stress and vulnerability might explain these mental health trajectories.

Moreover, we examined how households' financial situation before COVID-19 and their income development during COVID-19 explained financial stress. Having a financial buffer may protect against financial stress because a financial buffer can absorb income loss or unexpected expenditures. Especially in economically uncertain times, lacking a financial buffer may result in feelings of not being in control of one's financial situation and in worries about not being able to meet financial obligations. Thus, the absence of a buffer may result in increased financial stress. Similarly, having debts in economically uncertain times may trigger worries about being unable to repay them because of the anticipation of future income drops. Also, having debts may increase feelings of dependency on others\textsuperscript{54}. Thus, having debts in economically uncertain times such as COVID-19 may increase financial stress. Income is likely to be negatively associated with financial stress. Low-income households are more vulnerable to becoming unemployed. Also, low-income households may have fewer opportunities to cut spending. Finally, it stands to reason that income and financial stress are dynamically related: income drops are likely associated with increasing financial stress. We tested three hypotheses:

3. Financial stress trajectories mediate the association between financial vulnerability (in terms of lacking sufficient buffers, having debts, low incomes, and adverse income changes) and mental health trajectories.

Research design

Data and variables

We used longitudinal data from the Long-running Internet Studies on Social Sciences (LISS) panel (initial $N=1,114$). The LISS panel consists of a representative sample of approximately 5,000 households, drawn by the Central Bureau of Statistics of the Netherlands\textsuperscript{55}. Respondents fill in monthly questions on various topics, such as health, family, work, personality, and economic situation. To ensure that vulnerable households can participate, they are supplied with a laptop and internet connection if necessary. The rich dataset enabled us to examine the relationship between developments in households’ economic situation, financial stress, and mental health. We used three
measures to compare the situations before and during COVID-19: April – November 2018 (t = 0), December 2019 – March 2020 (t = 1), and December 2020 – March 2021 (t = 2).

Mental health

To assess mental health, we used the Mental Health Index (MHI-5), a brief and reliable measure of mental health, and a subset of the validated SF-36 Health Survey\textsuperscript{56} (Cronbach’s $\alpha = .87$). MHI-5 asks respondents how often they felt nervous, down, calm, depressed, and happy in recent weeks (see Appendix for the complete questionnaire). Respondents’ scores on each item ranged from 1 (never) to 6 (continuously). We recoded the items so that a higher score reflected better mental health. LISS’ health questionnaire measures MHI-5 every year. We used the measurements administered in November / December 2018, 2019, and 2020.

Explanatory variables

We used the Psychological Inventory of Financial Scarcity (PIFS) (Cronbach’s $\alpha = .93$) to measure financial stress\textsuperscript{53}. The PIFS assesses the subjective experience of financial scarcity and captures appraisals of insufficient financial resources and lack of control over one’s financial situation, responses in terms of financial rumination and worry, and a short-term focus (see Appendix). Respondents’ scores on each item range from 1 (totally disagree) to 7 (totally agree). Higher scores indicate more financial stress. The PIFS was administered in April 2018, February 2020, and August 2020.

We included three aspects of a household’s economic situation in the analyses because previous research has shown that these are strongly associated with financial stress: income, financial buffers, and the number of debts\textsuperscript{52}. We used monthly income data for 2018, 2019, and 2020. For financial buffers and debts, we used the last available measurement before the outbreak of COVID-19. This measurement was held in June/July 2019, and it concerned households’ financial situation at the end of 2018.

*Income.* The LISS panel measures net monthly household income in euros. We summed the net monthly household incomes for 2018, 2019, and 2020 to obtain yearly net household incomes. Since the needs of a household grow with each additional member, we corrected for household size. To consider economies of scale, we adjusted household income by dividing it by the square root of household size, in line with OECD guidance\textsuperscript{57}. We included income at the first measurement and income changes between the three measurements as independent variables in our model.

