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ARTICLE

The Economic Cost of Unpaid Care to the Public Finances: Inequalities in Welfare Benefits, Forgone Earnings-related Tax Revenue, and Health Service Utilisation

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Abstract
There is limited research on the effect of unpaid care on the public finances, and on the inequalities present when providing support to those with caring responsibilities. The aims of this research are to estimate the overall costs to the State of providing care, and to identify sub-groups of carers with relatively greater costs to the government who may need more support. We used waves eight to ten from the United Kingdom Household Longitudinal Survey and performed two-part Generalised Linear Models and Propensity Score Matching. We found that providing care is associated with excess and potentially avoidable costs to government in terms of forgone earnings-related tax revenue, welfare benefits, and health service use. Older carers have lower healthcare costs, indicating, perhaps, issues related to accessing to services due to their role (as they may neglect their own health, worry about safety and costs of public transport). Older carers were also found to have lower levels of welfare benefits, suggesting challenges associated with applying for support (such as navigating cumbersome application processes and stigma-related barriers).

Keywords: Forgone earnings-related tax revenue; healthcare costs; informal care; unpaid care; welfare benefits

Introduction

Unpaid care is the most important source of care provided and received by older people and those living with disability or a long-term illness (Verbeek-Oudijk *et al.*, 2014). Informal carers generally report financial, emotional, physical, or social burden, but they also simultaneously perceive satisfaction in their role of supporting loved ones as this provides meaning to their lives, helps them to learn new skills and maintain social connections (Martire *et al.*, 2003; Schulz & Sherwood, 2008). Care provision is therefore seen as a complex matter. The background, circumstances, and experiences of unpaid carers may influence their health, well-being, educational, and employment outcomes (Pristavec & Luth, 2020). Nevertheless, there are a number of well-known impacts of providing unpaid care. For instance, having caring responsibilities has been found to have a negative effect on educational attainment among young carers (Becker & Sempik, 2018), and is seen as a deterioration of their physical health (Cartagena-Farias & Brimblecombe, 2022; Brimblecombe *et al.*, 2018). While previous evidence has shown that unpaid care provision could have some positive effects on individual mental health and wellbeing (Young *et al.*, 2005; Schulz & Sherwood, 2008), this is reversed at more intensive levels of provision (Pinquart & Sörensen, 2003; Brimblecombe *et al.*, 2020; Robison *et al.*, 2020). Unpaid care has also been reported to have an

effect on retirement decisions (Dow & Meyer, 2010), and associated with other employment-related detrimental effects. Having caring responsibilities raises the likelihood that carers will leave their jobs, reduce their work hours and/or move to less demanding occupations, and in some cases accept a lower pay (Colombo *et al.*, 2011; Pickard *et al.*, 2015; Skills for care report, 2021).

The consequences of unpaid care provision are many and extend from the individual point of view to the sphere of public finances, the latter being the focus of this article. From the public budget perspective, the provision of unpaid care is often seen as a cost-effective way of providing care, as it reduces public spending on other long-term care services and support (Carers UK, 2015). It has been estimated that around five point one million carers exist in England and Wales (Office for National Statistics, **2023) who may support with their work the role of the state on providing care to the most vulnerable (Office for National Statistics, 2017), but also face challenges and difficulties that directly or indirectly may be also put pressure to the public finances (Rodrigues, *et al.*, 2013). For instance, health deterioration due to unpaid care provision may have an effect on the use of healthcare, so we could hypothesise that caring responsibilities relate to increasing health costs. Individual employment pattern changes, and retirement decisions will also have, among other things, an impact in terms of earnings-related tax revenue contributions and/or the receipt of welfare support (e.g., Social Protection Committee and the European Commission, 2014). That is, providing care is not cost-free to the State.

