



Assessing the impact of caregiving for older parents on caregivers' health: Initial health status and trajectories of physical and mental health among midlife caregivers for parents and parents-in-law in Britain

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ABSTRACT

Assessing the impact of caregiving for older parents on caregivers' health is increasingly important in the context of population changes and curtailment of state provided services. This has been extensively studied but results are inconsistent, possibly reflecting a lack of attention to health-related selection into the caregiver role.

We use data from a nationally representative UK longitudinal study to analyse differences in the health of people aged 40–69 at baseline by whether they were 'eligible' to provide parent care (with a living parent/parent-in-law) and by whether they subsequently assumed a caregiver role. We measured initial health status using a latent variable derived from three observer-recorded indicators as well as self-reported health. We analysed trajectories of physical and mental health over a seven-year follow-up for those providing intensive care (20+ hours per week) to a parent or parent-in-law, providers of lesser amounts of care, and non-caregivers. Outcomes were measured using the SF-12 indicators of mental and physical health.

Results: showed that those with a living parent or parent-in-law had better health than those lacking these relatives. However, among potential caregivers for a parent or parent-in-law, those assuming intensive caregiving had poorer initial health than non-caregivers or those who became providers of less intensive care. Fixed effects analyses of follow-up data showed that the mental health of intensive caregivers deteriorated. However, the physical health of intensive caregivers with low levels of education improved.

Results: show the importance of taking account of whether people are at risk of providing parental care and initial health status when assessing impacts of caregiving on health. They also indicate differential effects of caregiving on health depending on socio-demographic characteristics and reaffirm the need for greater supports for those providing substantial amounts of care to older parents.

1. Introduction

Demographic and policy changes mean that demands for family-provided care for older people are growing. In ageing populations greater longevity has resulted in increases in the number of older people with assistance needs and pressures on state provided supports which in many high-income countries, including the UK, have been curtailed (Guzman-Castillo et al., 2017; Ranci and Pavolini, 2015; Zigante et al., 2021). Assessing the impact of providing care for older parents on caregivers' health is therefore of increasing public health and societal importance, not least because any adverse effects of caregiving on health may have implications for caregivers' own later-life health and

economic participation, an issue of increasing policy concern (Boileau and Cribb, 2022).

Although numerous studies have investigated the association between caregiving and health results are inconsistent. This may partly reflect variations in measures, definitions and the caregiver groups studied and importantly also differing approaches to controlling for health-related selection effects. Many studies which have attempted to control for health-related selection into caregiving have relied on self-reported indicators but the extent to which these accurately reflect health status may vary by socio-demographic factors also related with propensity to undertake caregiving. We use nationally representative data from a large UK longitudinal study to investigate changes in the

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mental and physical health of adult children aged 40–69 providing care for a parent or parent-in-law, taking account of initial health status assessed using observer measured, as well as self-reported indicators.

2. Background

Commensurate with the increasing societal importance and recognition of family caregiving, there is an extensive literature on possible effects of caregiving on health. Many studies are informed by stress process theories and models developed by Pearlín et al. (1990) and findings of poorer health, particularly poorer mental health, among caregivers have been interpreted as an effect of cumulated stress, physical strain and reduced opportunities for other activities (Coe and Van Houtven, 2009; Pearlín, 2010; Pearlín et al., 1990; Pinguart and Sorensen, 2006; Pinguart and Sorensen, 2003; Schulz et al., 2012). However, other research has shown that the mental wellbeing of adult children is adversely affected by the disability of a parent regardless of whether they provide care, implying that some of the mental health symptoms reported by caregivers may arise from worries about a parent's poor health, rather than caregiver strain (Amirkhanyan and Wolf, 2003; Bom et al., 2019a; Broek and Grundy, 2020; Wolf et al., 2015). Studies adjusting for this 'family effect' have found weaker associations between caregiving and mental health and mixed effects of caregiving on physical health (Bom et al., 2019b). Other scholars note that caregiving provides a recognised and valued role and may be associated with increased physical activity and beneficial changes in other health-related behaviours (Brown and Brown, 2014; Roth et al., 2015). Several studies indicate that providing intensive care (20 h a week or more), co-residential care, or combining care and full-time employment has adverse effects on health but that providing less intensive care has fewer negative, or indeed, positive impacts (Bom and Stöckel, 2021; Pinguart and Sorensen, 2003). Negative impacts of caregiving may also be greater for those who feel constrained to take on the role (Kaschowitz and Brandt, 2017; Schulz et al., 2012). Thus, health effects of caregiving may vary by intensity of the role, competing demands, relationship with the person cared for, availability of supports, and individual vulnerabilities, including health status prior to becoming a caregiver (Broese van Groenou and De Boer, 2016; Kaschowitz and Brandt, 2017).

Inconsistent findings may also reflect differences in study designs and measures (Vlachantoni et al., 2016). As noted in reviews (Brown and Brown, 2014; del-Pino-Casado et al., 2011; Roth et al., 2015), the literature on health effects of caregiving is very mixed; definitions of caregiving vary and many studies are cross-sectional. Even results from studies using population representative longitudinal data and advanced methods are not wholly consistent. Kaschowitz and Brandt (2017), for example, used data for ten countries included in the Surveys of Health, Ageing and Retirement in Europe (SHARE) and English Longitudinal Study of Ageing (ELSA) to examine changes in the mental and physical health of caregivers aged 50 and older. They reported that caregivers for co-residents experienced a deterioration in mental health in nine countries observed, but not in the Netherlands or England. However, Bom and Stöckel (2021) using data from another UK longitudinal study and a Netherlands longitudinal data source and propensity score matching as a way of addressing selection effects, found that in both settings carers providing 20 or more hours per week of care had negative mental health outcomes.

Many studies have not been able to identify the population 'at risk' of becoming a caregiver – those with the relevant relative alive. This may be related to health because of associations between the survival of parents and the health of their children. Other health-related factors may also be associated with selection into- and out-of-caregiving (Carmichael and Ercolani, 2016). Young and Grundy (2008), for example, using data from a census-based record linkage study of England & Wales (ONS Longitudinal Study), found that women providing intensive care had lower levels of education, poorer health, and had had less labour market involvement over a 30-year retrospective period than women

who were not caregivers. More recently Carmichael and Ercolani (2016) examined the prior characteristics of those following different career and caregiving pathways using data from the UK Household Longitudinal Study (UKHLS) and found that people who subsequently followed full-time work trajectories started off healthier, happier and wealthier than those who became intensive caregivers. A countervailing influence may be that a certain level of health is needed to undertake intensive caregiving. Several studies have found that caregivers' mortality is lower than that of non-caregivers prompting suggestions that there may be a 'healthy carer' effect as people in poor physical health may be unable to take on the role (O'Reilly et al., 2008; Ramsay et al., 2013; Roth et al., 2015) or cease caregiving if their health deteriorates (Pavalko and Woodbury, 2000; Vlachantoni et al., 2016). Henz (2021), for example, using UKHLS data, found that midlife and older adults providing care for a parent or parent-in-law had better physical health than non-caregivers, and that those with poor mental or physical health were more likely to stop providing care.