*Buffer.* Savings may serve as buffers against unexpected expenditures and income shocks. Ruberton et al. stressed “the importance of holding minimal financial savings, but also the relative unimportance of having wealth above sufficiency levels”\textsuperscript{51}. We, therefore, defined buffer as a dichotomous variable that equaled one if a household’s liquid assets exceeded a threshold depending on income and household size and zero otherwise. We argue that higher-income households need a higher buffer because they have more fixed expenditures and own more property. Based on the Buffer Calculator for the Netherlands, provided by the National Institute for Family Finance Information\textsuperscript{58}, we used the following formula to define the threshold for having sufficient buffer: required buffer = € 600 + monthly income + € 400 * household size. Respondents were asked: “What was the total balance of your banking account, savings accounts, term deposit accounts, savings bonds or savings certificates, and bank savings schemes on 31 December 2018?”. If they responded “I don’t know,” the questionnaire asked, “To what category did the total balance (total value) belong on 31 December 2018 (positive or negative)?” and given 15 categories (less than €50 to €25,000 or more). We used the category midpoints to calculate whether the household’s liquid assets exceeded the buffer threshold.

*Debt.* Previous studies have indicated that the number of debts is positively related to financial stress and often more strongly than the total amount of debts\textsuperscript{52,59}. We used the number of different types of loans as a proxy for the number of debts. We excluded mortgages and study loans and focused on consumer credit. The survey asked respondents to indicate whether they had (a) one or more personal loans, revolving credit arrangement(s), or financing credit(s) based on a hire-purchase or installment plan, (b) a loan or credit arrangement based on a pledge, (c) overdue payments on one or more credit cards (d) money loaned from family, friends, or acquaintances, and (e) any other credits, loans or debts. We observed that the number of respondents with more than one type of debt was negligible. We, therefore, defined debt as a dichotomous variable that equaled one if a household had at least one type of debt and zero otherwise.

Control variables

We used age, education level, household composition, and personality traits as control variables in our analyses. Age and education level may be confounders of the association between income and financial stress. Furthermore, previous research has shown that mental health during COVID-19 may differ between households with compositions\textsuperscript{12,19,20,29}. We distinguished four household types: (1) no partner, no children, (2) children, no partner, (3) partner, no children, and (4) partner with children. Several studies have indicated that personality traits
influence saving behavior, impulse buying, and debt. The findings for extraversion, conscientiousness, and emotional stability are the most consistent. For example, conscientiousness is positively associated with savings and negatively associated with debt. Extraversion negatively predicts debt. Of the Big-Five personality traits, emotional stability and conscientiousness show the strongest (negative) association with experienced financial scarcity. For the current study, we used items from the 50-item Goldberg’s Big-Five index concerning the trait variables emotional stability, conscientiousness, and extraversion (α = .77, .89, and .87, respectively). We parsed out the variance between six controls (age, education level, household composition, emotional stability, conscientiousness, and extraversion) and the independent variables. This allows us to examine the unique relationship between economic variables, financial stress, and mental health.

Model

A linear mixed model enables analyzing the dynamic relationship between variables of interest within and across subjects. We were interested in how financial stress and mental health trajectories were associated. Moreover, we wanted to establish indirect relations between income development during COVID-19, income, financial buffers, and debts before COVID-19 on the one hand, and mental health trajectories on the other. In addition, we wished to allow for individual heterogeneity in mental health. We, therefore, chose a random intercepts model, meaning that the average mental health and financial stress over the three observations may differ between individuals. At the same time, the slopes are homogeneous for the sample. We included time as an independent variable to test whether mental health and financial stress changed between measurements. Also, to test whether the relationship between mental health and financial stress differed between the three measurements, we added time as a moderator to our model.