Gaining a better understanding of the potential costs to the State associated with unpaid care activities is relevant when reviewing and evaluating policy options designed to support carers, in making decisions about the provision of formal care services, and in order to obtain a more comprehensive picture of the costs associated with unpaid care activities. Nevertheless, there is very little research on the effect of caregiving on the public finances. A previous study (Pickard *et al.,* 2018a) estimated that the costs to the State of providing care leaving employment are around one point three billion pounds a year in the UK, but only included the costs of specific caring-related welfare benefits and lost earnings-related tax revenues on forgone income. Also, a previous study (Brimblecombe *et al.,* 2020) looked at the impact of having caring responsibilities on the employment and health and the associated individual and public expenditure costs, focusing on young people aged sixteen to twenty-five and found costs of £1,048 million annually, in 2017. In addition, because of the variation in outcomes, such as health and employment pattern among carers (Pinquart & Sörensen, 2003; Kumagai, 2017; Stacey *et al.*, 2018; Carr *et al.*, 2019; Cohen *et al.*, 2019), there may be some inequalities present in the costs absorbed by the State. Understanding which sub-groups of carers may be in need of higher levels of support is imperative in order to provide better healthcare access and ill health prevention and/or perhaps provide services that allow them to stay in employment. Inequalities in carer outcomes will be present in many forms. In this article we focus on three groups: younger versus older carers, those with lower and higher intensity of care provision, and ex- versus co-resident carers. This selection is based on previous evidence on differential impact on carers due to the hours dedicated to their role as carers, as well as their living arrangements (Organisation for Economic Co-operation and Development, 2011). The separation across age groups fundamentally captures the need to deal with differences in employment-related circumstances (as they may be retired or closer to retirement), and general health status experienced by older carers when compared to younger carers (Hirst, 2004).

The aims of this research are (i) to estimate the overall costs of providing care to the State, and (ii) to identify sub-groups of carers whose care provision is associated with relatively larger costs to the public finances and therefore may need more support. This is the first study that estimates these costs for the whole adult population in the UK using longitudinal data, and also the first to explore inequalities in costs to the State present within those with caring responsibilities.

Data and methods

Using data from a large nationally United Kigndom (UK) representative longitudinal survey, the UK Household Longitudinal Study (UKHLS) (University of Essex, 2022), we compared public

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expenditure costs at time 2 (wave ten; 2018–2020) for individuals who had unpaid care responsibilities and those that did not have unpaid care responsibilities at time 1 (wave nine; 2017–2019). To deal with potential endogeneity issues, we investigated the costs to the State of providing care for new carers (those who had caring responsibilities in wave nine, covering interviews during 2017–2019, but were not carers in the previous wave, wave eight) by comparing them to those that were never carers during the period of analysis. All people aged sixteen years old or older, with available information on their caring responsibilities at time one, were include in the sample of analysis. Under sixteen-year-olds were asked a much broader question than those in older groups. As a result, the provision of unpaid care most likely has a much higher prevalence than other surveys in this age group.

Measures

Caring responsibilities and locus of care

The UKHLS survey includes two questions that allowed us to classify individuals as unpaid carers at time one. The first question asks whether they live with somebody for whom they provide support due to illness, disability, or old age (excluding any help that is provided as part of their job). The second question asks whether they provide this type of support, but to somebody not living with them. The responses to these questions also allowed us to identify carers in different loci of care circumstances (co-resident and extra-resident carer), which is a well-known driver of inequalities across carers. Those living in the same household as the person they care for, tend to provider higher intensities of care (De Koker, 2008). In addition, the longitudinal nature of our sample allowed us to be able identify those carers that have just started to provide support. The latter was necessary in order to be able to rule out the possibility of selection bias, particularly in terms of health. Individuals could select themselves into the role of caring due to their better health and therefore have pre-established differences in health outcomes when compared to non-carers. This is known as the healthy carer effect in the literature (Ervin, *et al.*, 2022).

Age groups

In order to identify potential inequalities in the cost to the State, individuals were also classified into two groups, younger people (sixteen to sixty-four years old) and older people (sixty-five years old or older). This assumes that carers from different ages will face different challenges, such as retirement decisions or natural deterioration of their health due to the ageing process, all of which could affect the use of healthcare services, their income and welfare benefits received. The decision to have two groups split at sixty-five years old was based on an approximate age of retirement as well as using a widely used definition of older people, for comparison purposes (Orimo *et al.*, 2006).

Intensity of care provision

The UKHL survey also includes a question about the number of hours per week spent caring. More specifically, it asks individuals how many hours they spend supporting the people they look after, including those living and not living with them. This allowed us to classify carers into two groups: those providing lower intensity care (less than ten hours of care a week) and those providing higher intensity care (more than ten hours of care a week). The selection of this sub-group for analysis is based on previous evidence that highlights the detrimental effect of providing a larger number of hours of care on carers' health outcomes and employment patterns (Young *et al.*, 2005; Cartagena-Farias & Brimblecombe, 2022). The decision to split the sample at ten hours was based on previous research using English data. See for example, King & Pickard, 2013; Rand *et al.* (2019).