Several investigations into the health effects of caregiving have attempted to control for initial health-related selection generally using self-reported indicators of health (Henz, 2021; Kaschowitz and Brandt, 2017; Vlachantoni et al., 2016). However, variations in health expectations associated with socio-economic position, gender, age and locality are known to influence self-reports of health (Dowd and Zajacova, 2007; Ploubidis and Grundy, 2011; Singh-Manoux et al., 2007; Spitzer and Weber, 2019); as these factors are also associated with differentials in caregiving, use of self-reported measures alone may bias results. It has also been suggested that caregivers' self-assessments of health may be made in comparison with the person they care for, leading to overly favourable reports (Di Novi et al., 2015). Consistent with this argument, Bom et al. (2019b), found that the effects of caregiving on physical health appeared positive in studies using self-reported measures but negative in studies using indicators such as medication intake.

Our overall aim in this study is to improve understanding of the impact of caregiving on the mental and physical health of caregivers for a parent or parent-in-law taking account of eligibility to become a caregiver for a parent or parent-in-law, and initial health status, measured using both objective (nurse measured) and subjective indicators.

3. Research questions

3.1. Health related selection into caregiving

Our first three linked research questions focus on health-related selection into becoming a parental caregiver. This is of interest both because the extent of selection may partly explain some of the divergent results on caregiver health previously reported, but importantly too because the initial health status of those becoming caregivers may influence their resilience or vulnerability to the stresses associated with caregiving. Thus, any adverse effects of caregiving on mental and physical health may be greater for those with initially poorer health (De Frias et al., 2005).

Firstly, we wanted to see whether the initial health status of those with a living parent or parent-in-law differed from that of those having no living parent/parent-in-law. Following on from this our second research question was whether the initial health status of those becoming parental caregivers differed from that of those who did not take on parental care, and whether this varied between caregivers providing intensive care (20+ hours of care per week) or lesser amounts of care (henceforth termed 'light' caregivers). Given previous research suggesting that caregiver's self-reports of health may be overly optimistic, and other known socio-demographic differences in assessing and reporting own health, a third methodological question was whether there were differences in the apparent extent of health-related selection into caregiving by whether objective (observer measured) or subjective self-reported indicators were used.

3.2. Caregiving and changes in physical and mental health

Our fourth -and main-research question was whether caregiving was associated with changes in physical and mental health observed over a seven-year follow-up period, taking account of both initial health and various socio-demographic factors related to health, and whether health effects of caregiving differed by intensity of care provided.

3.3. Other influences on becoming a caregiver and impacts of caregiving on health

Additional research questions related to investigation of factors, such as educational attainment, employment, partnership status and responsibility for co-resident minor children, related to becoming a caregiver, and interactions between these and both initial health and health trajectories. In supplementary analyses we also explore effects of being never-married, as previous studies have shown that this group are especially likely to be providing intensive care, possibly because they are considered most available, which might lead them to feel constrained to provide care, with implications for later health (Young and Grundy, 2008). We also explore the influence of having experienced divorce as this may be indicative of past stress which might affect resilience to effects of caregiving and also of a more ambivalent relationship with parents as suggested in research reporting negative effects of a child's divorce on older parents' health and well-being (Tosi and Albertini, 2018; Ucheddu and van Gaalen, 2022). As adult children may be more likely to provide care for a biological parent, and more worried about the health of biological parents especially those living alone, we included indicators of whether respondents had a biological parent alive and whether they had a biological parent who lived alone. We included indicators of whether respondents had lived with both parents at age 16 and whether they had any siblings as these childhood factors may be related both to later health and to the probability of becoming a parental caregiver.

4. Materials and methods

4.1. Data

We use data from the UKHLS, a large nationally representative study of the UK population initiated in 2009 and followed up annually. The survey collects information on all household members including their relationships with each other. Information about relatives outside the household, including parents, was collected in waves 1, 3, 5, 7 and 9. For those with a current co-resident partner, information on living parents-in-law was derived from partner's responses to questions on relatives outside the household. In waves 2 or 3 of the study (fielded 2010 and 2013), participants from England, Scotland and Wales who met the eligibility criteria (McFall et al., 2014) received a health assessment visit from nurses who took physiological measurements (University Of Essex, I. F. S, 2019; 2021).

4.2. Sample selection and analytical sample

Our baseline sample (Supplementary-Fig. 1S) comprised all those who participated in the wave 2 or 3 nurse health assessment and were then aged 40–69 years, the age groups in which having a parent in need of care is most common (11,256 individuals). We identified individuals who had at least one parent or parent-in-law (including step and adoptive parents/parents-in-law) alive at some point in the observation window from waves 2 to 9 of the study (N = 7976). Among these potential caregivers, we excluded those who were providing care to parents (-in-law) at the baseline wave as our focus is on incident caregiving (N = 6592). When respondents reported more than one episode of caregiving, we chose the episode involving the most hours of caregiving. Those lacking any information on the outcome variables were excluded

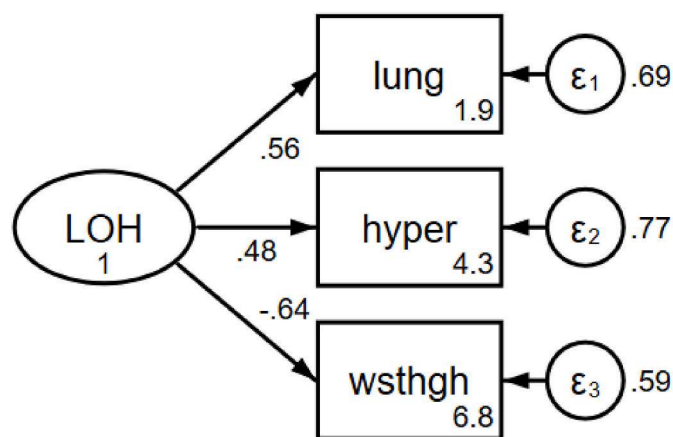


Fig. 1. Standardized factor loadings of the structure and measurement models of equations to derive the Latent Objective Health.

Note. LOH: Latent Objective Health; lung: lung function (forced vital capacity, FVC); hyper: stage 2 hypertension; wsthgh: waist to height ratio.

from the longitudinal analysis of the health effects of incident caregiving. Observations from respondents whose parent(s)/parents-in-law died during the follow-up period were retained in the analysis for one wave after the death of the last such relative (to control for effects of parental death on respondents' wellbeing) and were then censored. Finally, we selected individuals with at least 3 observations with complete information on the outcome measures between the wave 2/3 baseline and wave 9 (N = 4273 with 3–8 valid observations); in sensitivity analyses, we additionally investigated differences in characteristics and outcomes of those with fewer follow-ups. Individuals who had any missing information on the control variables used in the fixed effect models were excluded (0.4%). These fixed effect models were estimated using a sample of 22,438 observations from 4102 individuals.

5. Measures

5.1. Health status based on observer measured indicators

Initial objective health was measured using a latent variable derived from three baseline observer-measured indicators (lung function, waist-to-height ratio and hypertension). Lung function was measured taking the highest technically satisfactory reading of forced vital capacity (htfvc) after at least three acceptable manoeuvres. We used within-gender deciles of lung function because females score lower than males at equivalent health status due to physiological differences. The measure of hypertension was based on blood pressure measurements and use of anti-hypertensive medication (McFall et al., 2014). We derived a binary variable distinguishing between normotensive untreated and a hypertensive stage 2 category (160/100) including normotensive treated, hypertensive treated and hypertensive untreated respondents. We computed the ratio of valid mean waist measurement in cm to height. In preliminary analysis we investigated including measures of body mass index, body fat, grip strength, fev1/fvc ratio, number of prescribed medicines and other measures of blood pressure, but found these did not improve model fit. We estimated latent health using structural equation models with full information maximum likelihood (FIML) to allow for missing data. Our final model choice was based on goodness of fit statistics –the Comparative Fit Index (CFI), Tucker Lewis Index (TLI) and Root Mean Square Error of Approximation (RMSEA)– and the type of information collected (Chen et al., 2005).

