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Effect of the COVID-19 pandemic on depression in older adults: A panel data analysis☆

Alessio Gaggero [a], Ángel Fernández-Pérez [b], Dolores Jiménez-Rubio [b,*]

[a] Department of Quantitative Methods for Economics and Business, University of Granada, Campus Universitario de Cartuja, Granada 18071, Spain
[b] Department of Applied Economics, University of Granada, Campus Universitario de Cartuja, Granada 18071, Spain

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ABSTRACT

Background: This paper investigates the impact of the COVID-19 pandemic on depression in the older population, an especially vulnerable group for which to date there is limited empirical research.
Methods: We employ a panel data consisting of seven waves of the English Longitudinal Study of Ageing (2010–2020). The breadth and depth of the data considered enabled us to control for individual fixed effects, to adjust for pre-pandemic trends in depression levels and to perform a heterogeneity analysis, depending on the intensity of the lockdown measures implemented and relevant socioeconomic characteristics.
Results: We find that, following the COVID-19 pandemic, study participants reported a statistically significant increase in the depressive symptoms by around 0.7 over 8 points as measured by the Centre for Epidemiologic Studies Depression (CES-D) index. The estimated coefficients were larger in November than in July, for individuals who lost their job, retired and women. Interestingly, we observed that mental health has worsened substantially relative to the pre-pandemic period across all income groups of the older population, suggesting a limited role of income as a protective mechanism for mental health.
Conclusions: Our findings provide compelling evidence that depression levels amongst older adults have worsened considerably following the COVID-19 pandemic, and that factors other than income, such as social interactions, may be highly relevant for well-being in later life.

1. Introduction

Since January 2020, when the World Health Organization (WHO) declared the outbreak of the coronavirus disease 2019 (COVID-19) to be an international public health emergency [1], more than six million deaths worldwide from this cause have been confirmed [2]. Due to its highly transmissible nature, many countries have applied social distancing restrictions to contain the spread of the virus, such as school closures and stay-at home orders [3–5]. The lockdown policies seem to have been effective when it comes to reducing the number of new infections [6]. However, the implementation of these measures, in conjunction with fear of contracting the disease, other uncertainties and the difficult economic situation, may have had a strong negative impact on the mental health of the population [1]. In the UK, several studies have reported a deterioration in mental health amongst people aged 16 years or older after the first wave of the pandemic [7–9]. Similarly, most of the empirical studies included in the systematic reviews conducted by Vindegaard and Benros [10] and Xiong et al. [11] observed higher rates of anxiety, depression and/or psychological distress due to the COVID-19 pandemic in diverse population groups, including psychiatric patients, medical health care workers and the general population. To date, however, little attention has been paid to evaluate the extent to which the pandemic has affected the mental health of older adults, even though this population group is especially vulnerable to COVID−19 [12].

In addition to the more severe complications and adverse effects associated with COVID-19 in older adults, there are several specific mechanisms that may explain the more extreme effects of the pandemic on mental health amongst this population group. Firstly, the strict measures of social distancing imposed by health authorities have been identified as significant drivers of the deterioration of mental health in the general population [13,9]. For older adults, the lack of social contact is especially important, because in later life social interactions are often more relevant than economic factors in this respect [14]. This problem

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* Correponding author.
E-mail address: dolores@ugr.es (D. Jiménez-Rubio).

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has been aggravated by the absence or insufficiency of social support services in many countries during the pandemic [15], and by the fact that for much of the elderly population their only social contact tends to be away from home (visits to relatives and friends, day-care and community centres, places of worship, etc.) [16]. Another factor underlying the relationship between COVID-19 and mental health problems for older adults could be the general pressure and work overload experienced by certain groups such as child carers or informal caregivers, a role performed disproportionately by women [13,17,18]. Finally, while older adults usually enjoy greater economic stability than the younger population, they are not immune to the economic consequences of the pandemic. This is especially true for those older people still active in the labour market [17].

