OXFORD

Oxford Open Economics, 2023, **2**, 1–14
https://doi.org/10.1093/ooec/odad085
Advance access publication date 9 November 2023
Research Article

The informal carer experience during the COVID-19 pandemic: mental health, loneliness, and financial (in)-security

Edward JD Webb [1,*], David Meads[1] and Clare Gardiner[2]

[1]Leeds Institute of Health Sciences, University of Leeds, Worsley Building, Clarendon Way, Leeds, LS2 9NL, UK
[2]Health Sciences School, University of Sheffield, 362 Mushroom Lane, Sheffield, S10 2TS, UK
*Correspondence address. Leeds Institute of Health Sciences, University of Leeds, UK. E-mail: e.j.d.webb@leeds.ac.uk

Abstract

Informal caring is associated with many negative outcomes. COVID-19 caused societal disruption, which may have disproportionately impacted carers. Reducing inequalities requires knowing whether, and how, carers were impacted. COVID-19 Understanding Society survey participants who were informal household carers (IHCs) were matched with a non-IHC comparison group. Differences between the groups were assessed for mental health (measured using General Health Questionnaire, GHQ-12), loneliness, subjective financial security, whether behind with mortgage/rent payments or bills, household wealth changes, and whether receiving universal credit (UC). A total of 1617 IHCs were matched with 6684 comparators. IHCs' GHQ-12 scores were 0.613 points higher; they experienced greater loneliness and worse subjective financial security. IHCs were significantly more likely to experience decreased household wealth and receive UC, but not to be behind with bills. IHC outcomes remained worse than comparators in September 2021. Spending longer caring, caring for a partner, and not being employed were associated with worse outcomes.

Keywords: COVID–19, mental health, loneliness, financial security, UK Household Longitudinal Survey, welfare.

Introduction

Around 6.5 million people in the UK provide unpaid care to someone in need of support, for example due to illness, disability, age, or frailty Carers UK (2019). While many people find at least some aspects of care rewarding (Wolff et al. 2007; Wong et al. 2009), it can also present a burden, and lead to inequalities between carers and non-carers. There is evidence that caring can have a deleterious effect on people's mental health (Mahoney et al. 2005; Cooper et al. 2007; Coe and Van Houtven 2009; Schmitz and Westphal 2015; Ma et al. 2018; Bom et al. 2019; Balkaran et al. 2021). It can also lead to feelings of loneliness (Gray et al. 2020; Hajek et al. 2021; Velloze et al. 2022), partly driven by a lack of social interaction (Vasileiou et al. 2017). Loneliness has been shown to be a key driver of poor quality of life for carers (Ekwall et al. 2005). Beyond mental health and loneliness, caring may also affect people's financial and economic wellbeing (Van Houtven et al. 2010; Liu et al. 2019; Balkaran et al. 2021), for example due to out-of-pocket costs related to caregiving tasks (Gardiner et al. 2014), or by changing patterns of workforce participation (Heitmueller 2007; Van Houtven et al. 2013; Schmitz and Westphal 2017) and reducing wages (Heitmueller and Inglis 2007).

COVID-19 has now caused over six million deaths worldwide (World Health Organization 2022), as well as leading to a range of sequelae in survivors (Aiyegbusi et al. 2021; Crook et al. 2021; Sudre et al. 2021). Beyond the immediate health effects, the pandemic and responses to it have had a huge impact on all aspects of society, including opportunities for, and methods of, working and spending. The pandemic and response to it has led to worse mental health (Daly et al. 2020; Pierce et al. 2020; Fancourt et al. 2021; O'Connor et al. 2021) and increased loneliness (Varga et al. 2021) among the UK general population.

In this paper, we examine whether the negative effects of the pandemic and response to it, while felt by the whole of society, have disproportionately impacted informal carers. Specifically, we studied informal household carers (IHCs): people who provide informal, i.e. unpaid, care to another person within the same household. The topic of whether IHCs were disproportionately impacted during COVID-19 is important to investigate, as it could potentially exacerbate existing inequalities faced by IHCs (Gardiner et al. 2020). It is essential to know how, and in what ways, IHCs have been affected by COVID-19 if support and interventions to help them are to be viable and cost effective. To give further insight into who was most affected, we also study whether there were differences in how different subgroups of IHCs were affected by the pandemic, for example whether those who spent more time caring were worse off than those who spent less time caring, or whether the impact depended on who care was being provided to. This shows whether there are some subgroups of IHCs who are in greater need, and might be prioritised for interventions and support.

Received: April 13, 2023. **Revised:** November 2, 2023. **Accepted:** November 3, 2023

Some existing research has indicated that carer mental health may have declined more than for non-carers during the pandemic (Willner et al. 2020; Mak et al. 2021; Whitley et al. 2021). However, little is known about other important outcomes such as loneliness and financial security during COVID-19. Studying several outcomes together is also useful in order to explore the intersectionality of risk factors and their associated outcomes. For example, Hanna et al. (2022) and Giebel et al. (2021) suggest that carer mental health has been impacted due to services for the person they care for closing in the wake of COVID-19. In addition, such closures may have affected IHCs financially, for example due to reduced employment opportunities or extra expenditures. We thus provide a holistic picture of the IHC experience, using high quality longitudinal data, and with analyses designed to identify a causal effect of caring for someone within the same household. This will enable support to be targeted towards the aspects of IHCs' lives where it is most needed.

Methods

All analysis was carried out in R.

The analysis aimed to measure differences on a range of outcomes between IHCs and a comparison group of non-IHCs in the UK using Understanding Society COVID-19 survey data collected between April 2020 and September 2021. The comparison group was selected by matching IHCs and non-IHCs on their observable characteristics.

Data

Understanding Society, also known as the UK Household Longitudinal Survey, is a longitudinal survey which has been running since 2009. In the main survey around 40 000 households take part, completing annual in-depth interviews with several modules about different aspects of their lives. Data gathering for each main survey wave typically takes two years, with a new wave started in January each year, so that recruitment periods overlap. The latest available waves of the main survey at the time of writing are 10, which recruited from January 2018 to December 2020, and 11, which recruited from January 2019 to December 2021. To supplement the main survey with a more frequent and specific picture of COVID-19's societal impact, participants were asked to take part in the Understanding Society COVID-19 survey, with around 18 000 responding. It was shorter than the main survey, with most responses gathered online and a subset from phone interviews. Participants answered questions about their life and experiences during the COVID-19 pandemic, including mental health, loneliness and financial measures. In their first wave taking part in the COVID-19 survey, they also answered some questions about their status at baseline, i.e. January/February 2020.

There were nine waves of the Understanding Society COVID-19 survey in total, with data gathering for each wave taking a month. Aligning these waves with government responses to the pandemic, wave 1 (April 2020) and part of wave 2 (May 2020) of the Understanding Society COVID-19 survey recruited during the first national UK lockdown. Eased measures and regional restrictions were in place for the rest of wave 2 as well as waves 3 and 4 (June and July 2020). There were increasing restrictions during wave 5 (September 2020), and wave 6 (November 2020) recruited during the second national lockdown. Waves 7 and 8 (January and March 2021) recruited during the third national lockdown, and some partial restrictions were still in place during the final wave (September 2021). The above is only intended to give a rough guide to the UK pandemic response, as there was variation in the measures used and their timing over both the nations of the UK and English regions.

Participants' mental health was measured using the General Health Questionnaire-12 (GHQ-12), a widely used 12 item survey (Banks et al. 1980; Goldberg 1988; Jackson, 2007). Participants are asked how often they have experienced various feelings, such as enjoying daily activities, on a four-point scale. For the GHQ-12 Likert scale used here, responses are scored from 0 to 3, with higher numbers representing more severe problems, and the overall score is calculated by summing all item scores.

In all waves of the main Understanding Society survey and waves 4, 6, 7, 8, 9 of the Understanding Society COVID-19 survey, participants who were not living alone were asked if they cared for someone in their household. The precise wording of the survey was: 'Is there anyone living with you who is sick, disabled or elderly whom you look after or give special help to (for example a sick, disabled or elderly relative, husband, wife or friend etc.)?' In this study, IHCs were defined as anyone who answered yes in any COVID-19 survey wave, or the main survey with a response data after 1/1/20. The reason for the main survey cut-off date was to maximise the chances that participants were IHCs at some point during the pandemic, and had not ceased caring some time previously. Potential comparison group members were defined as anyone who did not indicate being an IHC in either the main or the COVID-19 surveys, and who clearly indicated not being an IHC at least once in either waves 10 or 11 of the main survey or any COVID-19 survey wave.

Mahalanobis distance matching

Non-IHCs were matched to IHCs on baseline variables, i.e. their status prior to March 2020. The following baseline variables from the COVID-19 survey were used: age, gender, ethnicity, location classified using Nomenclature of Territorial Units for Statistics (NUTS) level 1, household size, household earnings, occupation, key-worker status, and whether in receipt of universal credit (UC). In addition, participants were matched on their most recent main survey responses pre-March 2020 for GHQ-12, loneliness, and subjective financial situation. Missing baseline variables were replaced using multiple imputation as implemented in the missForest package (Stekhoven and Bühlmann 2012).