5.2. Caregiver status

Respondents were asked in every survey wave whether they looked

after or provided regular help to any sick, disabled, or elderly person inside or outside their household; the total hours per week spent caring, and to identify co-residents they helped whose relationship to them was derived using the household roster. Those providing care to non-co-residents were asked about their relationship to the first and the second non-co-resident person they helped. Questions did not distinguish between caring for a parent or parent-in-law. Our measure of care for a parent thus includes care provided to any biological, adoptive or step-parent or parent-in-law; henceforth we use the term parental caregiver to refer to those providing care to any of these relatives. For respondents eligible to be a parental caregiver, we distinguished between non-caregivers, ‘light’ caregivers, and ‘intensive’ caregivers - those giving help for 20 or more hours per week.

5.3. Outcome measures

We measured health trajectories using the Mental (MCS) and Physical (PCS) Component Summary Scores of the Short-Form Health Survey (SF-12), a 12-item multidimensional self-reported measure of health and health related quality of life included in every survey wave. Validation studies have shown that the SF-12 (MCS) and physical (PCS) scores consistently capture the domains they aim to measure (Gandek et al., 1998; Ware et al., 1996). Both indicators range from 0 to 100 – with higher scores indicating better health –and have a mean of 50 and a standard deviation of 10.

5.4. Co-variables

We included time-variant and time-constant covariates to adjust for sociodemographic factors which may be associated both with caregiving and with health trajectories. These included age, gender, educational attainment, quintile of net equivalized household income, housing tenure (owner occupiers vs. renters and others), employment status, whether respondents currently lived with a partner, and whether they had children under 16 in the household. We also considered family context and history with variables indicating whether respondents had lived with both parents at the age of 16; had living siblings (at baseline); had living biological parents and whether any biological parent lived

alone. In the preliminary analysis including results shown in Table 3, we distinguished between those in part time and full-time work. However, in the main analyses presented in Tables 4 and 5 we amalgamated these categories as results were substantially similar. In supplementary analyses we examined effects of marital status/history (never-married; ever-divorced).

6. Analytical strategy

We derived a measure of Latent Objective Health (LOH) at baseline based on the three selected observer-measured indicators of physical health using factor analysis (Ploubidis and Grundy, 2011). We then compared the initial health of population subgroups of interest using both LOH and Self-Reported Health (SRH). Firstly, we examined differences in baseline health between those eligible or ineligible to provide parental care (with a living parent or parent-in-law), and then differences in the baseline health of potential and actual caregivers distinguishing between intensive and light caregiving.

Secondly, we examined associations between initial health, socio-demographic and family-related variables and becoming a light or intensive caregiver using multinomial logit regression to estimate relative risk ratios. Lastly, we estimated fixed-effect linear models for both the MCS and PCS outcomes to model the effects of caring for parents on changes in respondents’ health. For both outcomes we fitted several models. Model 1 examines the effects of caregiving adjusted by age. Model 2 includes adjustment for the complementary SF-12 measure and sociodemographic and family related variables. Subsequent models build on Model 2, separately adding interaction effects to test hypothesised moderators; i.e. the interaction of caregiving with initial objective and reported health, gender, educational level, living with minor children, employment status, having lived with biological parents at 16, and having no living siblings. Additionally, we also included time-invariant predictors such as gender, lack of siblings and initial health. These were estimated using the *xthybrid* command, developed to conduct Between-Within models (Allison, 2009; Schunck and Perales, 2017).

Because multiple respondents from the same household were sampled, models were estimated with robust standard errors to address the potential problem of non-independent data. Analyses were

Table 1
Health indicators and age at baseline by eligibility to provide parental care and follow-up status.

Adults aged 40 to 69 at the time of the Nurse health assessment	Eligible vs. Ineligible groups		Among Eligible & 3+ follow-up			
	Total	Ineligible	Eligible insufficient follow-up	Eligible & 3+ valid follow-up	no caregiving at baseline	caregiving at baseline
N	11,256	3280	2777	5199	4273	926
Age	53.7 (8.6)	61.2 (6.3)	51.6 (7.8)	50.3 (7.3)	49.7 (7.1)	53.2 (7.5)
Latent Objective Health (LOH)	0.0 (1.0)	-0.4 (1.0)	0.0 (1.0)	0.2 (0.9)	0.2 (0.9)	0.2 (0.9)
SF-12 Physical Component Summary (PCS)	49.2 (11.2)	46.1 (12.3)	48.6 (11.3)	51.0 (10.2)	51.0 (10.2)	50.6 (10.0)
SF-12 Mental Component Summary (MCS)	49.8 (9.6)	50.4 (9.7)	49.2 (9.8)	49.8 (9.4)	49.8 (9.4)	49.6 (9.2)
Subjective wellbeing (GHQ)	11.5 (5.7)	11.3 (5.6)	12.0 (6.1)	11.4 (5.5)	11.3 (5.4)	11.6 (5.5)
Self-rated health (SRH)						
excellent	14.5%	10.0%	13.9%	17.7%	17.9%	16.4%
very good	33.0%	29.3%	31.1%	36.3%	36.7%	34.7%
good	28.2%	28.6%	29.0%	27.7%	26.9%	31.4%
fair	16.6%	21.1%	17.2%	13.6%	13.5%	14.1%
poor	7.6%	11.1%	8.8%	4.8%	5.1%	3.3%
Health limits moderate activities						
yes, limited a lot	8.8%	13.4%	10.8%	5.3%	5.6%	3.9%
yes, limited a little	19.5%	25.4%	20.6%	15.8%	14.9%	20.32%
no, not limited at all	71.7%	61.2%	68.6%	78.9%	79.5%	75.8%
Health limits several flights of stairs						
yes, limited a lot	10.1%	16.1%	11.8%	6.3%	6.4%	5.5%
yes, limited a little	21.2%	26.6%	22.2%	17.8%	17.4%	19.8%
no, not limited at all	68.7%	57.3%	66.0%	75.9%	76.2%	74.8%
Long-standing illness						
No	58.6%	47.4%	59.5%	64.9%	66.1%	59.2%
Yes	41.4%	52.6%	40.5%	35.1%	33.9%	40.8%

Note. Weighted means and proportions. A number of respondents have missing information for some variables: SRH (3), PCS and MCS (1,353), GHQ (853), Long-standing illness (6), Limitation in moderate activities (811), Limitation in climbing several flights of stairs (1,017).

Table 2

Latent Objective Health (LOH) and Self-Rated Health (SRH) associated with having at parent/parent-in-law alive (whole sample of adults with a nurse-health assessment record between age 40 and 69, N = 11,256).

Variable	LOH			SRH		
	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3
Age	-0.049***	-0.049***	-0.048***	-0.009***	-0.008***	-0.007***
Biological parent alive	0.253***			0.212***		
Living parents (/in-law) (Ref. none)		0	0		0	0
Biological parent alive		0.263***	0.275***		0.260***	0.262***
Other parent (/in-law) alive		0.033	0.071		0.152***	0.159***
Female (Ref. Male)			0.212***			0.038
Constant	5.520***	5.496***	5.331***	3.678***	3.568***	3.538***
N	11,256	11,256	11,256	11,253	11,253	11,253
	0.128	0.127	0.133	0.020	0.022	0.022

Note. LOH is in quintiles and SRH is reversed, so that higher values indicate better health in both cases. Both variables are used as quasi-continuous.