The aim of this study is to provide evidence on the effects of the COVID-19 pandemic on mental health, as measured by the Centre for Epidemiologic Studies Depression (CES-D) index, of the English population aged 50 years and over. To do so, we employ a uniquely suited long panel data set, the English Longitudinal Study of Ageing (ELSA), covering the period 2010–2020. The most recent waves were conducted in July and November 2020 in direct response to the COVID-19 outbreak. Our analysis is based on the before-after estimator, adjusting for socioeconomic attributes, lifestyle behaviour, health conditions, exposure to COVID-19, as well as individual fixed effects and pre-pandemic time-trends in mental health.

In addition to focusing on a population group who has been generally understudied in earlier work, we make several other contributions to the literature. First, in this study we make use of a rich longitudinal dataset providing both pre- and post-pandemic information on health and other relevant socioeconomic characteristics from a representative sample of older adults. This approach enables us to better identify changes in mental wellbeing associated with COVID-19 amongst this population group. In contrast, most earlier studies are generally drawn from non-representative samples or lack pre COVID-19 baseline data [5,15], which are important in order to capture relevant pre-pandemic differences in mental health levels across different population groups as well as unobserved confounding factors [19–22]. Second, unlike earlier work studying the effects of the pandemic after the first months of the outbreak [7], we evaluate the effect of the pandemic at two points in time: July 2020, a period when restrictions were more relaxed, and November 2020, a period when restrictions in place were much stricter across the whole of England. Finally, we conduct sub-group analyses (gender, labour market status and income level) to identify population groups for whom the effects are stronger, as well as to attempt to isolate some of the potential channels underlying the observed results (e.g. economic circumstances, social isolation and increased informal care workload, pre-pandemic health status).

Our findings show that average depression levels amongst older adults increased considerably due to COVID-19, especially during the second period studied (November 2020). In addition, the pandemic had a considerable impact on the mental health of women, retired individuals and those who lost their job during the pandemic. Interestingly, we find that the impact on the mental health status of the older adults is remarkably high for all income groups, even for those individuals with relatively better off income level.

The rest of the paper is organised as follows. Section 2 discusses the data, the key variables, as well as the methodological approach used in this study. Section 3 reports the results and finally Section 4 presents a discussion of the findings, and Section 5 concludes.

2. Material and methods

2.1. Data

2.1.1. Overview of the sample

The data analysed in this study are based on the ELSA, a large-scale longitudinal panel study of people aged 50 years and over, and their partners, living in private households in England. Every two years the sample has been interviewed to measure changes in their health status, their economic conditions, and their social circumstances. While the original sample spans from 2002 to 2018, due to the COVID-19 outbreak, two additional waves were collected in 2020, one in July and one in November, to monitor how the lives of study participants changed after the outbreak. Accordingly, the objective of this study is to evaluate the consequences of the COVID-19 pandemic on mental health. In order to avoid potential selection problems, we focus our analysis on data from 2010 onwards, implying a total sample size of 36,115 individuals.[1]

2.1.2. Outcome variable

The key outcome variable used in our study is the eight-item version of the CES-D index developed by Radloff [23] which is widely used to identify people at risk of depression in population survey studies. The CES-D index is based on a depression-screening test in which individuals are asked whether during the past week they experienced symptoms associated with depression, as defined by the American Psychiatric Association Diagnostic and Statistical Manual. Specifically, the questions are whether: (1) they felt depressed much of the time, (2) they felt everything they did was an effort, (3) their sleep was restless, (4) they were unhappy, (5) they felt lonely, (6) they did not enjoyed life, (7) they felt sad, and (8) they could not get going. The CES-D index ranges from zero, implying no depression and best mental health, to eight, implying high depression and worst mental health.[2]

2.1.3. Covariates

Thanks to the richness of the data, our empirical model accounts for demographic, socioeconomic, lifestyle, health conditions and COVID-19 exposure variables. Specifically, demographic indicators include age, gender, cohabiting status (married, other), family size and educational level (degree/higher education vs lower education level). Socioeconomic variables include labour market status (wage employed, self-employed, unemployed, retired, and out of work) and household income.[3] It is worth noticing that socioeconomic variables were fixed at their pre-pandemic value in order to avoid the *bad control* problem, as highlighted by Angrist and Pischke [24], namely that control variables might be themselves outcome of the pandemic.[4] Lifestyle behaviours are measured by binary indicators for daily smoking or drinking; pre-existing health conditions include self reported diabetes and hypertension. Finally, the model also controls for a set of variables measuring exposure to COVID-19, either by the individual or as a contact with a close relative or friend.