Furthermore, we did not impose any restrictions in advance on the covariance between observations at different measurement moments (unstructured covariances). To ease the interpretation of the parameter estimates, we standardized the numeric variables. We estimated a mediation model to test our hypotheses, where mental health was the dependent variable, financial stress was the mediator, and income, buffer, and debt were the independent variables. The following equations describe the model mathematically:

\[
\begin{align*}
y_t &= \alpha + \beta x_t + ym_t + \delta z + e_1 t + e_2 t m_t + \eta_t \\
m_t &= \alpha' + \beta' x_t + \delta' z + \alpha' + e'_1 t + \eta'_t
\end{align*}
\]

In these equations, \( t \) represents the time of the measurement \((t = 1, 2, 3)\), \( y_t \) is a vector with length \( N = 1114 \) with the dependent variable mental health at measurement \( t \) for each of the respondents, \( m_t \) is a vector with the mediator financial stress at measurement \( t \). \( x_t \) is a vector with the time-dependent variable income at time \( t \). \( z \) is a matrix with constant variables over time: the independent variables (buffer and debt), control variables (age, education level, gender, household composition, and personality traits). \( \alpha \) and \( \alpha' \) Are vectors with random intercepts. \( \beta, \delta, e_1, e_2, \beta', \delta', e'_1 \) are the regression coefficients, and \( \eta_t \) and \( \eta'_t \) are the prediction errors.

Methods

Our statistical analyses were designed to deal with missing values and outliers. First, many observations had missing data on one or more variables. All variables, except age and gender, had missing values. 15% of the values were missing, and 67% of the observations had a missing value on at least one variable. Missing values on the financial stress measurements were due to attrition; the reasons for missing values on the other variables are unknown. Second, an inspection of diagnostics from the OLS regression showed many influential observations (outliers). In our analyses, we addressed these data characteristics by performing multiple imputation and choosing a robust regression method for influential observations. Because the regressions tested multiple null hypotheses, we adjusted the p-values as proposed by Benjamini and Yekutieli to control for false discovery rates.

Multiple Imputation

Deleting observations with missing values on one or more variables would leave 67% of the observations unused, which would result in inflated standard errors. If the attrition is selective, the resulting estimations may be biased. Multiple imputation reduces standard errors and bias. We selected an iterative Monte Carlo Markov Chain (MCMC) mechanism to generate imputations and used the R package `jomo` to perform the imputations. MCMC assumes multivariate normality but performs well if this assumption does not hold. For the imputation, we did not consider the longitudinal nature of the data. Previous research has shown that reflecting the longitudinal structure of the data in the imputation process is not needed. To increase the plausibility of missingness at random, we included the control variables age and gender as auxiliary variables in the imputation process. A test run with 20 imputations, using Satterthwaite’s correction for the
degrees of freedom, resulted in a maximum fraction of missing information (fmi) of .64\textsuperscript{72}. Based on Von Hippel’s guidance, we set the number of imputations at 101, corresponding with a 5% variation in the standard error estimates\textsuperscript{73}. We performed the subsequent analyses with each of the 101 imputed datasets and combined the results using Rubin’s rules\textsuperscript{74}. The parameter estimates are simply the averages over the imputations. The standard error is the square root of the within-imputation variance and the between-imputation variance.

Robust Multiple Regression

It is well established that ordinary least squares (OLS) estimation can give highly unreliable outcomes in the presence of influential observations. OLS minimizes the sum of the squared residuals, which gives “unusual” observations an unduly large weight. We applied the robustlmm package in R to generate robust parameter estimates for our linear mixed-effects model\textsuperscript{75}. This package minimizes a smoothed version of the Huber function\textsuperscript{76}. It uses an iterative reweighing algorithm to estimate the model parameters.

To establish whether financial stress mediated the association between respondents’ economic situation and their mental health, we calculated the indirect associations using the distribution-of-the-product method proposed by MacKinnon\textsuperscript{77}.