Mahalanobis distance matching (MDM) using the nearest neighbour algorithm was implemented using the MatchIt package (Stuart et al. 2011). MDM is similar to the popular method of propensity score matching, but is more likely to create samples which are closely balanced on all matching variables. Propensity score matching may find samples which are balanced on their propensities to belong to the treatment or comparison group, but which differ on individual variables (King and Nielsen 2019). A 4:1 matching ratio was used, i.e. four members of the comparison group for every IHC. This ratio was chosen pragmatically on the grounds that it was likely to maximise sample size while ensuring enough potential comparators to provide close matches.

Analysis

The following outcomes were analysed using matched IHC/non-IHC samples: GHQ-12, loneliness, subjective financial security, whether up to date with housing payments, whether up to date with bills, and changes to household wealth during the pandemic. For participants under 65 and not on UC at baseline, it was also recorded whether they were in receipt of UC at any point during the pandemic. Different models were used appropriate to each dependent variable, with IHC status as an independent variable

Table 1. Outcome variables

Outcome	Description	Waves	Model
GHQ-12	Integer scale from 0–36, higher means worse mental health	1–9	RE linear model
Loneliness	In the last 4 weeks, how often did you feel lonely? 1 = Hardly ever or never; 2 = Some of the time; 3 = Often	1–9	RE ordered logit
Subjective financial security	How well would you say you yourself are managing financially these days? Would you say you are… 1 = Living comfortably; 2 = Doing alright; 3 = Just about getting by; 4 = Finding it quite difficult; 5 = Finding it very difficult	1,2,4,6,8,9	RE ordered logit
Up to date with housing payments	Many people find it hard to keep up with their housing payments. May we ask, are you up to date with your rent/mortgage? (Yes/no)	1,2,4,6,8,9	RE logit
Up to date with bills	Sometimes people are not able to pay every household bill when it falls due. May we ask, are you up to date with all your household bills such as electricity, gas, water rates, telephone, council tax, credit cards and other bills or are you behind with any of them? 1 = Up to date with all bills; 2 = Behind with some bills; 3 = Behind with all bills	1,2,4,6,8,9	RE ordered logit
Household wealth changes	During the pandemic, some people have had to borrow or use their savings to make ends meet. Others have saved more than usual because lockdowns restricted how they could spend. We are interested in what has happened to your household's total net wealth. That is, thinking about the value of any assets you may have (property including home, investments, deposit or current accounts, and other) minus any debts (mortgage, personal or car loans, credit cards and other), would you say that relative to just before the pandemic began (January/February 2020) the net amount has: 1 = Gone up by 10% or more; 2 = Stayed about the same; 3 = Gone down by 10% or more	8,9	Pooled ordered logit
UC	Have you applied for UC since March 1st 2020/the last time you completed this survey on [date]? (Yes/no)	4,6,8,9	Pooled logit

Note. GHQ = General Health Questionnaire; RE = random effects

along with control variables. For panel models, dummy variables for waves 2–9 were included and interacted with IHC status. Full details of how the outcomes were defined, what survey waves they were collected in, and what models were used to analyse them are given in Table 1.

The following were included as control variables: log age, gender, ethnicity (white/non-white), key worker status, annualised household income, household size, annualised baseline household earnings, whether in employment (including self-employment) at baseline, baseline GHQ-12, baseline loneliness, baseline subjective financial security, location. Key workers were self-identified using a survey question[1] which was part of questions about paid employment. Thus it is unlikely that any respondents considered themselves key workers by virtue of being an informal, unpaid carer for someone within their household.

Random effects (RE) linear models were estimated using the plm package (Croissant and Millo 2008). RE ordered logit models were estimated via simulated maximum likelihood with 1000 Halton draws using the Apollo choice modelling package (Hess and Palma 2019). RE logit models were estimated using the pglm package (Croissant 2021), pooled ordered logit models were estimated using the polr function from the MASS package (Ripley et al. 2013).

A range of outcome measures were studied in order to obtain a broad view of IHCs' experiences. However, testing multiple outcome variables can lead to spurious results. To guard against this, it was assessed whether the main effects of being an IHC on all seven outcome variables were still statistically significant at the conventional 5% level after applying Holm's sequential Bonferroni correction (Holm 1979).

As a robustness test, models were also run with a binary outcome reporting a GHQ-12 caseness[2] score of four or more. Being above this threshold is often used as an indicator of possible mental health problems (Goldberg 1988; Thomson et al. 2018).

Subgroup analysis

The analysis methods outlined above were also used with subgroups (including separate MDM for each group). The subgroups were based on COVID-19 survey wave 1 responses, and were defined as follows:-

1. Relationship to person cared for
   - Adult child
   - Child under 18
   - Parent
   - Partner/spouse
2. Hours spent caring each week
   - 1–19 hours
   - 20–100 hours
   - Provides continuous care
3. Gender
   - Female
   - Male
4. Occupation
   - Employed/self-employed
   - Not in employment/self-employed
5. Age
   - Above median age (55 years)
   - At or below median age (55 years)
6. Household income
   - Above median household income (£23 400)
   - At or below median household income (£23 400)

[1] 'Are you a key worker?'

[2] GHQ-12 caseness is calculated by scoring an item as 0 if either of the two least serious responses are indicated and 1 if either of the two most serious responses are indicated. The total caseness score thus has a range from 0 to 12.

Table 2. Mahalanobis distance matching

			Pre-matching		Post-matching		SMD
			IHCs %	Non-IHCs %	IHCs %	Non-IHCs %	
Age	(mean)	50.9	54.1	48.8	54.1	52.6	0.0878
Female		58.2	61.3	57	61.3	61.2	2.77x10^−3
White		86.1	82.4	86.4	82.4	82.6	−4.32x10^−3
Location	North East	3.43	3.29	3.22	3.29	3.29	0
	North West	9.8	10.6	9.89	10.6	10.8	−8.26x10^−3
	Yorkshire	8.42	8.14	8.42	8.14	8.02	4.38x10^−3
	East Midlands	7.51	7.84	7.74	7.84	7.94	−3.90x10^−3
	West Midlands	8.71	9.46	8.58	9.46	9.44	5.11x10^−4
	East England	9.46	8.32	9.65	8.32	8.24	2.71x10^−3
	London	11.3	12.7	10.8	12.7	12.6	4.04x10^−3
	South East	13.3	12.9	13.5	12.9	13.1	−6.24x10^−3
	South West	8.79	7.96	8.89	7.96	7.59	0.0138
	Wales	6.05	6.28	5.99	6.28	6.37	−3.70x10^−3
	Scotland	8.67	6.94	8.63	6.94	7	−2.35x10^−3
	Northern Ireland	4.56	5.51	4.59	5.51	5.51	0
Household size	(mean)	2.76	3.06	3.02	3.06	3	0.0465
Annual earnings (£1000 s)	(mean)	22 300	23.7	35.3	23.7	26.9	−0.124
Occupation	Employed	52	41.5	57	41.5	44.9	−0.0701
	Self-employed	8.04	6.58	8.18	6.58	6.72	−5.43x10^−3
	Employed and self-employed	2.18	1.62	2.19	1.62	2.21	−0.0475
	Not employed	37.8	50.3	32.6	50.3	46.1	0.0838
	Key-worker	25.2	22.8	29.7	22.8	23.2	−0.0103
Baseline GHQ-12	(mean)	11.4	12.9	11.2	12.9	11.7	0.199
3-point scale loneliness	(mean)	1.46	1.54	1.42	1.54	1.46	0.126
5-pont scale subjective financial security	(mean)	2.02	2.28	1.98	2.28	2.1	0.175
Receiving UC		0.0285	0.0497	0.0227	0.0497	0.0492	2.07x10^−3
N		20 468	1671	15 174	1671	6684	

Note. IHC=informal household carer; SMD=standardised mean difference; GHQ-12=General Health Quesionnaire-12; UC=universal credit

Some control variables were omitted if they were perfectly or closely correlated with subgroup definitions. In addition, UC models were not estimated in the age subgroup, since participants over 65 were excluded from these models in any case.

Results

Table 2 summarises the baseline characteristics of all COVID-19 survey participants, as well as IHCs and non-IHCs before and after matching. Of 20 468 total participants, 1671 were IHCs and 15 174 potential comparison group members. IHCs were on average older than potential comparison group members, more likely to be female, less likely to be employed/self-employed, and more likely to be receiving UC prior to March 2020. After matching, 6684 comparison group members were included in the analysis, and the IHCs and matched non-IHCs generally had similar characteristics. A majority of respondents (~60%) in the analysis sample said they were rarely lonely at baseline, with around 6% saying they often felt lonely. The modal baseline subjective financial severity response was 'doing alright', with around 7% reporting one of the two worst outcomes (finding it very/quite difficult). Fewer than 5% of participants were receiving UC at baseline.

Table 3 gives the results for analysing GHQ-12 scores. There is a significant main effect of being an IHC with their scores being 0.613 higher overall. There were significant time effects, with scores significantly lower in waves 2, 4 and 5 (May, July, September 2020) and higher in waves 6,7 and 8 (November 2020, January, March 2021) and finally lower again in wave 9 (September 2021). Such fluctuations roughly coincide with increasing/decreasing COVID-19 rates and restrictions in the UK. No significant interactions between time and IHC status were observed.