2.2. Empirical approach

Given the nature of the data, and the fact that almost the entire population has been exposed to the COVID-19 pandemic, our analysis is based on a before-after estimator, which compares observed outcomes at two moments in time: before and after the outbreak. Notably, thanks to the longitudinal nature of the data we are able to control for baseline

[1] In Table A.1, in the Appendix, we present the results when including all waves from 2002. Results are remarkably consistent.

[2] The eight item version of the CES-D index employed in this study has been validated in older population and is shown to have strong psychometric properties (Lyness et al. [32]; Zivin et al. [33]).

[3] Employment status was entered in five categories: wage employment, self-employed, retired, unemployed and out of the labour market (reference category). Household income was measured using the log-yearly equivalised disposable real household income deflated using the Consumer Price Index with baseline 2005 = 100.

[4] Leaving out potential endogenous variables such as income and employment leads to very similar findings.

individual differences in mental health which could otherwise bias the results. The model we estimate is the following:

$$Y_{it} = \alpha + \beta COVID19_{it} + X_{it}^{'}\gamma + \mu_t + a_i + \varepsilon_{it}$$

where Y_{it} is the outcome of interest for individual i at time t. $COVID19_{it}$ is an indicator variable that takes the value 1 for individuals exposed to the COVID-19 pandemic, and β measures the effect of the pandemic on the CES-D index. $X_{it}^{'}$ is a vector of personal attributes, as described above, which also includes region fixed effects. Additionally, the model controls for pre-pandemic time trends in the CES-D index, denoted μ_t,[5] and a time-invariant individual-specific effect, denoted a_i. Finally, ε_{it} is an independent and identically distributed error term. Standard errors are clustered at the individual level because individuals appear in the regressions in multiple waves. However, the results obtained are insensitive to variations in the specifications.

3. Results

Table 1 shows the summary statistics of the sample used. According to the data, on average, study participants reported around 1.4 depressive symptoms. The average age of the participants was 69 years, 56% were women, 59% were married, and 19% had higher education. With respect to the socioeconomic characteristics, 22% were (wage) employed while 67% retired, the remaining were either unemployed or in self-employment. Regarding lifestyle, 10% were smokers and 28% drank alcohol daily. With respect to the health conditions, 8% had been diagnosed with type-2 diabetes and 31% with hypertension. Finally, 3% of the sample were tested for COVID-19 (with only a small proportion testing positive) and another 3% had a close person tested for COVID-19.

Table 1
Summary Statistics

	Mean	S.D.	Min	Max
Outcome Variable:				
CES-Depression Index [0,8]	1.41	1.90	0	8
Demographics:				
Years of age	69.41	8.48	51	90
Female [0,1]	0.56	0.50	0	1
Married [0,1]	0.59	0.49	0	1
Family size	1.95	0.78	0	9
Higher education [0,1]	0.19	0.39	0	1
Socio-Economics:				
Wage Employed [0,1]	0.22	0.41	0	1
Self Employed [0,1]	0.06	0.23	0	1
Retired [0,1]	0.67	0.47	0	1
Unemployed [0,1]	0.01	0.11	0	1
Log HH Income	5.75	0.66	0	10
Lifestyle Behaviours:				
Smoker [0,1]	0.10	0.30	0	1
Drinker [0,1]	0.28	0.45	0	1
Conditions:				
Type-2 Diabetes [0,1]	0.08	0.27	0	1
Hypertension [0,1]	0.31	0.46	0	1
COVID-19 Test:				
Tested [0,1]	0.03	0.18	0	1
Contracted the Disease [0,1]	0.00	0.04	0	1
Anyone Close Positive [0,1]	0.03	0.18	0	1
Observations	36115			

Source: English Longitudinal Study of Ageing (ELSA).
Note: The Table reports summary statistics of the variables of interest.