Table 3

Incident caregiving. Coefficients of taking on a parent-caregiver role relative to non-caregivers. (N = 6592).

Incident caregiving	Light caregiver						Intensive caregiver					
	M1		M2		M3		M1		M2		M3	
Baseline latent objective health	1.056	(0.036)	0.971	(0.035)	0.973	(0.036)	0.829*	(0.061)	0.806**	(0.060)	0.804**	(0.061)
Age	1.026***	(0.004)	1.219***	(0.074)	1.229***	(0.075)	1.015	(0.009)	1.309	(0.195)	1.356*	(0.204)
Age squared			0.998**	(0.001)	0.998**	(0.001)			0.998	(0.001)	0.997	(0.001)
Female (Ref. Male)			1.156*	(0.079)	1.167*	(0.080)			2.090***	(0.378)	2.158***	(0.383)
Any Biological parent alive			2.395***	(0.231)	2.407***	(0.232)			3.667***	(0.927)	3.722***	(0.919)
Parent living alone			1.515***	(0.109)	1.518***	(0.110)			1.231	(0.202)	1.232	(0.203)
Lived with both parents at age 16			1.213*	(0.096)	1.210*	(0.096)			1.857**	(0.386)	1.844**	(0.384)
No living siblings			1.058	(0.123)	1.056	(0.123)			1.648*	(0.391)	1.652*	(0.392)
Living with a partner			1.066	(0.091)					1.015	(0.193)		
Ever divorced or separated					0.840	(0.078)					0.879	(0.178)
Never married					1.079	(0.142)					1.720*	(0.435)
Children under 16 y.o. living in household			0.775**	(0.064)	0.788**	(0.066)			0.570**	(0.117)	0.622*	(0.126)
Household net-income quintile equivalized			1.000	(0.027)	0.999	(0.027)			0.831**	(0.053)	0.837**	(0.053)
Tenant and others (Ref. Ownership)			0.599***	(0.058)	0.605***	(0.059)			0.712	(0.142)	0.695	(0.139)
Employment (Ref. Unemployed)			1		1				1		1	
Full-time employed			1.245*	(0.116)	1.252*	(0.117)			0.516**	(0.110)	0.520**	(0.110)
Part-time employed			1.262*	(0.133)	1.262*	(0.133)			0.795	(0.172)	0.803	(0.174)
Highest qualification-3 categories (Ref. Low)			1		1				1		1	
Median			1.223**	(0.094)	1.228**	(0.094)			1.074	(0.183)	1.070	(0.182)
High			1.021	(0.088)	1.017	(0.088)			0.804	(0.171)	0.777	(0.168)
Country of residence (Ref. England)			1		1				1		1	
Wales			0.780	(0.114)	0.784	(0.115)			1.699*	(0.434)	1.715*	(0.439)
Scotland			0.934	(0.117)	0.935	(0.117)			1.283	(0.342)	1.287	(0.343)
N	6592		6249		6249		6592		6249		6249	

Note. Independent variables are measured at baseline.

conducted with *Stata*17.

7. Results

7.1. Measurement of initial health and comparison across groups by exposure to caregiving

Fig. 1 shows the standardized parameters to derive the Latent Objective Health (LOH) indicator for respondents aged 40–69 who took the nurse health assessment. The LOH is a continuous variable with a quasi-normal distribution that captures the common variance between the objective indicators of health (OH), lung function, hypertension and waist-to-height ratio. The relative contribution to LOH of lung function (0.56) and hypertension (0.48) is notable but the negative load of waist-to-height ratio is larger (−0.64) with all loading factors significant at $p < 0.001$. We standardized the LOH for the whole age-group 40–69 (mean = 0, s.d. = 1) where lower scores indicate poorer health.

The mean LOH score of sub-populations varied substantially by eligibility for parental caregiving (Table 1). Men and women in the analytical sample were physically healthier than the whole sample aged 40–69. Those with no living parent or parent-in-law were older (mean age 61.2), had poorer objective health (mean LOH -0.4) and poorer self-reported health as indicated by SF-12 MCS and PCS scores, SRH, severity of limitations and long-standing illness, than those ‘at risk’ of providing parental care. Among adults eligible to become parental caregivers, those who had insufficient follow-up information were in poorer physical health than those with 3 or more valid follow-ups – the group in the best health on all indicators –. This is consistent with results from many studies which have found that attrition in longitudinal studies is associated with poorer health (Chatfield et al., 2005). Finally, among the retained sample those who were parental caregivers at baseline and were dropped for the analysis of incident caregiving and changes in health were older (53.2) and in slightly poorer health than the 4273 adults selected for the analytical sample, who were on average healthier

Table 4
Results from fixed effects models; Mental Component Summary score (MCS). N = 4102.

SF-12 Mental Component Summary (MCS)	Model 1	Model 2	Model 3
TIME-INVARIANT CHARACTERISTICS (Between-Within models)^a			
		Models 2 ^a	
Female (ref. male)		-1.324***	
Educational attainment (ref. low)			
Median education		0.676*	
High education		-0.252	
No living siblings (ref. having living siblings)		0.267	
Lived with both parents at age 16		0.306	
INITIAL HEALTH			
Latent Objective Health		0.415**	
Self-Rated Health		2.671***	
TIME-VARIANT CHARACTERISTICS (Fixed effects models)^b			
	Model 1 ^b	Model 2 ^b	Model 3 ^b
Independent variable			
Caregiving (ref. no care)			
Light care	-0.320	-0.243	-0.242
Intensive care	-2.638***	-2.136***	-2.149***
Control variables			
Age	-0.039	-0.164***	-0.166***
SF-12 Physical Component Summary (PCS)		0.550***	0.550***
PCS squared		-0.010***	-0.010***
Living with a partner		1.058*	
Ever divorced			-0.510
Never married			-1.846*
Biological parent living alone (ref. no living relative)			
Biological parent not living alone		-0.354	-0.347
Biological parent living alone		0.090	0.095
Living with children under the age of 16 (ref. no)		0.260	0.267
Household net-income quintile equivalized		0.056	0.064
Tenant (ref. owner)		0.804	0.801
Employed (ref. not employed)		0.684*	0.676*
Country (ref. England)			
Wales		2.673	2.652
Scotland		0.499	0.596
Constant	52.018***	56.581***	57.668***
N	22,438	22,438	22,438
r ² _a	0.001	0.139	0.139
INTERACTION TERMS (Fixed effects)^c			
		Models 2 ^c	Models 3 ^c
Interactions with time-invariant characteristics			
<i>Gender (ref. male)</i>			
Light care * Female		-0.431	-0.418
Intensive care * Female		-1.269	-1.286
<i>Educational attainment (ref. high education)</i>			
Light care * Median education		-0.151	-0.151
Light care * Low education		0.303	0.303
Intensive care * Median education		1.091	1.091
Intensive care * Low education		1.923	1.923
<i>Siblings (ref. Having living siblings)</i>			
Light care * Having no living siblings		-0.465	-0.478
Intensive care * Having no living siblings		-3.729	-3.764*
<i>Living with biological parents at 16 (ref. no)</i>			
Light care * Living with biological parents at 16		0.349	0.354
Intensive care * Living with biological parents at 16		-1.806	-1.772
INITIAL HEALTH			
<i>Latent Objective Health</i>			
Light care * Latent Objective Health (continuous)		-0.014	-0.018
Intensive care * Latent Objective Health (continuous)		0.296	0.315
<i>Self-rated health (ref. excellent, very good or good)</i>			
Light care * Fair self-rated health		0.061	0.066
Light care * Poor self-rated health		0.406	0.370

Table 4 (continued)

SF-12 Mental Component Summary (MCS)	Model 1	Model 2	Model 3
Intensive care * Fair self-rated health		-2.202	-2.207
Intensive care * Poor self-rated health		3.230	3.141
Interactions with time-variant characteristics			
<i>Employed (ref. not employed)</i>			
Light care * Employed		-0.665	-0.668
Intensive care * Employed		0.842	0.845
<i>Minor children (ref. no living with children under 16)</i>			
household		-0.522	-0.529
Intensive care * Children under 16 in household		-1.659	-1.609

Significance: *p < 0.05, **p < 0.01, ***p < 0.001.