Results

Descriptive statistics

Table 1 summarizes sample statistics. The initial sample contained 1,114 respondents (see Table 1). Attrition was 25% between the first and the second measurement and 12% between the second and third measurements. Inspection of the descriptives for the three measurements reveals that – on average – those who remained in the sample had somewhat higher incomes and were somewhat older compared to those who dropped out. Financial stress, on average, was low and mental health was relatively high in all three measurements.
Table 1
Descriptive Statistics. Median (IQR); Mean (SD) [Minimum Maximum]; N(%)

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>(t=0): (N=1,114)</th>
<th>(t=1): (N=838)</th>
<th>(t=2): (N=736)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Net Income</td>
<td>32,688 (21,575, 46,225)</td>
<td>34,100 (22,800, 47,950)</td>
<td>34,380 (22,800, 48,068)</td>
</tr>
<tr>
<td>Adjusted Income</td>
<td>22,228 (16,800, 29,698)</td>
<td>23,700 (17,744, 31,595)</td>
<td>24,000 (17,545, 32,345)</td>
</tr>
<tr>
<td>Age (years)</td>
<td>53.0 (17.8) [18.0 92.0]</td>
<td>54.5 (16.9) [18.0 92.0]</td>
<td>55.6 (16.6) [18.0 92.0]</td>
</tr>
<tr>
<td>Education Level</td>
<td>1: primary school</td>
<td>65 (5.8%)</td>
<td>46 (5.5%)</td>
</tr>
<tr>
<td></td>
<td>2: vmbo (intermediate secondary education)</td>
<td>220 (20%)</td>
<td>180 (22%)</td>
</tr>
<tr>
<td></td>
<td>3: havo/vwo (higher secondary education/preparatory university education)</td>
<td>133 (12%)</td>
<td>94 (11%)</td>
</tr>
<tr>
<td></td>
<td>4: mbo (intermediate vocational education)</td>
<td>269 (24%)</td>
<td>208 (25%)</td>
</tr>
<tr>
<td></td>
<td>5: hbo (higher vocational education)</td>
<td>283 (25%)</td>
<td>213 (25%)</td>
</tr>
<tr>
<td></td>
<td>6: wo (university)</td>
<td>143 (13%)</td>
<td>96 (11%)</td>
</tr>
<tr>
<td>Gender: Female</td>
<td>613 (55%)</td>
<td>451 (54%)</td>
<td>390 (53%)</td>
</tr>
<tr>
<td>Household Composition</td>
<td>1: no partner, no children</td>
<td>301 (30%)</td>
<td>249 (30%)</td>
</tr>
<tr>
<td></td>
<td>2: no partner, with children</td>
<td>37 (3.7%)</td>
<td>34 (4.1%)</td>
</tr>
<tr>
<td></td>
<td>3: partner, no children</td>
<td>381 (38%)</td>
<td>329 (39%)</td>
</tr>
<tr>
<td></td>
<td>4: partner, with children</td>
<td>293 (29%)</td>
<td>226 (27%)</td>
</tr>
<tr>
<td>Sufficient Buffer (Y)</td>
<td>367 (70%)</td>
<td>312 (71%)</td>
<td>282 (71%)</td>
</tr>
<tr>
<td>Number of Debts</td>
<td>0</td>
<td>871 (89%)</td>
<td>720 (90%)</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>99 (10%)</td>
<td>75 (9.4%)</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>8 (0.8%)</td>
<td>5 (0.6%)</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>1 (0.1%)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>2 (0.2%)</td>
<td>1 (0.1%)</td>
</tr>
<tr>
<td>Financial Stress (1–7)</td>
<td>1.78 (1.03) [0.92 6.42]</td>
<td>1.76 (1.04) [0.92 6.42]</td>
<td>1.63 (0.96) [0.92 6.42]</td>
</tr>
<tr>
<td>Mental Health Index (1–6)</td>
<td>4.14 (0.85) [1.00 5.40]</td>
<td>4.13 (0.83) [0.60 5.40]</td>
<td>4.17 (0.84) [0.40 5.40]</td>
</tr>
</tbody>
</table>


Figure 1 provides a graphical presentation of mental health trajectories during COVID-19. There are no observable shifts in average mental health between November/December 2018 and November/December 2020 (see Fig. 1A). This corroborates the findings of the Dutch Social Planning Office and the Dutch Health Council. However, we observed considerable variation in mental health trajectories (see Fig. 1B). For large proportions of respondents, mental health increased (39%) or decreased (40%) between the first and last measurements. In 21% of the respondents, mental health did not change. In sum, while the mean level of mental health appeared stable, we observed considerable heterogeneity among respondents.