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Other sub-samples

While gender disparities have been widely reported in the literature, in particular with regards to take-up of the role being higher among female individuals (Seedat & Rondon, 2021), we have excluded this sub-group analysis in the present article. In particular, it is beyond the scope for this study to disentangle existent differences due to the care provision role and income variability linked to the widely reported gender-gap. The latter may have an unexplained and unobserved component linked to discrimination in the labour market for which we cannot control for (Kunze, 2008; Bishu & Alkadry, 2017). We assume this as a limitation of our analysis, as well as the study of differential outcomes across ethnic groups which suffer from similar challenges.

Sample size

Information on having (or not having) caring responsibilities was available for 29,596 individuals, 54.4 per cent of those were female, 81.8 per cent were ethnically White, 34.7 per cent had a long-standing illness or disability, and 20.3 per cent were classified as carers at wave nine (time one). A quarter of carers (24.1 per cent) were aged sixty-five years old or older, 62.7 per cent were (de facto) married, 62.1 per cent were female, and 43.8 per cent were co-resident. We also explore the cost to the State from those that have just started their role as carers. For this analysis, we included a total of 19,234 individuals who had information about having caring responsibilities at wave eight (time zero) and at wave nine (time two). From them, 1,494 were classified as new carers. More than half (58.8 per cent) were female, 86.0 per cent were ethnically White, 22.7 per cent were aged sixty-five years old or older, 39.1 per cent had a long-standing illness or disability, and 40.3 per cent are co-resident at wave nine (time one).

Analysis

We estimated the cost of caring to the public finances by comparing them at time two for carers and non-carers at time one. For this, we used two-part Generalised Linear Models (GLM). Control variables included relevant factors associated with the cost of unpaid care provision at wave nine (see for instance, Pickard, *et al.*, 2018b). More specifically, for State welfare benefits, and forgone earnings-related tax revenue, we controlled for the following factors: sex; ethnicity; self-reported health; marital status; highest educational qualification; age; and housing tenure. To estimate health service costs, the following covariates were included: sex, ethnicity, marital status, highest educational qualification, age, and housing tenure.

We used two-part Generalised GLM to deal with the skewed distribution of the cost variables (mostly due to a large number of zero cost in the sample analysed). The distribution and link function were selected by using the modified Park test (Mullahy, 1998). We obtained the marginal effect of providing care, by comparing the mean cost at time two associated with an individual with caring responsibilities at time one and the mean cost at time two associated with an individual without caring responsibilities at time one. Nevertheless, investigating the association between providing care and the cost of health and employment related outcomes may raise selection bias concerns due to pre-established differences between carers and non-carers before they started their caring responsibilities (such as the healthy carer effect mentioned in the previous section of this article). This is a common concern when using observational data to attempt to establish causality (Heckman *et al.*, 1986). We addressed this potential selection bias by performing Propensity Score Matching (PSM) in combination with the two-part models GLM. The main feature of the PSM approach is the estimation of a propensity score, i.e. the probability of having caring responsibilities (participation), conditional on observed baseline characteristics (Rosenbaum & Rubin, 1983). The PSM methodology aims to create a counterfactual/comparison group, that is, a group of non-carers who are similar to carers with regards to observable

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characteristics and circumstances at baseline (before care provision started), to then compare their outcomes at a later point in time. The main benefit of using PSM is that we avoid comparing carers to non-carers who had differential outcomes (e.g., if for example, carers were healthier) before they took caring responsibilities. Kernel matching was performed, that is, all carers were matched with a weighted average of all non-carers. The use of the full sample of non-carers allows for achieving a lower variance (Caliendo & Kopeinig, 2008).