Note.

^a Time-invariant coefficients were estimated with between-within models. Variables were included one at a time adjusted for all the time-variant variables included in model 2^b.

^b Time-variant coefficients were estimated with fixed-effect models.

^c Interactions were introduced one at a time in the corresponding full model^b.

(mean LOH 0.2) and younger (mean age 49.7) than the overall study sample.

Results thus showed a positive association between better initial objective and self-reported health and having a living parent or parent-in-law. As shown in Table 2, having a biological parent alive was associated with better objective health and better perceived health (SRH) than having no living biological parent, after adjustment for age and sex. Those who lacked a biological parent but had any other parent (including step/adoptive) or parent-in-law had better SRH than those lacking any parent. Finally, parental survival adjusted for age explains 13% of LOH variation and only 2% of SRH.

7.2. Health-related selection into caregiving: results

Fig. 2 shows the association between baseline health and becoming a light or an intensive caregiver during the follow-up period relative to not taking on a caregiver role, among those adults who were eligible and were not parental caregivers at baseline. We used three measures of health in two multinomial models, the first adjusted for age and the second adjusted for all control variables. Age adjusted results show that those who were healthier at baseline, on any of these indicators, were more likely to become light caregivers while those who started in poorer health were more likely to become intensive caregivers. After adjusting for socioeconomic and family context variables these differences disappear for light caregivers and their association with becoming an intensive caregiver attenuates, especially in the case of SRH, but remains significant for the indicator based on objective measures.

Table 3 shows the full model including associations between becoming a light or intensive parental caregiver and respondents' socio-demographic and family related characteristics. We also show results from a separate model (Model 3) including indicators of marital status/history (never-married; ever-divorced) rather than the current partnership indicator shown in Model 2, (it was not possible to include these in the same model due to collinearity). Older age, being female, having a biological parent alive, having lived with both parents at the age of 16 were positively, and having a co-resident child under the age of 16 negatively, associated with becoming a light or an intensive caregiver. Some other variables were associated with caregiving but in different ways, or to a different extent, for light and intensive care provision. For example, being in full-time or part time-employment increased the chance of becoming a light caregiver but was negatively associated with becoming an intensive caregiver; the association between part-time employment and intensive caregiving did not reach conventional levels of statistical significance but was in the same negative direction. Living in Wales was positively associated with uptake of intensive

Table 5
Results from fixed effects models for Physical Component Summary score (PCS).
N = 4102.

SF-12 Physical Component Summary (PCS)	Model 1	Model 2	Model 3
TIME-INVARIANT CHARACTERISTICS (Between-Within models)^a			
		Models 2 ^a	
Female (ref. male)		-0.043	
Educational attainment (ref. low)			
Median education		0.906**	
High education		2.404***	
No living siblings (ref. having living siblings)		0.291	
Lived with both parents at age 16		1.020**	
INITIAL HEALTH			
Latent Objective Health		2.605***	
Self-Rated Health		5.011***	
TIME-VARIANT CHARACTERISTICS (Fixed effects models)^b			
	Model 1 ^b	Model 2 ^b	Model 3 ^b
Independent variable			
Caregiving (ref. no care)			
Light care	0.308	0.254	0.254
Intensive care	1.073*	0.494	0.480
Control variables			
Age	-0.288***	-0.293***	-0.293***
SF-12 Physical Component Summary (PCS)		0.158***	0.157***
PCS squared		-0.005***	-0.005***
Living with a partner		-0.240	
Ever divorced			0.547
Never married			-0.696
Biological parent living alone (ref. no living relative)			
Biological parent not living alone		-0.622*	-0.619*
Biological parent living alone		-0.779***	-0.777***
Living with children under the age of 16 (ref. no)		0.053	0.049
Household net-income quintile equivalized		-0.038	-0.038
Tenant (ref. owner)		0.790	0.795
Employed (ref. not employed)		1.178***	1.178***
Country (ref. England)			
Wales		-1.236	-1.248
Scotland		-2.003	-1.916
Constant	65.550***	70.855***	70.855***
N	22,438	22,438	22,438
r ² _a	0.011	0.123	0.123
INTERACTION TERMS (Fixed effects)^c			
		Models 2 ^c	Models 3 ^c
Interactions with time-invariant characteristics			
Gender (ref. male)			
Light care * Female		0.143	0.145
Intensive care * Female		1.170	1.152
Educational attainment (ref. high education)			
Light care * Median education		0.451	0.452
Light care * Low education		0.342	0.341
Intensive care * Median education		1.097	1.090
Intensive care * Low education		3.672*	3.641*
Siblings (ref. Having living siblings)			
Light care * Having no living siblings		-1.002	-1.032
Intensive care * Having no living siblings		-0.973	-0.995
Living with biological parents at 16 (ref. no)			
Light care * Living with biological parents at 16		1.317*	1.324*
Intensive care * Living with biological parents at 16		-0.573	-0.510
INITIAL HEALTH			
Latent Objective Health			
Light care * Latent Objective Health (continuous)		0.013	0.018
Intensive care * Latent Objective Health (continuous)		0.297	0.315
Self-rated health (ref. excellent, very good or good)			
Light care * Fair self-rated health		0.484	0.498
Light care * Poor self-rated health		1.859**	1.834**

Table 5 (continued)

SF-12 Physical Component Summary (PCS)	Model 1	Model 2	Model 3
Intensive care * Fair self-rated health		1.753	1.779
Intensive care * Poor self-rated health		3.415	3.347
Interactions with time-variant characteristics			
Employed (ref. not employed)			
Light care * Employed		-0.993**	-0.996**
Intensive care * Employed		-0.387	-0.381
Minor children (ref. no living with children under 16)			
Light care * Children under 16 in household		-0.549	-0.549
Intensive care * Children under 16 in household		-3.504**	-3.493**

Significance: *p < 0.05, **p < 0.01, ***p < 0.001.

Note.

^a Time-invariant coefficients were estimated with between-within models. Variables were included one at a time adjusted for all the time-variant variables included in model 2^b.

^b Time-variant coefficients were estimated with fixed-effect models.

^c Interactions were introduced one at a time in model 2.

caregiving, the association with becoming a light caregiver was not significant but was in the opposite direction. Those with no siblings and those with lower incomes were more likely to become intensive caregivers while uptake of light caregiving was positively associated with having a median level of education and having a biological parent who lived alone and negatively with being a tenant rather than a homeowner. Although current partnership was not associated with becoming a caregiver, Model 3 shows that never-married respondents were more likely to become intensive caregivers than the ever-married.