We begin to study the consequences of the pandemic graphically. Specifically, Fig. 1 illustrates the effect of the COVID-19 pandemic on depression, showing that prior to the outbreak the mean CES-D index value remained approximately stable in the range of 1.30 and 1.50. However, this value then rose significantly to 1.97 in July 2020 and to 2.1 in November of the same year. Two main findings can be highlighted from this graphical evidence. First, the number of depressive symptoms reported increased significantly after the pandemic; second, the number of depressive symptoms grew as the pandemic progressed. In what follows, we tested the robustness of these findings using a regression framework and controlling for a set of confounding factors.[6]

Table 2 reports the main findings of this study and presents the robustness of the results including a battery of specifications.[7] Specifically, Column (1) shows the unconditional estimates of the COVID-19 pandemic on the CES-D index. In Column (2), we include the demographic, socioeconomic characteristics, lifestyle behaviour, health status, COVID-19 and regional fixed effects. Next, in Column (3), we account for pre-pandemic CES-D trends by including linear time trends. Likewise, in Column (4), we control for individuals fixed effects.

The estimated coefficients in Column (4), the most comprehensive model, reports an increase in the mean level of depression ($\beta = 0.617$), as measured by the CES-D index, which is significant at any conventional significance level. The coefficient implies that, after the COVID-19 outbreak, the average number of reported depressive symptoms by our study population, as measured by the CES-D index, increased by 0.617 over 8. To summarise, consistently across different specifications, Table 2 suggests the existence of a robust and significant negative effect of the COVID-19 pandemic on the mean levels of depression reported by older adults, which is not strongly modified when we control for several individual characteristics.

Next, the breadth and depth of the data allows us to conduct an

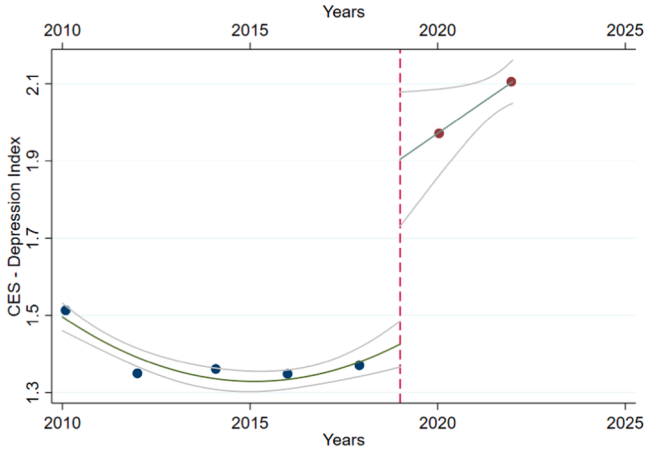

Fig. 1. Effect of the COVID-19 Pandemic on Depression - Graphical Evidence
Note: The Figure shows the evolution of the CES-Depression Index overtime.
Source: English Longitudinal Study of Ageing (ELSA).

[5] We have accounted for pre-pandemic CES-D trends by including linear time trends and a full set of year dummies. However, according to the Bayesian Information Criterion (BIC), the model with linear time trends performs slightly better (BIC value = 111,281.9 vs 111.304,8, respectively, with an Akaike Information Criterion virtually identical in both cases).While the results of both models are very similar in size and statistical significance, for the sake of simplicity, we use the linear trend model as our baseline specification.

[6] In Fig. A.2, in the Appendix, we plot similar graphs to show (descriptively) the effect of the COVID-19 pandemic on four labour market outcomes by gender: (i) wage employment; (ii) self-employment; (iii) unemployment; and (iv) retirement.

[7] In Table A.2, in the Appendix, we provide the results of Table 2 accounting for the sampling weights which are not used in the main analysis becaue they imply a smaller sample (due to a high number of missing values). We find that the results remain substantially unchanged both in terms of size and statistical significance when we consider sampling weights.