For PSM to be performed, individuals should be matched prior to participation (before they became carers). Our analyses and estimation, therefore, identifies two groups: those without caring responsibilities during the period of analysis (non-carers) and those found to be providing care at time one, but not having caring responsibilities at the previous wave, i.e., time zero (wave eight; 2015–2017), new carers. Those that had caring responsibilities at time zero and time one were excluded from the analysis. Those who took caring responsibilities between 2015 and 2017 (time zero) and 2017–2019 (time one) are understood to be part of the 'treated' sample and were, thus, matched, to those who did not (non-carers, also known as the 'untreated' sample). Matching variables were based on factors previously found to influence simultaneously the participation decision (being a carer) and the outcome variable and are either constant over time or measured before starting to provide care at time zero (Caliendo & Kopeinig, 2008). On the other hand, all outcomes were measured in the subsequent wave (2018–2020), time two. We calculated the average treatment effect (ATE) for each outcome analysed. Bootstrapping was performed to estimate the associated standard errors and confidence intervals. The success of the matching process was assessed by two measures of covariate balance post-matching: The absolute standardised difference of the means of the linear index of the propensity score in the carers/treated and matched non-carers/untreated groups (Rubin's B), and Rubin's R (the ratio of treated to (matched) non-treated variances of the propensity score index). A rule of thumb indicates that, to conclude that the samples are sufficiently balanced, B should be less than twenty-five and R should have a value between zero point five and two (Rubin, 2001). A potential caveat of performing PSM is that we were only able to include new carers in the analysis. This may impose some limitations to our analysis, as some carers may have been caring for a long period of time, and so would not be included in the PSM sample. We therefore report findings from both the unmatched sample (when all carers have been included), and from the matched analysis, when only new carers have been included.

Public expenditure costs: Annual forgone earnings-related tax revenue, welfare benefits, and health service use

We followed the same methodology performed by Brimblecombe *et al.* (2018). For this, we included three types of public expenditure costs at time two associated with health, employment, and welfare. More specifically, we estimated the differences between carers and non-carers in annual forgone earnings-related tax revenue, welfare benefits, and health service use (our regression outcomes). Earnings-related tax revenue was calculated by subtracting net earnings from gross earnings. This gave us the total earnings-related tax paid (including income tax, national insurance contributions, and any other deductions such as any pension contributions). Annual welfare benefits were calculated using additional information, available in the UKHLS, on other sources of income received by individuals including pension credit, state pension, childcare benefits, disability living allowance, attendance allowance, carer's allowance, income support, housing benefit, council tax benefit, foster allowance, other disability related benefit or payment, and/or universal credit. To calculate the total health service cost, the number of general practitioner (GP) visits, outpatient visits, and inpatient stays, were multiplied by their associated UK unit cost (Curtis & Burns, 2020). In the case of the number of hospital inpatient stays, these were multiplied by the National Health Service (NHS) 2017–2018 elective and non-elective combined excess bed day cost (NHS, 2020).

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Outcomes: Annual cost to the State

We estimated the annual aggregate costs to the State of individuals providing care using the two approaches described above. All carers versus all non-carers (the unmated sample) and new carers versus matched non-carers (the matched sample). In both cases, to obtain the total aggregated annual costs to the State, we multiplied per-person mean differences in annual lost earnings-related tax revenue, annual welfare benefits (monthly welfare benefits multiplied by twelve) and annual health service costs by the estimated numbers of people aged sixteen or older with caring responsibilities. We then added up all the costs to obtain the total annual cost to the State. Some of the differential costs between carers and non-carers were found not to be statistically significant, but in order to apply a standard procedure, they were still included in the total figure. For our estimations, we used the prevalence of being a carer in the UKHLS (20.4 per cent) at wave ten (when outcomes are compared) and the projected numbers of individuals aged sixteen or older in mid-2019 (Office for National Statistics, 2015). For the aggregate estimates for new carers, we used the prevalence of acquiring new caring responsibilities between 2015 and 2017 in the UKHLS (7.7 per cent).

It is important to note that when presenting overall total costs alongside total costs by age group, the latter will not be additive to produce the overall total costs. For instance, younger (sixteen to sixty-five) and older (sixty-five plus) subsamples estimated total costs cannot be added and be equal to the overall (sixteen plus) total costs. Differences of aggregate annual costs are not estimated using accounting methods (where sub-totals do add up to the overall total), but average effects within each sub-sample: The average cost of all carers is estimated against the overall cost of non-carers when using the full sample, but the average cost of older carers is estimated against the average cost of older non-carers when the sixty-five plus sub-group is being analysed.

All tests of statistical significance used robust standard errors. We conducted analyses using Stata 16 (StataCorp, 2019).