7.3. Caregiving and changes in mental and physical health

Tables 4 and 5 summarize results from multivariable fixed effects models which examine the associations between the outcomes -MCS (Table 4) and PCS (Table 5)- and variations in caregiving adjusted for changes in age (M1), the complementary measure of SF12 -mental or physical health-, and the family context, currently living with a partner, employment, socioeconomic status and country of residence variables (M2). Again, Model 3 controls for never-married and ever-divorced rather than current partnership status. Results from models of associations between the outcomes and time-invariant variables (sex, baseline health, education, having no siblings and living with biological parents at 16) and various interactions are also shown. Figs. 3 and 4 summarize the fixed effects results by estimating the marginal predictions, that is the expected MCS and PCS by caregiving intensity, and the interactions with time-variant indicators.

Table 4 shows that providing light care for a parent was not associated with changes in MCS, but providing intensive care had a negative impact (M2 -2.136 P < 0.001) controlling for changes in PCS and changes in family-context and sociodemographic variables. Being in employment and having a current partner in the household were associated with better MCS. Random coefficients estimate heterogeneity between respondents for the time-invariant variables considered and show that, as might be expected, individuals with better initial health had better MCS trajectories and women scored lower on MCS than men. Other things being equal, a standard deviation (a unit) increase in LOH was associated with a 0.415 (P < 0.01) higher MCS score, and a unit increase in SRH with 2.671 higher MCS. Among the potential moderators of caregiving on MCS, we found significant interactions only in Model 3^c for intensive caregivers without living siblings, who had a worse MCS trajectory than those with siblings (-3.764, P < 0.05).

Table 5 presents estimates of the relationship between changes in caregiving and changes in physical health. Model 1 -adjusted for age- shows a positive effect of intensive caregiving on PCS. However, coefficients become smaller and insignificant after adjustment for all

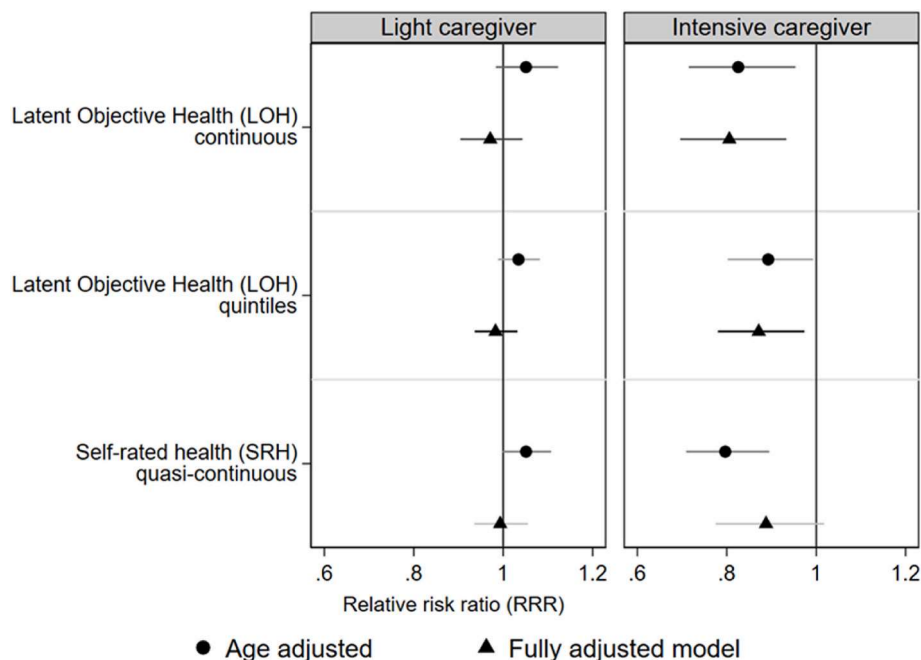


Fig. 2. Incident caregiving. Relative risks ratios of taking on a parent-caregiver role (relative to not becoming a caregiver), by LOH and SRH (N = 6592) Note. Full model adjusts for demographic, socioeconomic and family of origin and current family variables. Control variables included: age, age squared, gender, any biological parent alive, any parent living alone, living with parents at the age of 16, living siblings, living with a partner, living with children under 16 y. o., equivalized net household income (quintile), housing tenure, employment, educational attainment and country of residence.

control variables (Model 2^b). Among the socioeconomic and family context variables, being employed was associated with better, and having a biological parent – whether living alone or not –, with worse PCS trajectories. Random coefficients show no differences by gender. However, both baseline objective and subjective health showed positive associations with PCS; i.e. a standard deviation increase of LOH is associated with 2.6 higher PCS score, and a unit increase in SRH is associated with a difference of 5 additional points in PCS. Living with both biological parents at 16 was positively associated with PCS and level of education was inversely associated with PCS with the lowest PCS among those with the lowest level of education. The interaction of care with objective health showed no different effects of caregiving by initial health status. However, for those who reported being in poor health, providing light care was associated with an increase in PCS. PCS score also improved for intensive caregivers with a low level of education and light caregivers who had lived with both biological parents at 16. However, PCS worsened for light caregivers who were employed and for intensive caregivers with minor children at home (−3.504, $P < 0.01$).

Marginal predictions showed that non-caregivers are expected to score 50.0 in MCS and 50.4 in PCS (panel a) in Figs. 3 and 4). Light care had no impact on mental health, but intensive care reduced MCS by 2.7 points (47.3). Once adjusted by age, provision of intensive care was associated with a slight increase in PCS compared to non-caregivers (M1) but differences disappear in adjusted models (M2). However, the expected PCS of intensive caregivers living with children under the age of 16 is 48.1 compared to 51.5 for those who do not have minor children in the household. Finally, being employed is associated with higher PCS and MCS, (sensitivity analysis showed that this was the case regardless of whether it was full- or part-time employment (results not shown)). However, those who were neither employed or caregiving had a significantly lower expected PCS, around 49.4.

8. Discussion

We examined the effects of providing care for a parent or parent-in-law on the mental and physical health of caregivers using data from a

large longitudinal sample representative of the population of Great Britain. We accounted for initial health, and assessed health-related selection into both eligibility for becoming a caregiver for a parent (or parent-in-law) and caregiving, examining health-related biases in the study design influencing the population included in the analytical sample. We used a baseline measure of objective health derived from nurse-measured indicators and initial self-reported health indicators for comparison. In line with previous research, we found that being or becoming an intensive caregiver for a parent was positively associated with being female, having no living siblings, being never-married and having a biological parent alive, and negatively associated with being highly educated, being employed, and having children under 16 in the household. The effects of caregiving on health also differed by educational level, intensity of the role, competing demands, and the health outcome examined. Our measure of initial health was a predictor of both physical and mental health trajectories. The study highlights the importance of controlling for initial health and eligibility for becoming a parental caregiver in studies of effects of caregiving on health, something often neglected. We found a double and diverging health-related selection into parental caregiving. Midlife adults with a living parent or parent-in-law were healthier than their orphan counterparts, but of those eligible to become caregivers, those taking on an intensive care role were in worse health.