Table 3 also shows the results of analysing loneliness scores. Again there is a significant main effect of being an IHC, with IHCs reporting on average around 0.5 higher loneliness on a three-point scale. Significant and positive time effects were seen in waves 6, 7 and 8, corresponding to increasing COVID-19 rates/restrictions, with a significant decrease in loneliness in September 2021 when rates were lower. There were two significant and positive interactions between wave and IHC status, in waves 4 and 9.

Table 4 gives the result of analysing subjective financial security. There is a significant and positive main effect of being an IHC, indicating worse subjective financial security. The time variables indicate a general worsening of subjective financial security over time, but there were no significant interactions with IHC status. The results for whether participants were up to date with housing payments and other bills are also given in Table 4. In neither case were there significant main effects of being an IHC, nor interactions with wave variables.

Table 5 shows that IHCs were significantly more likely to be in receipt of UC post-March 2020, and that their household wealth was more likely to decrease over the course of the pandemic compared to matched non-IHCs.

Significant main effects of being an IHC were found for five outcomes: GHQ-12, loneliness, subjective financial security, household wealth and receiving UC. After applying Holm's sequential Bonferroni correction, all these main effects remained statistically significant at the 5% level with the exception of UC.

For the subgroup analysis, the MDM results are given in Table A1-Table A6, and full analysis results are shown in Table A7-Table A21. Figure 1 illustrates the subgroup analysis for GHQ-12 scores, showing the main effects of being an IHC as well as changes in waves 2–9 relative to wave 1 for both IHCs and matched

Table 3. Model results for General Health Questionnaire-12 and loneliness

	GHQ-12		Loneliness	
	Coefficient	**se**	**Coefficient**	**se**
IHC	0.613*	0.15	0.466*	0.113
Wave 2	−0.186*	0.0777	−0.0303	0.0609
Wave 2 x IHC	−0.0314	0.17	−1.25x10^−4	0.131
Wave 3	0.0663	0.0795	−0.0794	0.0646
Wave 3 x IHC	−0.218	0.173	−0.0226	0.136
Wave 4	−0.676*	0.0805	−0.101	0.0673
Wave 4 x IHC	0.235	0.175	0.323*	0.14
Wave 5	−0.404*	0.0823	−7.46x10^−3	0.0706
Wave 5 x IHC	−0.0228	0.179	0.156	0.146
Wave 6	0.516*	0.0853	0.448*	0.07
Wave 6 x IHC	0.11	0.186	0.0646	0.147
Wave 7	0.551*	0.0862	0.675*	0.0716
Wave 7 x IHC	0.0643	0.187	−0.0675	0.148
Wave 8	0.192*	0.0867	0.389*	0.0736
Wave 8 x IHC	−0.234	0.188	−0.211	0.155
Wave 9	−0.357*	0.0852	−0.175*	0.0756
Wave 9 x IHC	0.227	0.183	0.325*	0.159
ln Age	−0.916*	0.164	−1.97*	0.113
Female	0.688*	0.0959	0.643*	0.0698
Ethnicity	−0.0365	0.156	−0.425*	0.109
Employed/self-employed	−0.655*	0.119	−0.268*	0.0967
Key-worker	0.0839	0.131	0.13	0.0897
Household income (£1000 s)	−2.75x10^−3*	9.99x10^−4	−2.55x10^−3*	8.49x10^−4
Household size	0.0131	0.0358	−0.191*	0.0313
Baseline household earnings (£1000 s)	−4.79x10^−4	2.28x10^−3	-4.37x10^−3*	1.78x10^−3
Baseline employed/self-employed	0.538*	0.155	0.0511	0.118
Baseline GHQ-12	0.428*	0.0105	0.111*	7.46x10^−3
Baseline loneliness	1.41*	0.0936	2.13*	0.0676
Baseline subjective financial situation	0.380*	0.0556	0.227*	0.0389
North East	−0.24	0.292	−0.119	0.214
North West	−0.329	0.203	0.054	0.149
Yorkshire	−0.0742	0.218	0.328*	0.153
East Midlands	−0.418	0.223	−0.0971	0.162
West Midlands	−0.0411	0.207	0.192	0.147
East England	−0.437*	0.216	−0.133	0.152
South East	−0.454*	0.197	−0.157	0.143
South West	−0.647*	0.225	−0.208	0.16
Wales	−0.377	0.239	−0.0428	0.176
Scotland	0.319	0.23	0.432*	0.159
Northern Ireland	−0.675*	0.251	0.0662	0.182
Constant	8.31*	0.765		
σ			2.33*	0.0404
τ_1			−2.21*	0.533
τ_2			2.21*	0.536
N	7966		8355	
N observations	50 759		52 547	

Note. IHC=informal household carer. *Significant at 5% level; se=standard error; GHQ-12=General Health Questionnaire-12

non-IHCs. (Note that this means that, unlike with results tables, figures show how participants' outcomes change between wave 1 and subsequent waves, rather than interactions between wave and IHC status.) With subgroups based on the person cared for, only IHCs for a partner had a significant main effect, with worse GHQ-12 scores. However, with other subgroups there were cases in subsequent waves where there was either a significant worsening for IHCs with no significant effects for non-IHCs, or significant improvements for non-IHCs only, indicating a disproportionate impact of caring. Examples were IHCs for adult children in wave 4, IHCs for children under 18 in waves 3, 5, and 9, and IHCs for parents in waves 2, 4–7 and 9. The main effect of caring was increasing in the time spent caring, indicating a worse impact on GHQ-12 scores the longer participants spent caring. However, there was little difference between IHCs and matched non-IHCs in subsequent waves. Patterns were mostly similar between gender, household income, and age based subgroups. There was a significant and positive effect of being an IHC in the non-employed subgroup, but not in the employed subgroup.

Figure 2 shows the results of analysing loneliness by subgroup. There are significant and positive main effects for people who care for children under 18 and partners, indicating greater loneliness. The latter group are also significantly more lonely in waves 6–8, but with no significant effects for matched non-IHCs. The main effects were increasing in the amount of time spent caring, but only significant for the continuous care subgroup. Patterns are

Table 4. Model results for financial security, housing payments and bills

	Subjective financial security		Housing payments up to date		Bills up to date	
	Coefficient	**se**	**Coefficient**	**se**	**Coefficient**	**se**
IHC	0.580*	0.112	−0.171	0.162	0.388	0.239
Wave 2	−0.027	0.0502	0.216*	0.11	0.0698	0.131
Wave 2 x IHC	−0.176	0.104	0.0518	0.226	0.14	0.246
Wave 4	0.211*	0.0541	−0.115	0.133	6.15x10^−3	0.145
Wave 4 x IHC	−0.193	0.116	0.575	0.295	−0.239	0.281
Wave 6	0.456*	0.0604	0.211	0.155	−0.0117	0.174
Wave 6 x IHC	−0.141	0.128	0.258	0.326	0.0229	0.324
Wave 8	0.139*	0.0643	0.169	0.157	−0.131	0.174
Wave 8 x IHC	−0.0651	0.132	−0.179	0.306	−0.018	0.343
Wave 9	0.635*	0.0658	0.0896	0.151	0.143	0.173
Wave 9 x IHC	−0.226	0.137	−0.0555	0.296	−0.142	0.335
ln Age	−0.658*	0.139	0.872*	0.165	−1.88*	0.265
Female	−0.151*	0.0748	−4.39x10^−3	0.105	0.123	0.176
Ethnicity	−0.967*	0.127	0.963*	0.151	−1.59*	0.236
Employed/self-employed	−0.459*	0.122	0.394*	0.174	−0.435	0.226
Key-worker	−0.249*	0.1	0.185	0.137	−0.199	0.228
Household income (£1000 s)	−0.0120*	0.00119	1.70x10^−3	1.92x10^−3	−0.0190*	3.72x10^−3
Household size	0.175*	0.0318	−0.0871*	0.0427	0.187*	0.0612
Baseline household earnings (£1000 s)	−0.0135*	0.00201	9.34x10^−3*	2.73x10^−3	−0.0304*	6.28x10^−3
Baseline employed/self-employed	1.17*	0.143	−0.33	0.189	0.841*	0.285
Baseline GHQ-12	0.0248*	0.00868	−0.0165	0.0105	0.0532*	0.0171
Baseline loneliness	0.374*	0.0752	0.0188	0.0959	0.374*	0.153
Baseline subjective financial situation	2.70*	0.0591	−0.468*	0.0574	1.97*	0.114
North East	0.0917	0.253	0.0919	0.32	−1.05	0.603
North West	0.0645	0.158	−0.0199	0.203	−0.202	0.326
Yorkshire	0.102	0.181	0.197	0.221	−0.716*	0.363
East Midlands	−0.156	0.172	0.387	0.25	−1.23*	0.416
West Midlands	0.124	0.164	−0.0282	0.203	−0.371	0.329
East England	−0.0413	0.174	0.309	0.229	−1.17*	0.4
South East	−0.014	0.158	0.677*	0.222	−1.09*	0.354
South West	−0.151	0.183	0.233	0.243	−0.687	0.39
Wales	0.214	0.189	−0.164	0.25	−0.696	0.418
Scotland	0.241	0.183	0.338	0.25	−1.02*	0.403
Northern Ireland	−0.212	0.207	0.148	0.269	−0.674	0.444
Constant			0.932	0.761		
σ	2.71*	0.0516	−2.12*	0.0937	−3.72*	0.155
τ_1	0.951	0.653			3.11*	1.22
τ_2	6.41*	0.658			8.33*	1.26
τ_3	10.3*	0.67				
τ_4	12.8*	0.683				
N	7082		7893		8010	
N observations	35 010		23 438		34 878	

Note. IHC=informal household carer. *Significant at 5% level; se=standard error; GHQ-12=General Health Questionnaire-12

similar between the gender and household income subgroups. There is a significant and positive main effect of caring in the non-employed subgroup, but not in the employed subgroup. There is a significant and positive main effect of caring for older, but not younger participants, but note that effect sizes in both cases are similar.