Table 2
Effect of the COVID-19 pandemic on depression

	(1)	(2)	(3)	(4)
COVID-19 Pandemic [0,8]	0.793***	0.680***	0.670***	0.617***
	(0.031)	(0.040)	(0.048)	(0.053)
Demographics:				
Years of age		0.002	0.002	-0.069***
		(0.002)	(0.002)	(0.021)
Female [0,1]		0.395***	0.396***	0.000
		(0.020)	(0.020)	(.)
Higher education [0,1]		-0.088***	-0.086***	-0.044
		(0.024)	(0.024)	(0.062)
Married [0,1]		-0.277***	-0.278***	0.100**
		(0.025)	(0.025)	(0.046)
Family size		-0.100***	-0.099***	-0.112***
		(0.015)	(0.015)	(0.024)
Socio-Economics:				
Wage Employed [0,1]		-0.963***	-0.966***	-0.138***
		(0.047)	(0.047)	(0.051)
Self Employed [0,1]		-0.885***	-0.879***	-0.019
		(0.055)	(0.054)	(0.060)
Retired [0,1]		-0.884***	-0.845***	-0.166***
		(0.047)	(0.047)	(0.051)
Unemployed [0,1]		-0.658***	-0.656***	-0.259***
		(0.110)	(0.110)	(0.095)
Log HH Income		-0.267***	-0.258***	-0.005
		(0.016)	(0.016)	(0.019)
Lifestyle Behaviours:				
Smoker [0,1]		0.438***	0.438***	0.051
		(0.037)	(0.037)	(0.069)
Drinker [0,1]		-0.149***	-0.146***	-0.020
		(0.023)	(0.023)	(0.031)
Conditions:				
Type-2 Diabetes [0,1]		0.336***	0.332***	-0.047
		(0.038)	(0.038)	(0.064)
Hypertension [0,1]		0.233***	0.230***	-0.021
		(0.022)	(0.022)	(0.033)
COVID-19 Test:				
Tested [0,1]		0.320***	0.322***	0.213***
		(0.075)	(0.075)	(0.062)
Contracted the Disease [0,1]		-0.257	-0.274	-0.317
		(0.314)	(0.316)	(0.273)
Anyone Close Positive [0,1]		0.282***	0.267***	0.172***
		(0.076)	(0.076)	(0.062)
Region FE		✓	✓	✓
Linear Trend			✓	✓
Individual FE				✓
Observations	36115	36115	36115	35459

Source: English Longitudinal Study of Ageing (ELSA).
Note: The Table reports before-after estimates of the effect of the COVID-19 pandemic on the CES-Depression index. Standard errors in parenthesis are clustered at the individual level. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

intensity analysis and evaluate the COVID-19 effects on mental health at two different points in time: *(i)* July 2020, a period when restrictions were more relaxed, and *(ii)* November 2020, a period when restrictions in place were much stricter across the whole of England.[8] In the same fashion of the above, Table 3 reports the results of this exercise and confirms that the effects on depression were significantly stronger in November. Specifically, looking at Column (4), the estimated coefficient implies that the average number of (reported) depressive symptoms rose by 0.508 in July 2020, and by 0.894 in November 2020 as compared to the pre-pandemic period studied. Once again, the estimates are robust across a battery of model specifications and assumptions on pre-pandemic time trends.

[8] Table A.3 in the Appendix shows the differences in the COVID-19 related restrictions between July and November in UK.

Table 3
Effect of the COVID-19 pandemic on depression – intensity analysis.