Regarding the effects of caregiving on mental health, we found that providing intensive care had an adverse effect on the MCS of caregivers. In line with previous studies showing the deleterious effects of providing higher levels of care (Bom et al., 2019a; Bom and Stöckel, 2021; Brenna and Di Novi, 2016; Heger, 2017; Hirst, 2005; Kaschowitz and Brandt, 2017; Lacey et al., 2019; Pinquart and Sorensen, 2006), we also found no significant effects of providing less intensive care on mental health (Bom and Stöckel, 2021; Hirst, 2005). Contrary to some previous research (Bom and Stöckel, 2021), we found no significant differences in caregiving effects on MCS by whether respondents were living with minor children. Having a current partner in the household was protective consistent with theoretical and empirical studies which suggest that the support and help of a partner may buffer stress (Jackson, 1992; Sibalija

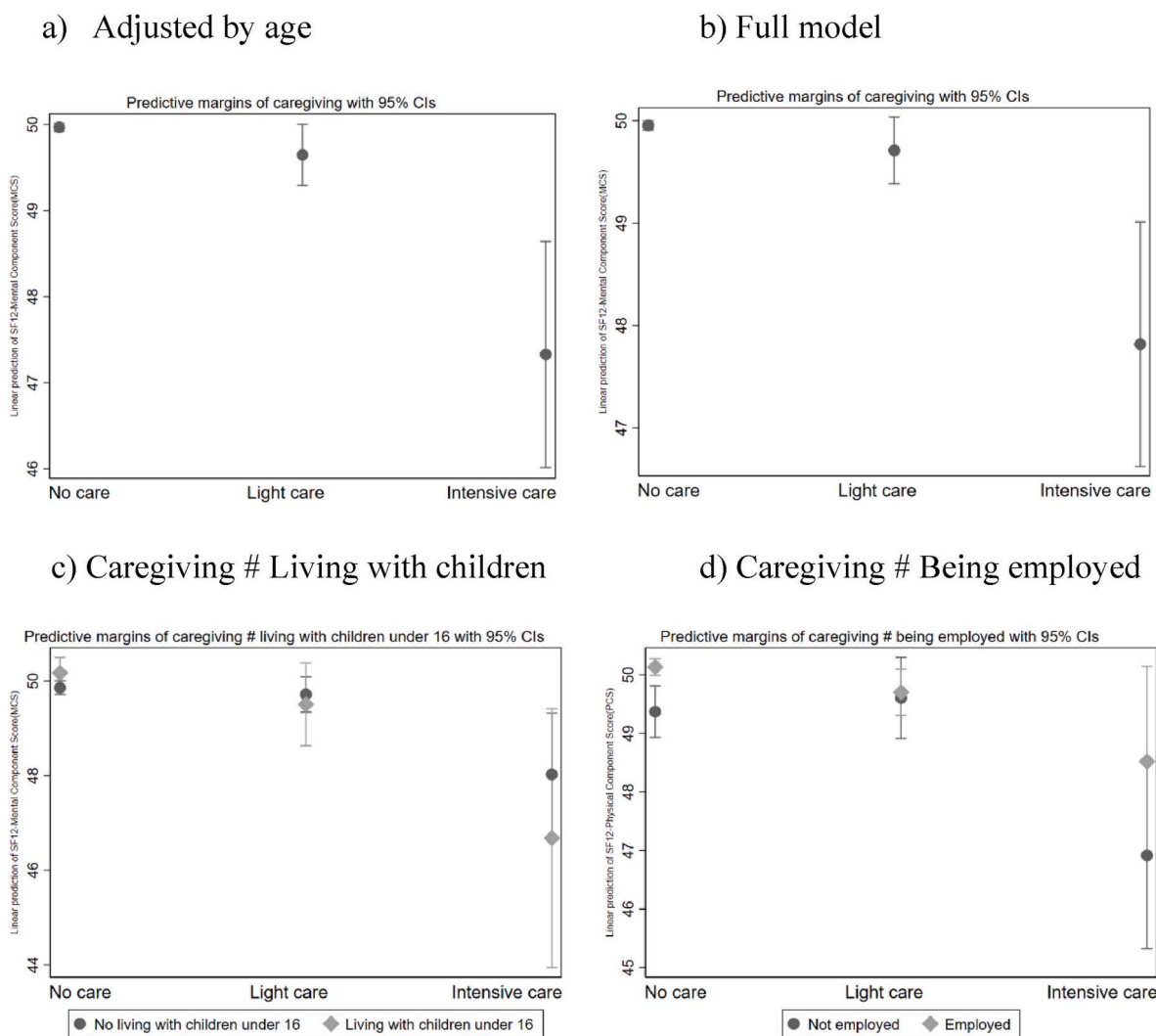


Fig. 3. Predictive margins of caregiving on SF-12 Mental Component Score (MCS).

Note. Margins were computed using the coefficients shown in Table 4 (Models 2^o). Full model was adjusted for age, the Physical Component Summary (PCS), PCS squared, living with a partner, having a biological parent alive and whether they live alone, living with children under the age of 16, household income, tenure, employment, and country of Great Britain. Interactions were introduced separately in the full model.

et al., 2020) but in contrast to the findings of Coe and Van Houtven (2009) who found that continued caregiving for a mother was associated with increases in depressive symptoms for married men and women but not for the single (unpartnered). However, their study, which was based on analysis of the US Health and Retirement Study, did not distinguish between intensive and light caregivers. Schulz et al. (2012) found that lack of choice in taking on the caregiving role had a negative impact on mental health. However, Chanfreau and Goisis (2022), found no significant differences in the impact of caregiving on mental health between only children and those with siblings. Our results are inconclusive; we found worse MCS trajectories for intensive caregivers without living siblings, which may be because only children may feel more constrained to take on caregiving, especially intensive caregiving (Broese van Groenou and De Boer, 2016; Kaschowitz and Brandt, 2017; Schulz et al., 2012). However, this result was only significant in supplementary models that adjusted for never being married and ever being divorced.

Some previous studies have suggested that physical health is more strongly associated with socioeconomic factors and initial health than with caregiving (Pinquart and Sørensen, 2007). Our results showed that, after adjustment for co-variates, providing intensive care was positively associated with the PCS trajectories of caregivers with low-level

education. This may reflect educational differences in alternatives to caregiving and in values and preferences. Several studies, for example, have found that less educated groups have a stronger family orientation and stronger preferences for family care (Finch et al., 1992; Silverstein and Bengtson, 1997) and so may gain more satisfaction from undertaking a role that is valued. Additionally, their paid work alternatives are likely to be more demanding and less rewarding. As already mentioned, it has also been suggested that apparent improvements in physical health after the onset of caring may reflect a reporting bias if individuals' self-assessments of health are made in comparison with the person they care for (Stöckel and Bom, 2022), consistent with our results for caregivers who initially reported poor self-rated health while this was not found with objective initial health. Contrary to studies that found a positive effect on physical health of having multiple roles (McMunn et al., 2006), we found that PCS worsened for light caregivers who were employed and intensive caregivers with minor children.