Table 4 (Appendix) provides statistics for the three groups of respondents: those with decreased, unchanged, and increased mental health. Those with unchanged mental health – on average – had higher adjusted incomes than those with decreased or increased mental health.
Adjusted incomes increased in all three groups, but the adjusted income increase was the lowest in the group with decreased mental health. Of the group with decreased mental health, 68% had a sufficient financial buffer, compared to 75% and 73% in the other two groups. The number of debts was lower in the group with unchanged mental health than in the other two groups. Financial stress decreased in all three groups, but there was more variability in the group with decreased mental health.

The correlations between mental health at the three measurements were around 0.7 (Table 2, left pane). For financial stress, correlations between the three measurements were between 0.6 and 0.8 (Table 2, right pane). We can interpret these correlations as mental health and financial stress parts that are more or less constant and determined by stable intra-individual factors such as demographic variables and personality traits. Although these autocorrelations are moderate to high, they are not perfect. These imperfect correlations confirm the view that there are dynamics in the two variables, which stable factors do not explain.

<table>
<thead>
<tr>
<th>Mental health</th>
<th>t = 0</th>
<th>t = 2</th>
<th>Financial stress</th>
<th>t = 0</th>
<th>t = 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>t = 1</td>
<td>0.73***</td>
<td>-</td>
<td>t = 1</td>
<td>0.70***</td>
<td>-</td>
</tr>
<tr>
<td>t = 2</td>
<td>0.71***</td>
<td>0.72***</td>
<td>t = 2</td>
<td>0.69***</td>
<td>0.81***</td>
</tr>
</tbody>
</table>

Regression results

**Main analysis**

Regression results partly confirmed our three hypotheses. Changes in financial stress predicted mental health trajectories; in line with hypothesis 1, financial stress was negatively related to mental health (Table 4, pane A). Changes in financial stress, in turn, were predicted by insufficient financial buffers and debts before COVID-19, in line with hypothesis 2 (Table 4, panel B). Having insufficient buffer and debts before the outbreak of COVID-19 was associated with increased financial stress during COVID-19. Also, financial stress trajectories mediated the association between buffer and debt on the one hand and mental health trajectories on the other, in line with hypothesis 3. However, we did not find support for an association between buffer and debt on the one hand and mental health on the other. We found no support for income just before the pandemic and income developments during the pandemic as explanatory variables for financial stress and mental health trajectories. Finally, we found no support for an indirect association between income and mental health.

**Additional analyses**

**Mental health.** We did not find an association between time and mental health. This corroborates our earlier observation that – on average - mental health did not change during the assessed period before and during the COVID-19 pandemic. Of the control variables, only household composition and emotional stability explained mental health. Couples without children had more positive mental health trajectories than the reference group (no partner, no children). Emotional stability was also positively associated with mental health.

**Financial stress.** We did not find an association between time and financial stress. This finding indicates that financial stress – on average - was stable during COVID-19. We found that age was negatively associated with financial stress, indicating that younger respondents experienced more financial stress during COVID-19. Also, we found that the group with the lowest education level (primary school) experienced more financial stress than the other groups. We did not find associations between gender and household composition and financial stress. Of the three included personality traits, conscientiousness and emotional stability were negatively associated with financial stress trajectories.

**Mediation.** In addition to the indirect relation (mediation) described above, we found that financial stress trajectories mediated the association between age, gender, and education level on the one hand and mental health trajectories on the other (see Table 3, pane (C)). We found no support for an indirect association between household composition and mental health trajectories, with financial stress as the mediator. Finally, we found that financial stress trajectories also mediated the association between conscientiousness and emotional stability on the one hand and mental health trajectories on the other.
Table 3
Regression results. Pane (A) contains the regression results of Eq. (1); Pane (B) contains the regression results of Eq. (2); Pane C contains the results of the mediation analysis. SE: standard error; p: adjusted p-value, Sig: * = < .05, ** = < .005, *** = < .0005, CI = confidence interval.