Figure 3 displays the results of analysing subjective financial security by subgroup. There were significant and positive main effects, indicating worse security, for people caring for adult children and partners. In wave 9, there were significantly positive effects for IHCs for children under 18 and partners, but no corresponding effect for their matched non-IHCs. In the time spent caring subgroups, there was a significantly positive main effect only for those spending 20–100 hours caring per week. There was a significant and positive main effect for female, but not male IHCs. The differential between IHCs and non-IHCs in wave 9 was greater for female than male IHCs. Both employed and non-employed IHC groups had a significant and positive main effect, but the size of the effect was greater for IHCs not in employment. In the non-employed subgroup, there were also significantly positive effects in waves 6 and 9, with no corresponding effect for matched non-IHCs. Patterns were similar in the older and younger subgroups. Patterns were somewhat different in the subgroups with below and above median household income, and there appeared to be a differential impact of caring in waves 4, 6 and 9.

Figure 4 summarises the subgroup analysis of whether participants were up to date with housing payments. Few significant effects were seen overall, but there was a significant and negative

Table 5. Model results for universal credit and household wealth change

	UC		Household wealth change	
	Coefficient	**se**	**Coefficient**	**se**
IHC	0.319*	0.148	0.188*	0.0735
ln Age	−0.917*	0.196	−0.0501	0.113
Female	0.169	0.141	0.0438	0.0618
Ethnicity	0.0473	0.191	−0.263*	0.107
Employed/self-employed	−0.582*	0.251	−2.19x10^−3	0.172
Key-worker	−0.395	0.232	−0.0349	0.0942
Household income (£1000 s)	−0.0163	0.0106	−0.0104*	3.34x10^−3
Household size	0.0616	0.0577	0.057	0.0317
Baseline household earnings (£1000 s)	−5.24x10^−3	7.36x10^−3	−5.72x10^−4	2.48x10^−3
Baseline employed/self-employed	0.982*	0.257	0.109	0.17
Baseline GHQ-12	−0.0203	0.0134	−5.15x10^−3	6.91x10^−3
Baseline loneliness	0.21	0.119	0.124*	0.0612
Baseline subjective financial situation	0.584*	0.073	0.336*	0.0377
North East	0.372	0.361	−0.029	0.189
North West	−0.651*	0.294	0.02	0.135
Yorkshire	−0.0161	0.257	0.0105	0.145
East Midlands	0.133	0.291	−0.0627	0.145
West Midlands	−0.267	0.255	−0.0399	0.138
East England	−0.269	0.295	0.0588	0.144
South East	−0.839*	0.321	0.0442	0.129
South West	−0.128	0.303	0.0668	0.149
Wales	−0.835*	0.413	0.152	0.16
Scotland	−0.155	0.313	0.323*	0.153
Northern Ireland	0.126	0.308	0.0359	0.166
Constant	−0.953	0.912		
τ_1			−1.38*	0.547
τ_2			2.75*	0.548
N	5727		5983	

Note. IHC=informal household carer. *Significant at 5% level; se=standard error; GHQ-12=General Health Questionnaire-12; UC=universal credit