	(1)	(2)	(3)	(4)
COVID-19 Pandemic [0,8]				
July Effects	0.744***	0.616***	0.612***	0.508***
	(0.069)	(0.068)	(0.072)	(0.058)
November Effects	0.803***	0.706***	0.700***	0.894***
	(0.034)	(0.046)	(0.054)	(0.078)
Demographics:				
Years of age		0.002	0.002	0.006
		(0.002)	(0.002)	(0.025)
Female [0,1]		0.396***	0.397***	0.000
		(0.020)	(0.020)	(.)
Higher education [0,1]		-0.087***	-0.085***	-0.045
		(0.024)	(0.024)	(0.062)
Married [0,1]		-0.269***	-0.270***	0.176**
		(0.026)	(0.026)	(0.050)
Family size		-0.102***	-0.101***	-0.117***
		(0.015)	(0.015)	(0.024)
Socio-Economics:				
Wage Employed [0,1]		-0.962***	-0.964***	-0.134***
		(0.047)	(0.047)	(0.051)
Self Employed [0,1]		-0.883***	-0.877***	-0.015
		(0.055)	(0.055)	(0.060)
Retired [0,1]		-0.845***	-0.847***	-0.164***
		(0.047)	(0.047)	(0.051)
Unemployed [0,1]		-0.661***	-0.660***	-0.270***
		(0.110)	(0.110)	(0.095)
Log HH Income		-0.268***	-0.259***	-0.004
		(0.016)	(0.016)	(0.019)
Lifestyle Behaviours:				
Smoker [0,1]		0.439***	0.439***	0.047
		(0.037)	(0.037)	(0.068)
Drinker [0,1]		-0.154***	-0.151***	-0.048
		(0.023)	(0.023)	(0.032)
Conditions:				
Type-2 Diabetes [0,1]		0.338***	0.334***	-0.021
		(0.038)	(0.038)	(0.064)
Hypertension [0,1]		0.236***	0.233***	-0.002
		(0.022)	(0.022)	(0.033)
COVID-19 Test:				
Tested [0,1]		0.309***	0.312***	0.186***
		(0.076)	(0.076)	(0.063)
Contracted the Disease [0,1]		-0.255	-0.273	-0.293
		(0.314)	(0.316)	(0.270)
Anyone Close Positive [0,1]		0.279***	0.264***	0.163***
		(0.076)	(0.076)	(0.062)
Region FE		✓	✓	✓
Linear Trend			✓	✓
Individual FE				✓
Observations	36115	36115	36115	35459

Source: English Longitudinal Study of Ageing (ELSA).
Note: The Table reports before-after estimates of the effect of the COVID-19 pandemic on the CES-Depression index. Standard errors in parenthesis are clustered at the individual level. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

3.1. Heterogeneity analysis

Lastly, in Table 4 we conducted a heterogeneity analysis to understand in which of the two periods studied are the effects stronger and which population group is more likely to be affected.[9] We first considered whether, and to what extent, the observed effects differed by gender. The results show that COVID-19 pandemic effects were significantly stronger amongst women. Specifically, the deterioration of the mental health in women was around 0.27 over 8 points higher than in men after the pandemic crisis.

[9] In Table A.4 in the Appendix, we provide a similar exercise by splitting between the July and the November effects. According to the results, the effects of the pandemic on mental health for women are particularly strong in November, a period with stricter COVID-19 related restrictions as compared to July 2020 (see Table A.3).

Table 4
Effect of the COVID-19 pandemic on depression: subgroup analysis.

	(1)
COVID-19 Pandemic [0,1]	0.377***
	(0.101)
COVID-19*Female	0.272***
	(0.049)
COVID-19*Retired	0.189**
	(0.078)
COVID-19*Age[65–74]	−0.121
	(0.082)
COVID-19*Age[>75]	−0.167*
	(0.093)
COVID-19*Job Loss	0.722**
	(0.334)
COVID-19*Middle Income Tertile	0.089
	(0.076)
COVID-19*Rich Income Tertile	0.058
	(0.073)
Covariates	✓
Region FE	✓
Linear Trend	✓
Individual FE	✓
Observations	35,459

Source: English Longitudinal Study of Ageing (ELSA).
Note: The Table reports before-after estimates of the effect of the COVID-19 pandemic on the CES-Depression index. Standard errors in parenthesis are clustered at the individual level. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

One potential limitation of the results presented in Table 2 is that they are not very informative on the exact mechanisms generating the estimated effects. For example, the observed increase in reported depressive symptoms may be due to various factors, such as work-related consequences (job loss, furlough, altered working environment, etc.) or the social isolation provoked by the COVID-19 restrictions. While the magnitude of each factor cannot be separately estimated by using this dataset, Table 4 presents an attempt to gauge at these important channels descriptively. We compare individuals who are still in the labour market, and whose economic situation may have been strongly affected by the pandemic, with individuals who are retired, a group that is arguably financially more stable, being less exposed to the economic effects of the pandemic. As Table 4 shows, the estimated effects are significantly larger amongst the retired. Next, we attempt to disentangle between the retirement and the age effects, by including in the model a set of dummies, and their interactions, for three age-brackets: (*i*) 50–64 (reference category); (*ii*) 65–74; (*iii*) older than 75. The results suggest that there is not a differential effect by age. To conclude, we study in depth the extent to which the economic situation matters in the observed pandemic effects. In particular, we first explore whether, and to what extent, individuals who lost their job as a consequence of the pandemic where more likely to experience stronger effects. The results of this exercise confirm that indeed those who lost their job experienced a greater increase in their depressive symptoms ($\beta = 0.722$) than their counterparts as a consequence of the pandemic. Finally, we examined whether the observed effects differ across three levels of income (tertiles): low, middle, and rich. The results obtained show that, regardless of the specification used, the effect of the pandemic on mental health is not statistically different across income groups.[10]