<table>
<thead>
<tr>
<th></th>
<th>(A) Dependent Variable: Mental Health</th>
<th>(B) Dependent Variable: Financial Stress</th>
<th>(C) Mediation: Indirect Associations</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Estimate</td>
<td>SE</td>
<td>p</td>
</tr>
<tr>
<td>Intercept</td>
<td>-0.1682</td>
<td>0.094</td>
<td>0.621</td>
</tr>
<tr>
<td>Financial Stress</td>
<td>-0.1031</td>
<td>0.019</td>
<td>&lt; .001</td>
</tr>
<tr>
<td>Adjusted Income (t = 0)</td>
<td>0.0771</td>
<td>0.041</td>
<td>0.621</td>
</tr>
<tr>
<td>∆ Adjusted Income</td>
<td>-0.0663</td>
<td>0.036</td>
<td>0.621</td>
</tr>
<tr>
<td>Buffer</td>
<td>0.0307</td>
<td>0.032</td>
<td>1</td>
</tr>
<tr>
<td>Debt</td>
<td>-0.0451</td>
<td>0.069</td>
<td>1</td>
</tr>
<tr>
<td>t = 0</td>
<td>-0.0119</td>
<td>0.022</td>
<td>1</td>
</tr>
<tr>
<td>t = 1</td>
<td>-0.0079</td>
<td>0.023</td>
<td>1</td>
</tr>
<tr>
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Discussion
The current study examined the role of financial vulnerability and financial stress in explaining individual differences in mental health trajectories during COVID-19. In a longitudinal study, we compared mental health in a large sample of the Dutch population before and during the pandemic. We used a random intercepts model, which enabled us to analyze the dynamic relationships between financial stress and mental health.

We found that changes in financial stress related negatively to changes in mental health during the pandemic. Having insufficient financial buffers and holding consumer debts before the pandemic outbreak explained increases in financial stress during the pandemic. Having insufficient buffer and holding consumer debts are two important aspects of financial vulnerability. Financially vulnerable households may well experience more economic uncertainty. Households without a financial buffer are less protected against income shocks or unexpected expenditures. Especially in a time of economic uncertainty, lacking a financial buffer may result in feelings of not being in control of one's financial situation and in worries about not being able to meet financial obligations. Thus, the absence of a buffer may result in increased financial stress.

Similarly, having debts may trigger worries about being unable to repay them because of the anticipation of future income drops. Also, having debts may increase feelings of dependency on others. Thus, having debts in economically uncertain times such as COVID-19 may increase financial stress. We also found that changes in financial stress mediated the relation between buffers and debts on the one hand and changes in mental health on the other. Theoretically, the causal relationship between financial vulnerability and mental health could go in both directions. However, because we used buffers and debts before the pandemic as independent variables, that does not seem likely in this case. Although we cannot make causal inferences, this finding confirms earlier findings that financial vulnerability may be a risk factor for mental health in a pandemic.

We found no support for income or income changes explaining financial stress trajectories. Having an insufficient financial buffer and being indebted are better predictors of financial stress than having a low income. The finding that decreasing income does not explain increasing financial stress may be due to governments' comprehensive income support packages immediately after the pandemic outbreak. As a result, few households had experienced income drops at the time of the third measurement. The variability in income may have been too small to explain variability in financial stress.

Mean levels of mental health did not change in the first six months of the pandemic compared to the pre-pandemic situation. This flat course of average mental health, however, masked underlying heterogeneity. For four out of five respondents, mental health either increased or decreased. This finding corroborates earlier findings of high proportions of unexplained heterogeneity in mental health development during COVID-19.