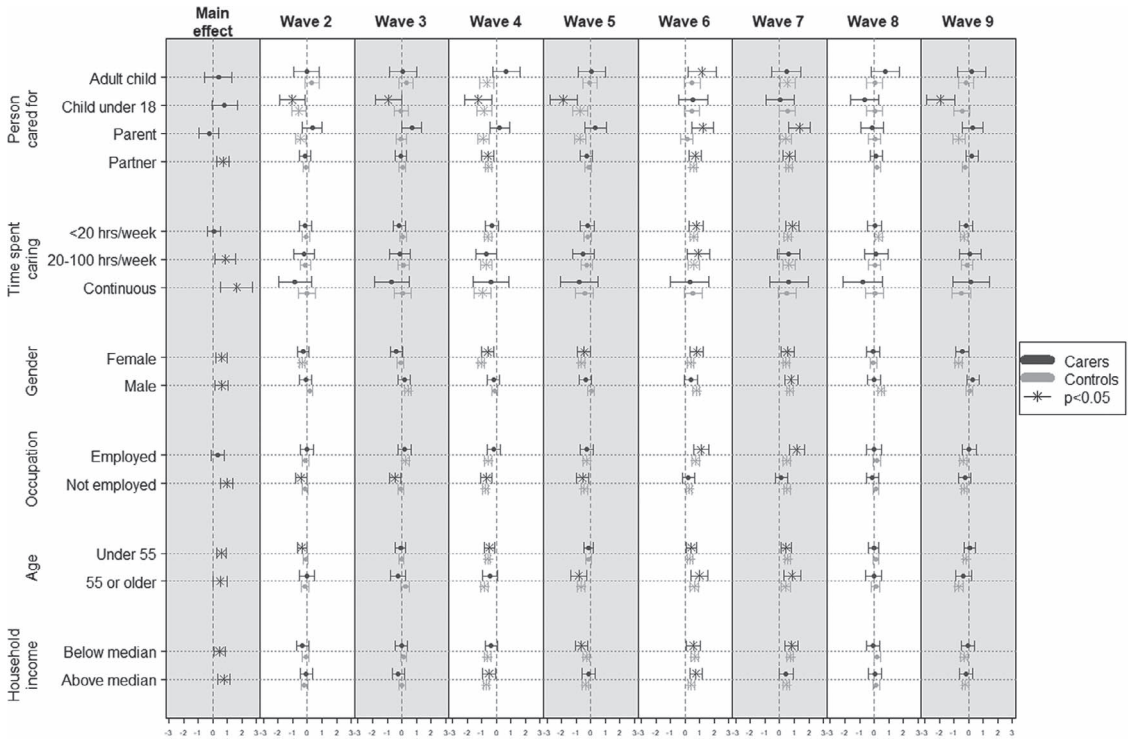

Figure 1. General health questionnaire results by subgroup

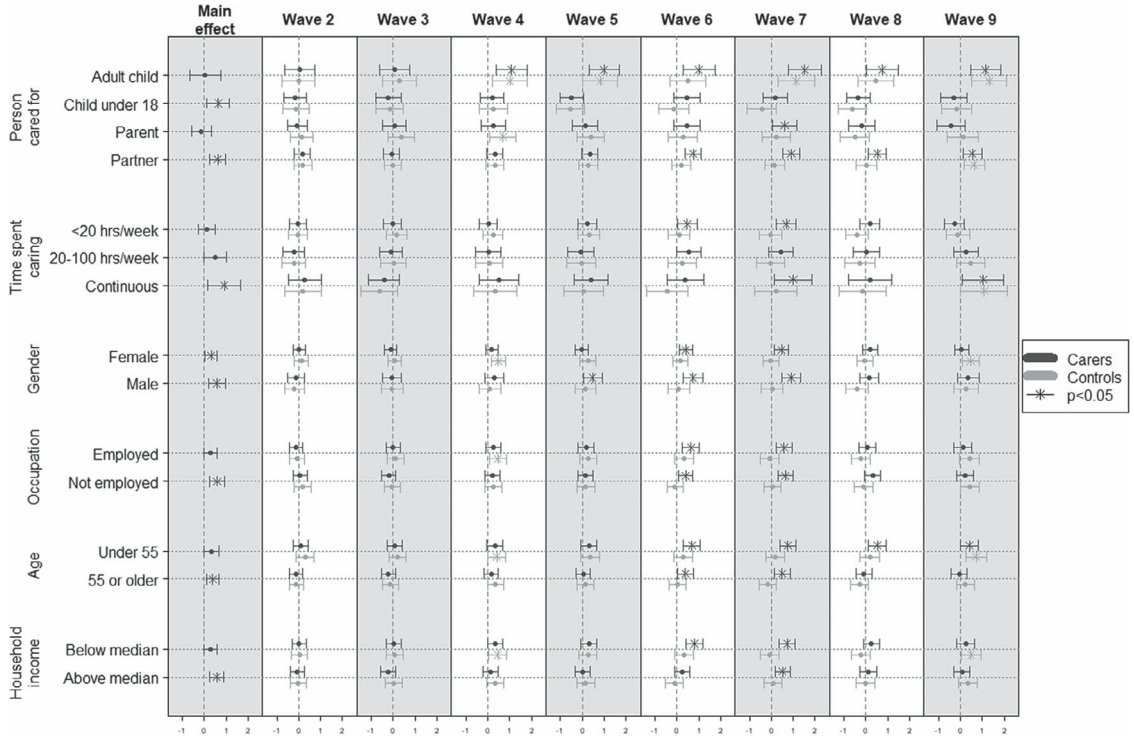

Figure 2. Loneliness results by subgroup

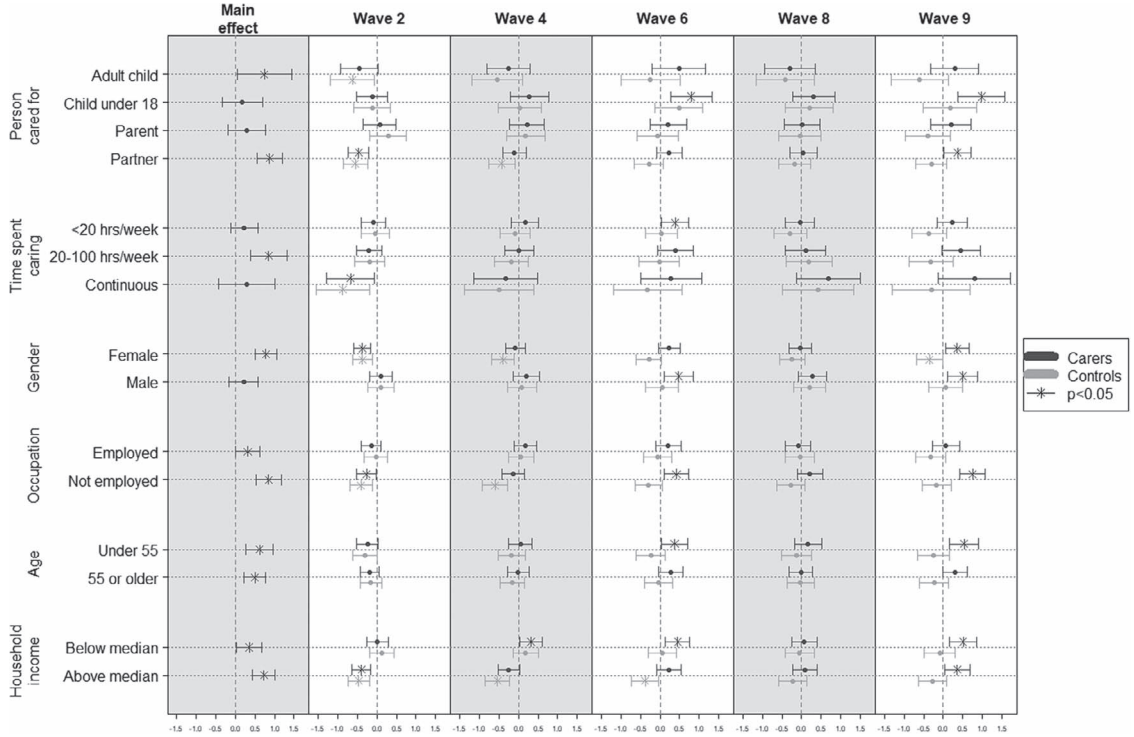

Figure 3. Subjective financial security results by subgroup

main effect, indicating being less likely to be up to date, for IHCs for children under 18.

Figure 5 illustrates the results of analysing whether participants were up to date with (non-housing) bills by subgroup. Again, few significant effects were seen overall, but there was a trend for the main effects of caring to increase with the time spent caring. Female and non-employed IHCs were also significantly more likely to be behind with bills, whereas male and employed IHCs were not. The results patterns differ between younger and older IHCs, and IHCs with below and above median household income. However, there are few indicators of a disproportionate impact of caring.

Figure 6 shows whether IHC subgroups were more likely than matched non-IHCs to receive UC during the studied period,

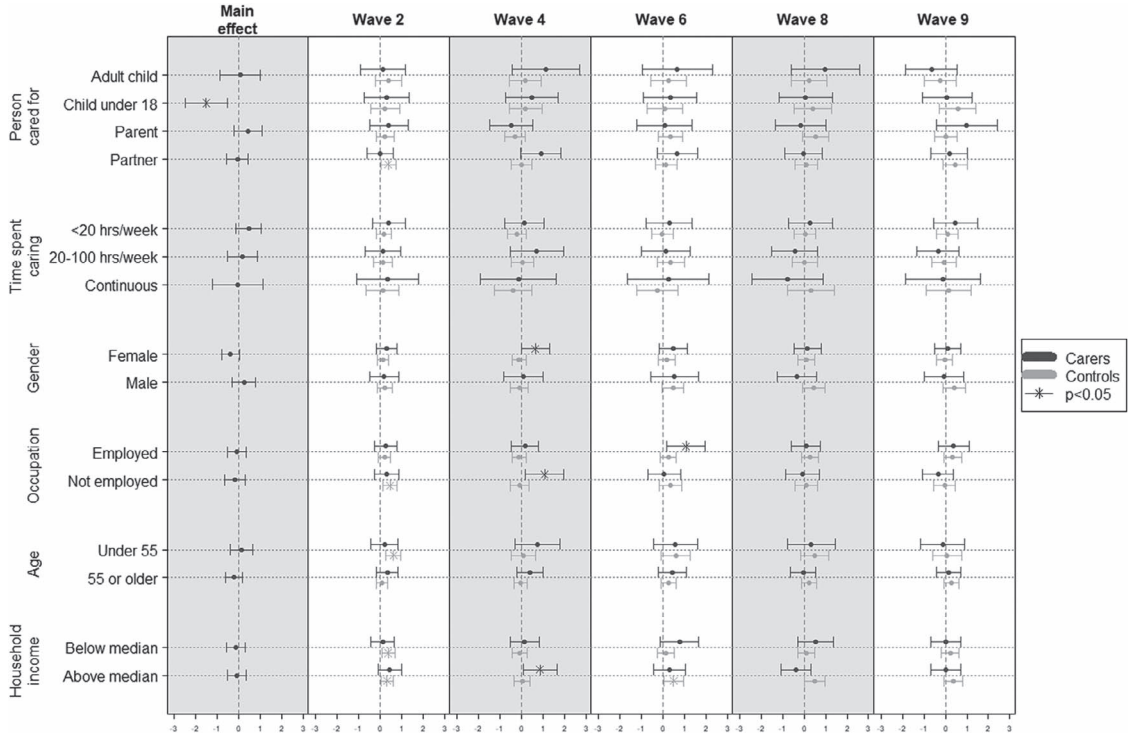

Figure 4. Housing payments up to date results by subgroup

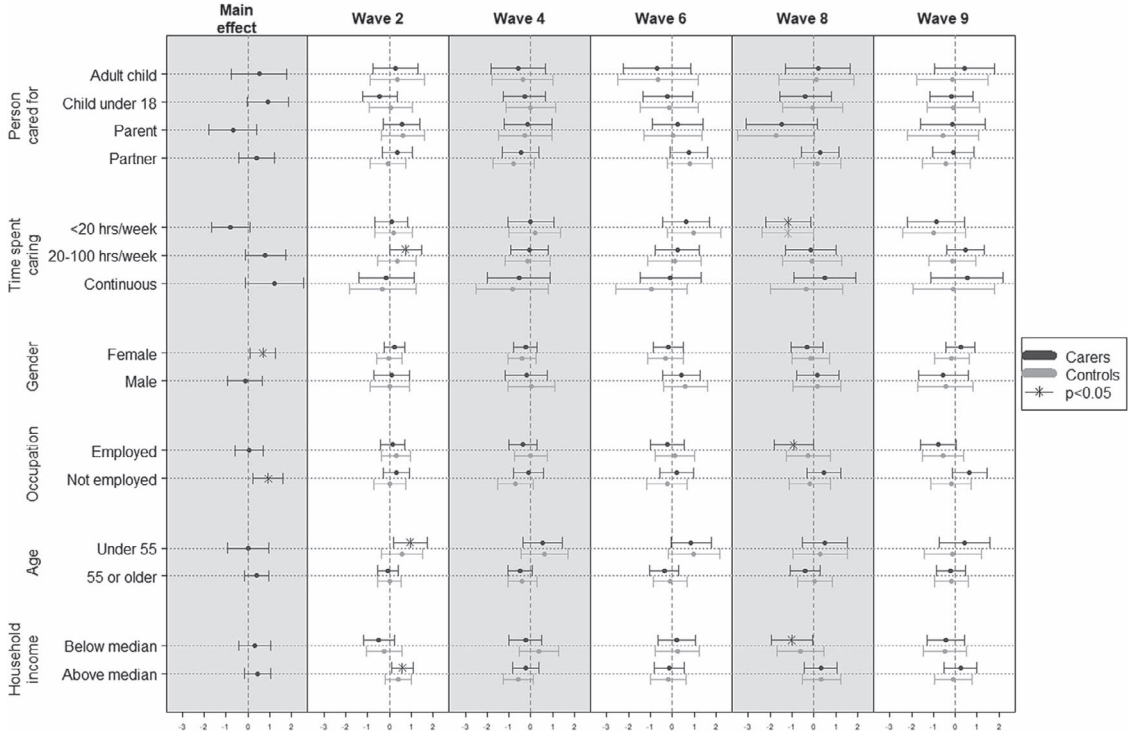

Figure 5. Bills up to date results by subgroup

conditional on not receiving it at baseline. IHCs for children under 18, who provide continuous care, who are female, who are in employment, and with a household income below the median, were all more likely to receive UC.