4. Discussion

In this paper, we use rich panel data to quantify the impact of the COVID-19 on mental wellbeing in people aged 50 years and over. Our findings shows that levels of depression amongst older adults in the UK worsened significantly following the pandemic. Thus, the CES-D index rose by an average of 0.62 over 8 points, after controlling for various individual attributes (such as socioeconomic parameters, lifestyle behaviour, health conditions, and exposure to COVID-19). Given the breadth and depth of the data used, which allowed us to control for individual, regional and time fixed effects, and to consider trends in depression levels prior to the pandemic outbreak, it can be assumed that our results reliably associate the observed mental health deterioration with the COVID-19 outbreak and with the confinement measures adopted by the health authorities.

Our findings corroborate previous results obtained for the general population and for specific sub-groups. For instance, drawing on data from the SHARE Corona Survey, Atzendorf and Gruber [25] found that 16% of retired respondents aged 60 and above reported more feelings of depression after the pandemic. Likewise, several studies have documented a worsening of the mental health in the UK general population as measured by the GHQ-12 index of around 8% in the period 2009–2020 [7], or a decrease of a slightly lower magnitude if only the period immediately before the COVID-19 outbreak is considered [21]. Additionally, a deterioration in mental state has also been reported for specific population groups such as persons with physical disabilities [25] or with chronic mental health disorders [20]. However, our study is amongst the very few to focus on the evolution of mental health in older adults, a population group that is especially vulnerable to the pandemic.

We observed sizeable differences in the effect of the pandemic on mental health according to socioeconomic features such as gender, and occupational situation, suggesting that individuals' socioeconomic conditions are a relevant factor and should be considered when measuring the impact of the COVID-19 outbreak on the mental health of the population [7,20,21,25]. In this respect, as expected, having lost employment appears to be the strongest predictor of underlying mental disorders during the pandemic, in line with previous research [7,17]. Retired individuals are next in experiencing worst mental health outcomes, despite the fact that most of them had a more stable financial situation during the pandemic. In addition, it is striking that the negative impact of the pandemic on the depression index was around 18% stronger in women than in men. Previous studies of the general population in the UK [7,9] and in other countries and for other population groups have found similar although slightly weaker gender effects [17,26].[11] This difference has been explained by the fact that women tend to perform more unpaid tasks, such as childcare, caregiving or housework, and this may provoke higher levels of stress [26]. This suggestion is supported by data reported by the European Association Working for Carers, according to which informal care tends to be delivered by older adult women [27]. However, interestingly, higher levels of ansxiety have also been reported by female healthcare workers relative to their male counterparts during the COVID-19 pandemic [28].

Regarding income, we depart from previous work [21] by observing an equal distribution of the mental health deterioration following the pandemic across the income distribution as found by Foremny et al. [17]. This suggests a limited role of income as a protective mechanism for mental health in older adults, possibly reflecting the fact that wealthier individuals are more likely to engage in behaviours such as teleworking, which limits the spread of the disease but may also increase

[10] In Table A.5, in the Appendix, we provide additional heterogeneity analysis and report differential effects by: (i) pre-pandemic depression status; (ii) pre-existing health conditions, to account for differences in precautionary health behaviour; (iii) self-employment; (iv) wage employment. The estimated coefficients imply that the pandemic had a greater toll on mental health for non-depressed, those with pre-existing health conditions, and those in self-employment.