Our results suggest that financial stress may partly explain the heterogeneity in mental health trajectories. Our study adds to the fast-growing knowledge of mental health development during COVID-19. We had the opportunity to use longitudinal data collected before and during COVID-19. Earlier studies examining mental health during COVID-19 were mostly cross-sectional or used data collected during the pandemic only. To our knowledge, our study is the first to examine the role of pre-pandemic financial buffers and financial stress in mental health changes during the pandemic.

There are also some limitations and opportunities for further research. First, we used data collected during the first year of the pandemic outbreak. The mental health consequences of the COVID-19 crisis may be present for a long time and peak later than the actual pandemic. Also, there is ample evidence of the effects of chronic stress on physical and mental health and childhood development. For these reasons, it may be fruitful to extend the study of mental health development and (financial) stress to include more prolonged periods. Second, we examined the role of financial stress in general mental health trajectories during COVID-19. Future studies could examine the role of financial stress during COVID-19 for a broader range of mental health symptoms and disorders, such as post-traumatic stress, insomnia, and loneliness. A third avenue for further research lies in understanding the effect of financial stress on physical health development. There is a rich literature on the relationship between socioeconomic status and several aspects of physical health, such as cardiovascular disease, arthritis, diabetes, chronic respiratory diseases, and cervical cancer. Examining the prolonged effects of financial stress during COVID-19 in developing these and other illnesses would be worthwhile. Such examinations could help disentangle the complex relationship between socioeconomic status and health and the role of lifestyle therein. They could establish the relative contribution of the different pathways (i.e., through the disease itself, the pandemic containment measures, and the economic consequences of the pandemic).

Financial stress may undermine mental health and can lead to anxiety and depression. Reduced mental health, in turn, may decrease employability and thereby income, which, in turn, may decrease the ability to build up buffer savings and increase the dependency on debts. Having insufficient buffers and holding debts, in turn, may increase financial stress. The economic effects of the pandemic may thereby
contribute to widening the mental health gap between the financially secure and the financially vulnerable. Therefore, it is crucial to ensure that financially vulnerable households do not fall into a poverty trap. To this end, the results of our study point to several policy implications.

First, our results confirm the importance of safeguarding financial security for financially vulnerable households in crises. Soon after the outbreak, governments worldwide implemented unprecedented income support packages. These support packages are currently being phased out while economic consequences may endure or only start to arise. Financially vulnerable households are the most likely to experience the prolonged economic consequences of the pandemic in the aftermath of the health crisis because they do not have the financial resources to deal with economic shocks.

Second, mental health programs should include financially vulnerable groups. Many of the studies referenced in this article have called upon health professionals, policymakers, and researchers to develop interventions to counter the adverse psychological consequences of the pandemic, especially for vulnerable groups. The current study results confirm that such programs should reach out to financially vulnerable households and address their specific mental health needs.

Third, mental health interventions should address countering the psychological symptoms of COVID-19, such as post-traumatic stress, anxiety, depression, loneliness, and insomnia, and prevent such symptoms by fighting financial stress because control is an essential aspect of financial stress. Financial counseling and coaching to increase control and self-efficacy provide promising avenues for reducing financial stress and promoting mental health, especially for financially vulnerable households.

Finally, an important lesson for future pandemics and other economic shocks is promoting buffer savings and avoiding unnecessary debts. This may make households more resilient to the adverse mental health consequences of future shocks. In sum, policymakers and professionals from mental health and finance can benefit from the notion that mental health and financial security go hand in hand by incorporating financial security into mental health programs and vice versa.

Declarations

All data are publicly available upon request from CentERData. The supplemental materials contains a list of the datasets used and a description of the steps taken to prepare the data and perform the analyses. The corresponding R-scripts are available as supplemental files.

Author contributions


Competing interests

The authors declare no conflicts of interest.

References


Figures
Figure 1

Development of mental health during COVID-19. A. Average mental health at t = 0 (November/December 2018), t = 21 (November/December 2019), and t = 2 (November/December 2020); B. Differences in mental health between t = 0 and t = 2

Supplementary Files

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