Figure 7 illustrates the effect of caring on how household wealth changed during the pandemic. A positive coefficient indicates that household wealth was less likely to increase and more likely to decrease. Significantly positive coefficients were seen for those caring for a partner, caring for under 20 hours per week, and those above the median age.

Fig. A1 summarises the results of analysing whether participants were above the GHQ-12 caseness threshold of 4, with full results given in Table A22 and Table A23. Results are generally similar to analysing GHQ-12 Likert scores.

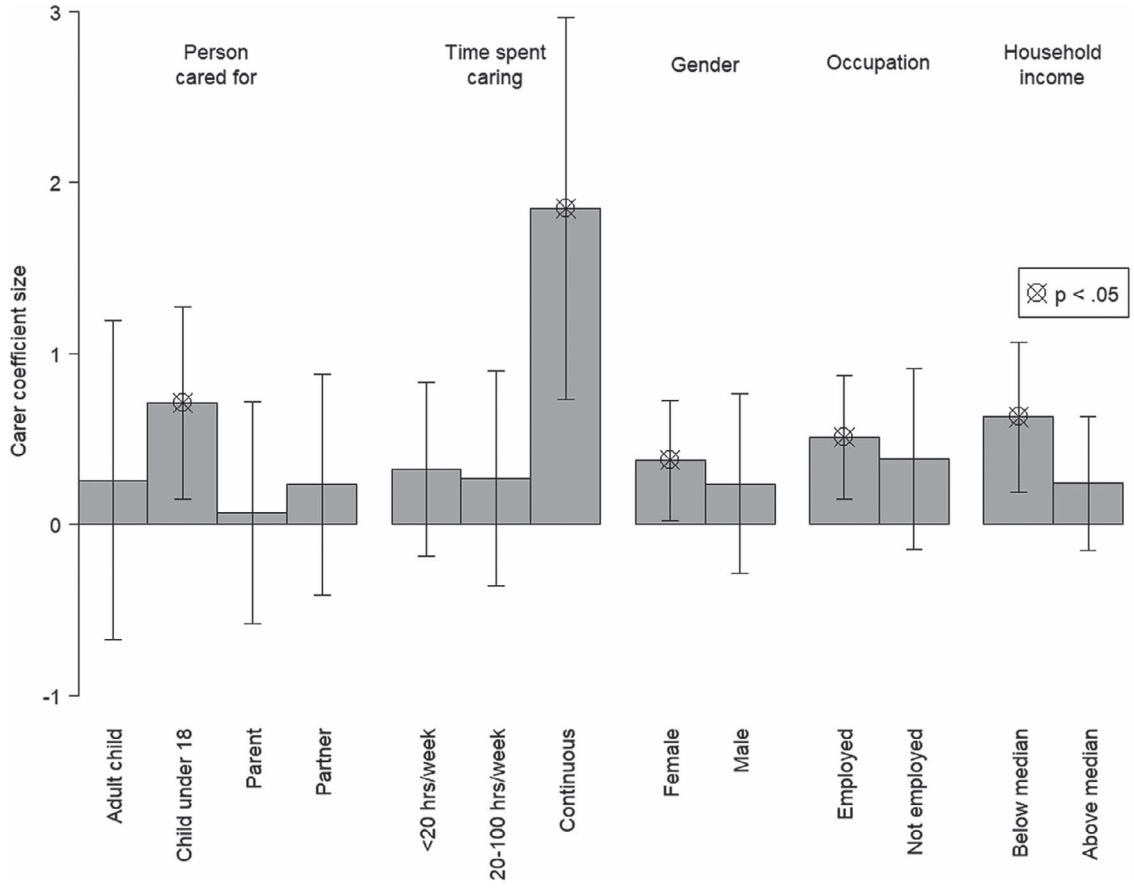

Figure 6. Universal credit results by subgroup

Discussion

The results show that during the COVID-19 pandemic, people who provided informal care for someone in their household were worse off in terms of mental health, loneliness, and a range of financial measures compared to people with similar characteristics who were not IHCs.

There are few previous studies on IHC financial wellbeing during the COVID-19 pandemic (Carers UK, 2020), although Jones (2022) and Wong et al. (2022) use a similar approach to provide evidence of worse labour market outcomes for people with disabilities. There are some studies on carer mental health during the period, including Costi et al. (2023), who examine people providing informal care outside the household using the COVID-19 UKHLS survey. The most similar study to ours is Whitley et al. (2021). They also use IHCs' GHQ-12 responses in the main survey and two waves of the COVID-19 UKHLS survey, and in line with our results show a decline in mental health compared to non-IHCs. We expand on this work, not only by exploring a wider range of outcomes, but also by using all COVID-19 survey waves. We also use a matched comparison group, in contrast to the aforementioned study, which provides more robust evidence of a causal effect of caring. Mak et al. (2021) studied carer mental health and loneliness using the University College London COVID-19 social study. In line with our findings they show a decline in mental health, but no effect for loneliness. This may be due to using a different measure of loneliness, or due to the fact that, although they used propensity score matching, they were not able to match on pre-covid outcomes. We also study a longer time frame, up to September 2021, as opposed to October 2020.

There were fluctuations in outcomes as the pandemic progressed over the study period, often indicating a worsening for IHCs, or an improvement only for non-IHCs. By the end of the study period, in September 2021, both mental health and loneliness for non-IHCs had improved compared to April 2020. This is in line with previous findings that, after a sharp initial fall, the UK general population's mental health gradually recovered during the pandemic (Fancourt et al. 2021; O'Connor et al. 2021). However, the wave 9 IHC interactions indicate that gaps remained between IHCs and non-IHCs for mental health, and IHC loneliness was even more severe by September 2021 than it was in April 2020. There were also indications that people felt less financially secure at the end of the studied period than at the start, with IHCs worse off than non-IHCs. This is in line with findings that IHCs' household wealth was more likely to decline over the course of the pandemic. Our results hence indicate the probability of long-term mental health and financial impacts of the pandemic on IHCs and there is a need to include IHC support as part of a post-covid recovery plan. Further follow-up of IHCs' outcomes would also be desirable in the light of declining mental health, and given the growing cost of living crisis, rising energy costs, and the fact that being behind with bills or housing payments can escalate into more serious financial situations.

The impact of the COVID-19 pandemic and response to it was not felt equally by all IHCs. This suggests that some groups may require greater, and more targeted, support. In particular, there were indications that mental health, loneliness, and financial status all became worse the more time people spent caring, with the hardest hit being those who provided round-the-clock care. There were also different outcomes depending on who individuals

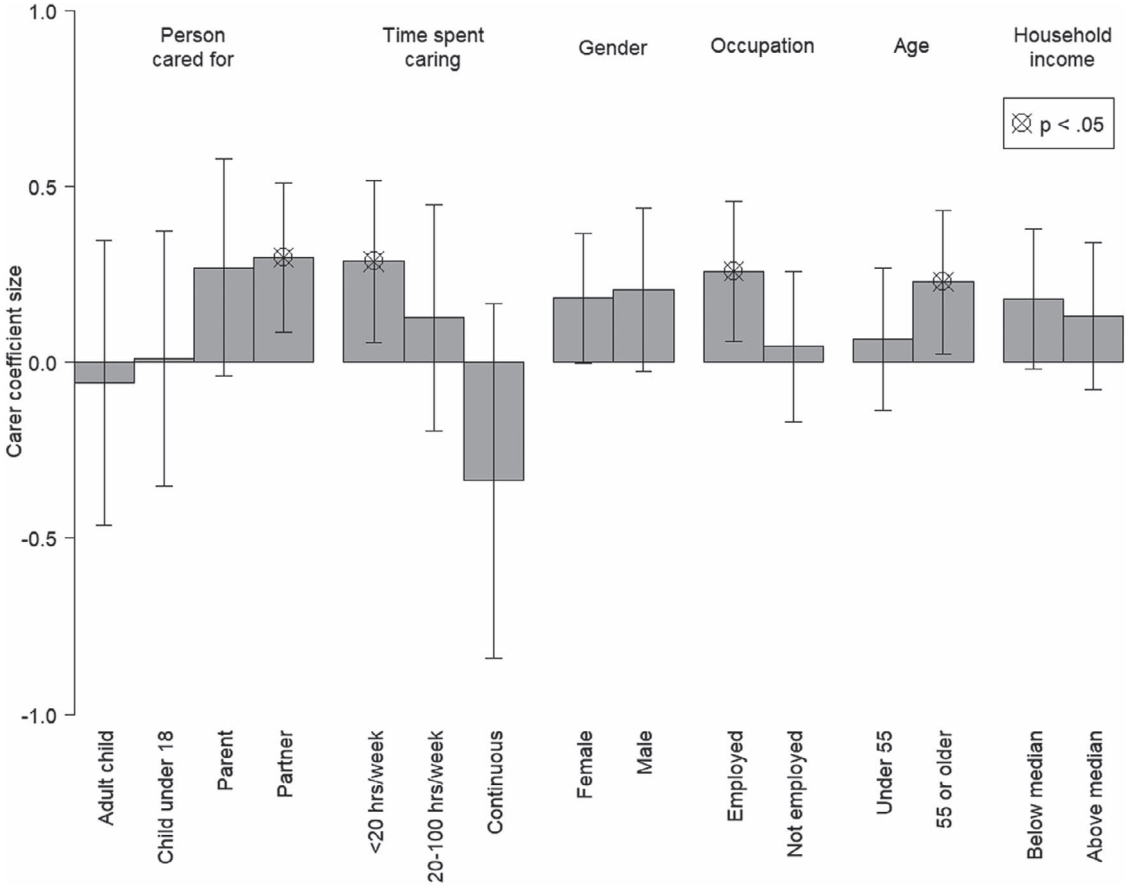

Figure 7. Household wealth change results by subgroup

were caring for. Those caring for a partner tended to fare worse than comparable non-IHCs over a range of outcomes. On the other hand, there were almost no significant effects observed for those caring for a parent. Outcomes also tended to be better for IHCs in employment compared to those not in employment. It would be constructive in future research to examine the latter group further, as it was not possible in the data to distinguish between people seeking employment and retired people. It is likely that each will have been affected differently by the pandemic.