[11] For instance, in the study by Banks and Xu [7] the share of women with any severe problems increased by 6 percentage points relative to men between 2009 and 2020 and in Foremny et al. [17] the probability of reporting worse mental health increased between 5.3 and 7.8 percentage points between 2017 and 2020.

social isolation [28], while at the same time low income indiduals may experience higher financial stress as a consequence of the pandemic.

The separate analysis of the lockdown intensity measures reveals that deterioration in mental health in November 2020 was almost twice as much that observed in July 2020, confirming that the more restrictive measures implemented in the UK in the second period played a key role in the observed increase in the CES-D index results. However, we should also bear in mind that this could also be a consequence of a cumulative effect of the pandemic restrictions. Finally, with respect to the pre-pandemic health outcomes, our results suggest a further deterioration in mental health states only for individuals with pre-existing physical health conditions, but not necessarily for those with pre-existing mental disorders as found in earlier work [20,21].

Although our findings show that the mental health of older adults has been damaged by the pandemic, it is difficult to isolate the exact factors causing this deterioration. Pierce et al. [21] suggest four potential channels by which COVID-19 could have worsened mental health: acute financial strain (unemployment or low income), household dynamics (loneliness, domestic violence, and family burden), the presence of underlying mental conditions, or specific effects such as the fear of being infected. To isolate acute financial strain from the other effects, we separately estimated the impact of COVID-19 on the mental health of retired and non-retired persons, under the assumption that the former would be less exposed to financial shock, since they tend to have greater financial security than persons who are working or otherwise non-retired. However, we observed that the pandemic had a stronger negative impact on the mental health of the participants who were retired, which suggests that, although levels of depression increased in both population groups, the differences observed during the pre-pandemic period have since narrowed.

These findings provide evidence that factors other than financial strain (such as social isolation or generalised fear of the virus) could have played a major role in the mental health deterioration experienced by older adults, suggesting that factors other than income, such as social interaction, might be more important for well-being in later life, as suggested by earlier studies. Moreover, the financial protection provided by the UK government to support household incomes and to maintain and create jobs [29,30] might have eased concerns amongst non-retired people about the potential effects of the pandemic on their economic situation. Overall, non-financial factors such as the closure of daycare or community centres, where older people usually have social contact [16], the frequent exposure to social media/news relating to COVID-19 [11], and the confinement measures [31], may have been the most important mediating factors influencing levels of mental health amongst older adults.

5. Conclusions

We investigate the impact of the COVID-19 pandemic on depression as measured by the CES-D index in the older population using data from seven waves of English Longitudinal Study of Ageing (2010–2020). By employing a panel data approach, we capture relevant pre-pandemic differences in mental health levels across different population subgroups and account for unobserved confounding factors. Additionally, we conduct several heterogeneity analysis (age, gender, income, working status, intensity of lockdown restrictions) which allows us to identify some of the most important channels behind the deterioration of mental health in older adults (such as high informal workload, financial situation, social isolation) following the COVID-19 pandemic.

Our findings provide compelling evidence that depression levels amongst older adults have worsened considerably following the pandemic. Likewise, we find a substantial worsening of the levels of depression for those who lost their job as a consequence of the pandemic, retired individuals, and women. However, our estimated effects show no income gradient, suggesting a limited role of financial factors during the pandemic as a protective mechanism for mental health in this population group.

According to our results, to protect mental well-being of older individuals in situations such as the current pandemic, financial measures should be combined with social support iniciatives. In particular, persons at risk are recommended to remain active, to take appropriate physical exercise, to maintain a healthy diet, to reduce their consumption and dissemination of COVID-related information and to make use of available technological resources (such as social networks) [11,26]. Moreover, health authorities should adapt their organisational structures to facilitate access to mental health resources for those most in need [13].

To complement the findings obtained in the present study, further research should be undertaken to analyse the influence of potential risk factors for depression amongst the older population. Nevertheless, the findings we present could help policy-makers design and implement more appropriate interventions, thus alleviating the potential consequences of the pandemic on the mental health of this vulnerable population group. Given that the pandemic is going to continue in the near future, the mental health of older adults should be closely monitored, and measures put in place in order to avoid the considerable economic and health burden associated to it.

Declaration of Competing Interest

None.

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Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.healthpol.2022.07.001.

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