Finally, we found that LOH was a strong predictor of subsequent PCS and, to a lesser extent, of MCS. Adults' physical and mental health trajectories are associated with their initial health, regardless of changes in caregiving, family and socioeconomic contexts. Objective health at baseline was captured by a latent continuous health variable (Ploubidis and Grundy, 2011), that results in a standardized score with normal

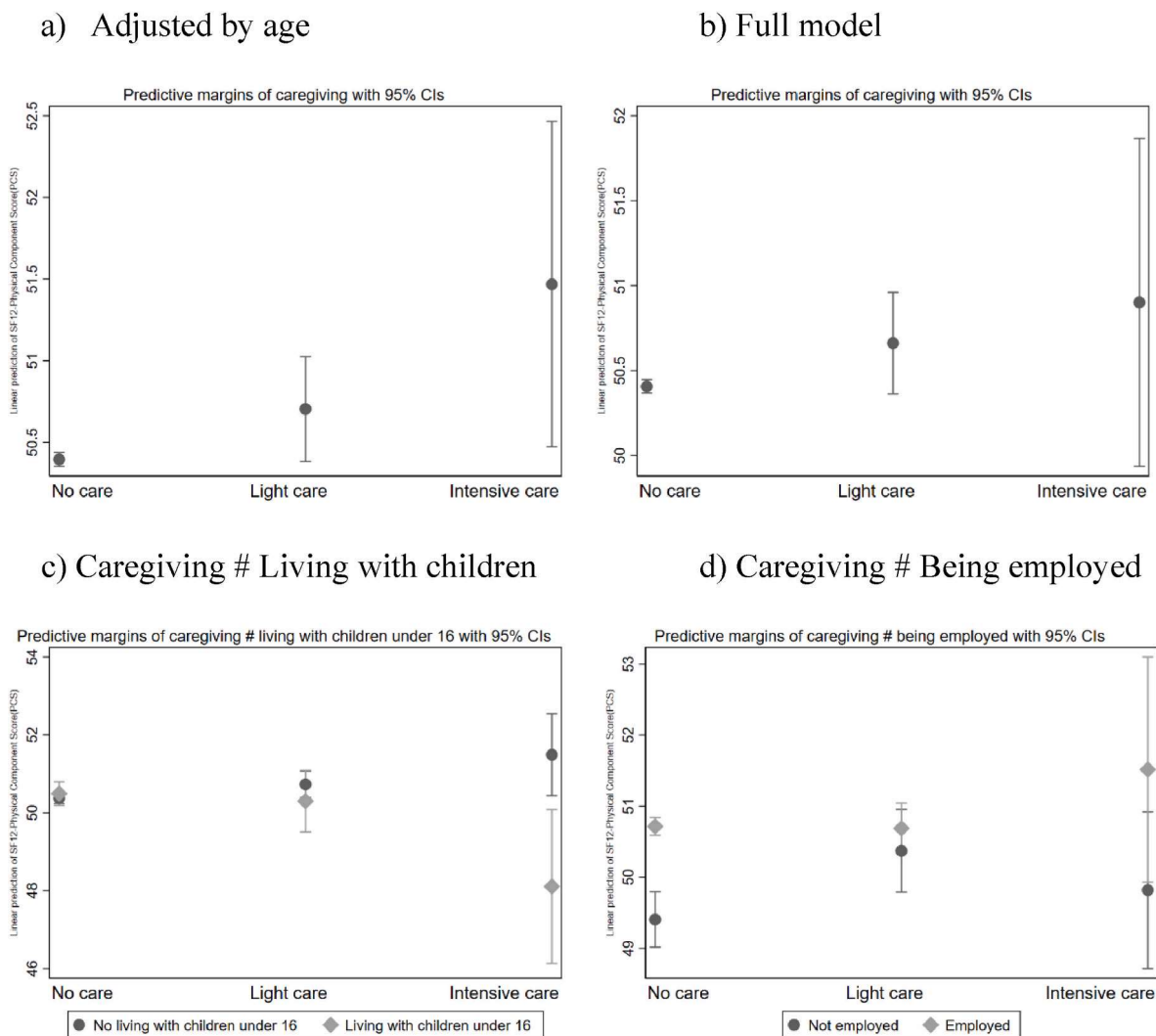


Fig. 4. Predictive margins of caregiving on SF-12 Physical Component Summary (PCS). Note. Margins were computed using the coefficients shown in Table 5 (Models 2^o). Full model was adjusted for age, the Mental Component Summary (MCS), MCS squared, living with a partner, having a biological parent alive and whether they live alone, living with children under the age of 16, household income, tenure, employment, and country of Great Britain. Interactions were introduced separately in the full model.

distribution. We believe that the use of observer-measured indicators measured by a nurse make this continuous measure of health more reliable than self-reported indicators, which may be influenced by psycho-social factors, culture, expectations, and may vary between study members (Eriksson et al., 2001).

We contribute with solid evidence on a frequently suggested but rather unexplored topic: the importance of taking health selection effects into account when assessing the health impacts of caregiving for an older relative. Particularly, because selection occurs at two points in time and in different directions in the case of parental care. First, potential parental caregivers comprised a healthier subsample at baseline. Men and women aged 40–69 who had a biological living parent were in better health than those ineligible to become a parental carer. Similarly, those who had any (biological or step) parent or parent-in-law alive reported better general health. These findings are consistent with a correlation between parents and children’s health (Henretta et al., 2001) and the better health of married adults relative to non-married (Zueras et al., 2020). Given the correlation of partners’ health -based on socio-economic assortative mating and shared lifestyles and exposure to stressors- (Drefahl, 2012; Schulz and Sherwood, 2008), these results may also apply to eligibility for providing spousal care, although this merits further investigation. Second, and contrary to Henz (2021), we

found that health selection into caregiving differed according to the intensity of care provided, as suggested by Kaschowitz and Brandt (2017). Individuals who became light caregivers were healthier than non-caregivers while those who became intensive carers were in poorer health, consistent with other studies suggesting health-related selection into caregiving of unhealthier individuals, who tend to have weaker labour force attachment (Brown and Brown, 2014; Carmichael and Ercolani, 2016; Coe and Van Houtven, 2009; Hirst, 2005; Lee and Gramotnev, 2007). These results are more consistent when we use the objective than the self-reported measure of initial health.

8.1. Strengths and limitations

This study has several limitations relating to information available in the UKHLS. The data do not allow distinction between parents and parents-in-law among care receivers, do not provide information about parents’ care needs, types of support provided by caregivers or whether respondents were sole caregivers. The lack of information on the health status of parents also meant we could not identify whether there was a ‘family effect’ of poor parental health on children’s mental health, regardless of whether they provided care. Also, although the UKHLS is the largest all age longitudinal survey in the UK, numbers were still

insufficient to allow analyses by ethnic group.

Despite these limitations, our study has several strengths: it is based on a large representative household survey with a 7-year follow-up; we control for initial health using a measure of objective health based on observer-measured indicators and compare results with initial self-rated general health; and we adjust for a large range of socio-economic and family related factors which may be associated with both the likelihood of undertaking caregiving and health consequences of caregiving.

9. Conclusion

This study provides strong evidence for the importance of considering health selection effects when assessing the health impact of parental care and shows the complex relationship between care and health outcomes. The implications of initial health status for study design suggest that researchers should consider participants' baseline health status and control for eligibility or, when this is not feasible, acknowledge potential biases and their direction.

Our findings reveal a pattern of double and divergent health-related selection into parental care roles. Potential parental caregivers were healthier than adults who had no living parents or parents-in-law, but among these, children who took on intensive caregiving roles had worse health. Initial health status also plays an important role in predicting later physical and mental health outcomes, regardless of caregiving behaviour. Taking on an intensive care role has detrimental effects on mental health, highlighting the need for adequate support and resources for caregivers in such demanding roles. Interestingly, we also find that light care has beneficial effects on the physical health of caregivers with poor self-rated health or low educational attainment. These findings emphasise the importance of tailored interventions and support systems to meet the diverse needs of caregivers and their families.

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Data availability

Data will be made available on request.

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.socscimed.2023.116537>.

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