That the pandemic's effects were heterogeneous is in line with previous findings that the mental health (Ma et al. 2018; Bom et al. 2019) and financial (Heitmueller and Inglis 2007) impact of caring can depend on the characteristics of both the carer and the person being cared for. A useful avenue of future investigation would be to explore what drove the heterogeneity of IHC experiences by investigating the causes of the observed differences between IHCs and non-IHCs during the pandemic. Some IHCs may have seen a positive effect, for example, if they were furloughed from their job, reducing the time pressures of caring while maintaining employment. Other IHCs may have experienced more time pressure and increased burden due to reduced help from outside the household. Informal caring for people in other households was not prevented by pandemic restrictions, and in fact saw an increase following the onset of COVID-19 (Office for National Statistics 2020). Formal carers were classed as key workers (Department for Education and Cabinet Office 2022), and so could continue providing services. Yet there are many reasons that some households may have received reduced outside help, leading to more within-household care. For example, carers for people ouside the household may have been confused about changing and unclear restrictions. People being cared for may have felt at risk from visitors from outside their household, whether from informal or paid carers. It could also be that at various periods carers or people being cared for were isolating.

It would also be useful in future to explore the links between the studied outcome variables, in particular the complex relationships between mental health and financial status.

In this study we did not seek to disentangle the direct effects of COVID-19 and the effects of the various policies and interventions employed in response to it, as this would have been difficult given the data. So for example, it was not possible to examine if mental health declines were attributable to anxiety about catching the disease, movement/activity restrictions, anxiety about anti-COVID-19 measures being ineffectual, or many other possible causes. Nevertheless, it is hoped that highlighting which IHC groups were most affected and how during the pandemic will help target future interventions and make best use of resources. This latter is especially needed given that, particularly in the early stages of the crisis, it is not clear that cost effectiveness was a concern when implementing COVID-19 interventions (National Audit Office 2020; Raffle 2020; House of Commons Public Accounts Committee 2021; Limb 2021).

There are two important questions regarding the interpretation and applicability of the results: First, to what extent were observed differences caused by participants being IHCs, and second, to what extent were differences caused by the COVID-19 pandemic and response to it. To address the first question, a range of sophisticated techniques were used to maximise the chances of

identifying causal inference. IHCs were matched with non-IHCs with similar baseline characteristics, so that caring was likely to be the salient difference between them. We used Mahalanobis distance matching, as there is evidence that it is superior to propensity score matching in identifying causality (King and Nielsen 2019). When running regression models, the matching variables and other covariates were included, to further control for differences between IHCs and non-IHCs. Finally, for longitudinal models, random effects were included, which can control for differences in unobserved characteristics, provided such characteristics are constant over time. However, despite these measures, it is not possible to say conclusively that differences between IHCs and non-IHCs are specifically caused by caring, and we do not make any claims to have definitively identified any causal effects in this study.

Regarding the second question, we do not attempt to present a counterfactual as to what outcomes would have been in the absence of the pandemic. Previous research has shown that caring can have adverse effects on both quality of life and finances (Foley et al. 2021). This means that, even in the absence of the pandemic, it might be expected that a cohort of IHCs would show worse outcomes over time compared to a cohort of non-IHCs, although both groups were similar at baseline. Yet, even if, hypothetically, the pandemic did not disproportionately affect IHCs, their outcomes are still worse than their non-IHC counterparts. Thus there is a policy need to address such inequalities.

In addition to the strengths and weaknesses regarding analysis techniques and causality discussed above, this paper has several other strengths and weaknesses. It is a strength that it makes use of detailed and timely data, which was longitudinal with frequent sampling points during crucial phases of the pandemic. We also studied a wide range of disparate outcomes, which enables a broad picture of the IHC experience during COVID-19 to be studied.

On the other hand, it is a weakness that COVID-19 survey participants were asked if they were an IHC only in a subset of waves, and first in wave 4 in July 2020. Thus it is difficult to know if someone was an IHC during the crucial first few months of the pandemic, although 70% of studied IHCs also reported being an IHC in a main survey wave before 1/3/20.

Conclusion

Our results have important implications. They show that inequalities have developed between IHCs and non-IHCs during the COVID-19 pandemic. There is an urgent need for interventions to address IHC welfare, with those who spend longer caring and caring for a partner a priority. Long COVID-19 may also lead to increased numbers of IHCs in future. The findings also highlight the need to plan for future crises to prevent exacerbating such inequalities going forward. Further research could usefully review the services available for IHCs during the pandemic, and how they did and did not support IHC needs.

Supplementary Data

Supplementary data is available at *Oxford Open Economics* online.

Acknowledgements

We would like to thank participants at the Summer 2022 Health Economists' Study Group Workshop in Sheffield, particularly Matt Sutton (University of Manchester) who acted as a discussant for the paper. This work was undertaken on ARC4, part of the High Performance Computing facilities at the University of Leeds, UK.

Funding

This work was funded by Research England through a grant to The University of Sheffield. The funder had no involvement in study design, analysis, interpretation of results, article writing or the decision to submit for publication.

Conflict of interests

The authors declare no competing interests.

Ethical approval

This study used publically available data and no ethical approval was required.

Data availability

This study uses data from Understanding Society which is available from the UK Data Service https://beta.ukdataservice.ac.uk/datacatalogue/series/series?id=2000053.

References

Aiyegbusi, O. L. *et al.* (2021) 'Symptoms, Complications and Management of Long COVID: A Review', *Journal of the Royal Society of Medicine*, **114**: 428–42.

Balkaran, B. *et al.* (2021) 'Self-Reported Burden of Caregiver of Adults with Depression: A Cross-Sectional Study in Five Western European Countries', *BMC Psychiatry*, **21**: 1–14.

Banks, M. H. *et al.* (1980) 'The Use of the General Health Questionnaire as an Indicator of Mental Health in Occupational Studies', *Journal of Occupational Psychology*, **53**: 187–94.

Bom, J. *et al.* (2019) 'The Impact of Informal Caregiving for Older Adults on the Health of Various Types of Caregivers: A Systematic Review', *The Gerontologist*, **59**: e629–42.

Carers UK. (2019). *Facts About Carers*. London, UK: Carers UK. https://www.carersuk.org/images/Facts_about_Carers_2019.pdf

Carers UK. (2020). *Caring Behind Closed Doors: Six Months On*. London, UK: Carers UK. https://www.carersuk.org/images/News_and_campaigns/Caring_Behind_Closed_Doors_Oct20.pdf

Coe, N. B., and Van Houtven, C. H. (2009) 'Caring for Mom and Neglecting Yourself? The Health Effects of Caring for an Elderly Parent', *Health Economics*, **18**: 991–1010.

Cooper, C., Balamurali, T., and Livingston, G. (2007) 'A Systematic Review of the Prevalence and Covariates of Anxiety in Caregivers of People with Dementia', *International Psychogeriatrics*, **19**: 175–95.

Costi, C. *et al.* (2023) 'Does Caring for Others Affect our Mental Health? Evidence from the COVID-19 Pandemic', *Social Science & Medicine*, **321**: 115721.

Croissant, Y. (2021). *Pglm: Panel Generalized Linear Models*. https://cran.r-project.org/package=pglm

Croissant, Y., and Millo, G. (2008) 'Panel Data Econometrics in R: the plm Package', *Journal of Statistical Software*, **27**: 1–43.

Crook, H. *et al.* (2021) 'Long Covid—Mechanisms, Risk Factors, and Management', *BMJ*, **374**: n1648.

Daly, M., Sutin, A. R., and Robinson, E. (2020) 'Longitudinal Changes in Mental Health and the COVID-19 Pandemic: Evidence from the UK Household Longitudinal Study', *Psychological Medicine*, **52**: 1–10.

Department for Education, & Cabinet Office. (2022). *Children of Critical Workers and Vulnerable Children Who Can Access Schools or*

Educational Settings. London: UK Government. Retrieved from https://www.gov.uk/government/publications/coronavirus-covid-19-maintaining-educational-provision/guidance-for-schools-colleges-and-local-authorities-on-maintaining-educational-provision

Ekwall, A. K., Sivberg, B., and Hallberg, I. R. (2005) 'Loneliness as a Predictor of Quality of Life Among Older Caregivers', *Journal of Advanced Nursing*, **49**: 23–32.

Fancourt, D., Steptoe, A., and Bu, F. (2021) 'Trajectories of Anxiety and Depressive Symptoms During Enforced Isolation Due to COVID-19 in England: A Longitudinal Observational Study', *The Lancet Psychiatry*, **8**: 141–9.

Foley, N. *et al.* (2021) '*Informal Carers* House of Commons Library Research Briefings'. https://commonslibrary.parliament.uk/research-briefings/cbp-7756/.

Gardiner, C. *et al.* (2014) 'Exploring the Financial Impact of Caring for Family Members Receiving Palliative and End-of-Life Care: a Systematic Review of the Literature', *Palliative Medicine*, **28**: 375–90.

Gardiner, C. *et al.* (2020) 'Equity and the Financial Costs of Informal Caregiving in Palliative Care: A Critical Debate', *BMC Palliative Care*, **19**: 1–7.

Giebel, C. *et al.* (2021) 'Impact of COVID-19 Related Social Support Service Closures on People with Dementia and Unpaid Carers: a Qualitative Study', *Aging & Mental Health*, **25**: 1281–8.

Goldberg, D. P. (1988) 'User's guide to the general health questionnaire', in *Windsor*. https://books.google.co.uk/books/about/A_User_s_Guide_to_the_General_Health_Que.html?id=LpSuGQAACAAJ&redir_esc=y.

Gray, T. F., Azizoddin, D. R., and Nersesian, P. V. (2020) 'Loneliness Among Cancer Caregivers: A Narrative Review', *Palliative & Supportive Care*, **18**: 359–67.

Hajek, A., Kretzler, B., and König, H.-H. (2021) 'Informal Caregiving, Loneliness and Social Isolation: A Systematic Review', *International Journal of Environmental Research and Public Health*, **18**: 12101.

Hanna, K. *et al.* (2022) 'Emotional and Mental Wellbeing Following COVID-19 Public Health Measures on People Living with Dementia and Carers', *Journal of Geriatric Psychiatry and Neurology*, **35**: 344–52.

Heitmueller, A. (2007) 'The Chicken or the Egg?' *Journal of Health Economics*, **26**: 536–59.

Heitmueller, A., and Inglis, K. (2007) 'The Earnings of Informal Carers: Wage Differentials and Opportunity Costs', *Journal of Health Economics*, **26**: 821–41.

Hess, S., and Palma, D. (2019) 'Apollo: A Flexible, Powerful and Customisable Freeware Package for Choice Model Estimation and Application', *Journal of Choice Modelling*, **32**: 100170.

Holm, S. (1979) 'A Simple Sequentially Rejective Multiple Test Procedure', *Scandinavian Journal of Statistics*, 65–70.

House of Commons Public Accounts Committee (2021) *COVID-19: Government Procurement and Supply of Personal Protective Equipment*. London: UK Parliament.

Jackson, C. (2006) 'The General Health Questionnaire', *Occupational Medicine*, **57**: 79–9.

Jones, M. (2022) 'COVID-19 and the Labour Market Outcomes of Disabled People in the UK', *Social Science & Medicine*, **292**: 114637.

King, G., and Nielsen, R. (2019) 'Why Propensity Scores Should Not be Used for Matching', *Political Analysis*, **27**: 435–54.

Limb, M. (2021) 'COVID-19: Private Hospitals "Fell Well Short" in Delivering Care during the Pandemic, Says Report', *BMJ*, **375**: n2471. https://doi.org/10.1136/bmj.n2471.

Liu, Y. *et al.* (2019) 'Financial Strain, Employment, and Role Captivity and Overload over Time Among Dementia Family Caregivers', *The Gerontologist*, **59**: e512–20.

Ma, M. *et al.* (2018) 'Alzheimers' Disease and Caregiving: a Meta-Analytic Review Comparing the Mental Health of Primary Carers to Controls', *Aging & Mental Health*, **22**: 1395–405.

Mahoney, R. *et al.* (2005) 'Anxiety and Depression in Family Caregivers of People with Alzheimer Disease: the LASER-AD Study', *The American Journal of Geriatric Psychiatry*, **13**: 795–801.

Mak, H. W., Bu, F., and Fancourt, D. (2021) 'Mental Health and Wellbeing Amongst People with Informal Caring Responsibilities Across Different Time Points During the COVID-19 Pandemic: A Population-Based Propensity Score Matching Analysis', *medRxiv*.

National Audit Office (2020) 'Investigation into Government Procurement During the COVID-19 Pandemic', *HC959 Session 2019–2021*.

O'Connor, R. C. *et al.* (2021) 'Mental Health and Well-Being During the COVID-19 Pandemic: Longitudinal Analyses of Adults in the UK COVID-19 Mental Health & Wellbeing Study', *The British Journal of Psychiatry*, **218**: 326–33.

Office for National Statistics. (2020). *Coronavirus and the Impact on Caring*. https://www.ons.gov.uk/peoplepopulationandcommunity/healthandsocialcare/conditionsanddiseases/articles/morepeoplehavebeenhelpingothersoutsidetheirhouseholdthroughthecoronaviruscovid19lockdown/2020-07-09

Pierce, M. *et al.* (2020) 'Mental Health Before and During the COVID-19 Pandemic: A Longitudinal Probability Sample Survey of the UK Population', *The Lancet Psychiatry*, **7**: 883–92.

Raffle, A. E. (2020) 'Screening the Healthy Population for COVID-19 Is of Unknown Value, but Is Being Introduced Nationwide', *BMJ*, **371**: m4438.

Ripley, B. *et al.* (2013) 'Package 'mass'', *Cran r*, **538**: 113–20.

Schmitz, H., and Westphal, M. (2015) 'Short-and Medium-Term Effects of Informal Care Provision on Female Caregivers' Health', *Journal of Health Economics*, **42**: 174–85.

Schmitz, H., and Westphal, M. (2017) 'Informal Care and Long-Term Labor Market Outcomes', *Journal of Health Economics*, **56**: 1–18.

Stekhoven, D. J., and Bühlmann, P. (2012) 'MissForest—Nonparametric Missing Value Imputation for Mixed-Type Data', *Bioinformatics*, **28**: 112–8.

Stuart, E. A. *et al.* (2011) 'MatchIt: Nonparametric Preprocessing for Parametric Causal Inference', *Journal of statistical software*. **42**: 1–28.

Sudre, C. H. *et al.* (2021) 'Attributes and Predictors of Long COVID', *Nature Medicine*, **27**: 626–31.

Thomson, R. M., Niedzwiedz, C. L., and Katikireddi, S. V. (2018) 'Trends in Gender and Socioeconomic Inequalities in Mental Health Following the Great Recession and Subsequent Austerity Policies: a Repeat Cross-Sectional Analysis of the Health Surveys for England', *BMJ Open*, **8**: e022924.

Van Houtven, C. H. *et al.* (2010) 'Economic Burden for Informal Caregivers of Lung and Colorectal Cancer Patients', *The Oncologist*, **15**: 883–93.

Van Houtven, C. H., Coe, N. B., and Skira, M. M. (2013) 'The Effect of Informal Care on Work and Wages', *Journal of Health Economics*, **32**: 240–52.

Varga, T. V. *et al.* (2021) 'Loneliness, Worries, Anxiety, and Precautionary Behaviours in Response to the COVID-19 Pandemic: a Longitudinal Analysis of 200,000 Western and Northern Europeans', *The Lancet Regional Health-Europe*, **2**: 100020.

Vasileiou, K. *et al.* (2017) 'Experiences of Loneliness Associated with Being an Informal Caregiver: a Qualitative Investigation', *Frontiers in Psychology*, **8**: 585.

Velloze, I. G. *et al.* (2022) 'Interventions to Reduce Loneliness in Caregivers: An Integrative Review of the Literature', *Psychiatry Research*, **311**: 114508.

Whitley, E., Reeve, K., and Benzeval, M. (2021) 'Tracking the Mental Health of Home-Carers During the First COVID-19 National Lockdown: Evidence from a Nationally Representative UK Survey', *Psychological Medicine*, **53**: 1–10.

Willner, P. *et al.* (2020) 'Effect of the COVID-19 Pandemic on the Mental Health of Carers of People with Intellectual Disabilities', *Journal of Applied Research in Intellectual Disabilities*, **33**: 1523–33.

Wolff, J. L. *et al.* (2007) 'End-of-Life Care: Findings from a National Survey of Informal Caregivers', *Archives of Internal Medicine*, **167**: 40–6.

Wong, W. T., Ussher, J., and Perz, J. (2009) 'Strength Through Adversity: Bereaved Cancer Carers' Accounts of Rewards and Personal Growth from Caring', *Palliative & Supportive Care*, **7**: 187–96.

Wong, J. *et al.* (2022) 'Employment Consequences of COVID-19 for People with Disabilities and Employers', *Journal of Occupational Rehabilitation*, **32**: 464–72.

World Health Organization. (2022). *COVID-19 Weekly Epidemiological Update - 4 May 2022*. https://www.who.int/publications/m/item/weekly-epidemiological-update-on-covid-19—4-may-2022