Results

Table 1 presents descriptive statistics of the full sample of people aged sixteen or older on whom we had information about caring responsibilities at baseline (time one), their socio-demographic characteristics, and information about healthcare use, welfare system usage, and earnings-related tax paid at time two. As expected, a larger proportion of carers are female, more than a third of them have a long-standing illness or disability, and the latter exacerbate with age (39.0 per cent and 54.5 per cent of younger and older carers, respectively) have a long-standing illness or disability). Overall, carers receive higher mean annual welfare benefits than non-carers, pay lower annual earnings-related tax, and have higher health service costs. Inequalities across carers are also present when comparing carers providing more intensive support (ten or more hours of care) to those providing ten or less hours of care. Similarly, variability on the cost to public finances is present when comparing extra and co-resident carers, and when comparing younger (sixteen to sixty-five years old) and older carers (sixty-five years old or older).

Unmatched sample

Table 2 presents the mean annual cost differences at time two between carers and non-carers at time one controlling for covariates mentioned in the analysis section. Looking at all adult carers at baseline, we estimated that, on average, each carer received £1,258 more welfare benefits at time two than non-carers. Carers also paid, on average, £599 less a year compared to non-carers in terms of earnings-related tax revenue and had a cost of £60 more to the public finances than those without caring responsibilities in terms of annual health service cost. These results correspond to an estimated aggregate annual cost to the State of twenty one billion pounds. We also found some

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Table 1. Characteristics and mean outcomes by sub-group (full sample) at wave nine

Sample (Unmatched)	Gender: Female (%)	Ethnicity: White (%)	Employment: Employed (%)	Highest qualifications: Degree or higher (%)	Marital status: Married/with partner (%)	Long-standing illness (%)	Annual welfare benefits time 2 mean (£)	Annual earnings-related tax paid time 2 mean (£)	Annual health service costs time 2 mean (£)
16+									
Non-carer (all)	53.6	80.4	79.6	45.7	63.7	30.7	3,133.61	4,255.68	454.2
Carer (all)	62.1	84.7	72.7	41.2	62.7	43.0	4,968.55	2,704.91	531.08
Caring for <10 hrs. a week	60.0	86.8	82.0	45.7	62.8	39.3	3,650.32	3,543.15	487.89
Caring for 10+ hrs. a week	65.3	83.1	58.7	34.1	64.2	48.2	6,972.73	1,483.63	587.33
Extra-resident carer	66.0	89.3	82.6	46.0	60.0	39.7	3,744.18	3,240.03	485.35
Co-resident carer	57.0	78.9	58.3	34.5	66.23	47.3	6,673.02	1,944.91	596.14
16–65									
Non-carer	55.1	78.8	79.3	47.7	58.3	25.4	1,972.76	5,285.61	375.46
Carer	64.9	82.7	71.9	43.2	59.4	39.0	3,652.04	3,624.41	473.08
<10 hrs. caring	62.1	85.4	81.3	4.4	60.6	35.8	2,102.59	4,627.24	423.56
10+ hrs. caring	69.4	80.2	57.6	36.9	58.1	43.9	6,185.62	2,066.72	556.71
Extra-residents	68.4	88.0	82.0	47.1	61.4	37.2	2,343.99	4,137.63	419.86
Co-residents	59.7	74.8	57.2	37.0	56.5	41.7	5,694.07	2,796.20	558.61
65+									
Non-carer	47.3	93.1	87.9	36.9	86.4	52.7	8,119.28		793.11
Carer	54.1	94.2	90.3	35.3	71.8	54.5	8,760.60		696.54
<10 hrs. caring	53.3	95.8	96.3	40.7	65.4	50.6	8,606.72		692.44
10+ hrs. caring	54.9	92.7	83.9	27.3	79.4	58.7	8,933.30		662.68
Extra-residents	57.4	96.7	98.7	41.9	55.2	48.8	8,636.36		713.82
Co-residents	51.1	92.0	80.6	28.9	87.2	59.6	8,885.95		678.97

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Table 2. Aggregated annual costs (£): Unmatched sample

ALL carers 16+	Prevalence (weighted)	Estimated population (N)	Annual welfare benefits (ATE)	Forgone earnings-related tax revenue (ATE)	Annual health service costs (ATE)	Total mean cost per carer	Aggregate annual costs (£): Total cost per carer* Estimated population
Overall	20.37	10,896,685	1,257.48***	599.17***	60.34**	1,916.99	20,888,836,222
<10 hrs. caring	12.16	6,504,845	273.36***	32.21	55.53	361.1	2,348,899,480
10+ hrs. caring	7.81	4,177,865	3,117.84***	1655.7***	53.6*	4,827.14	20,167,139,251
Extra-residents	11.56	6,183,882	316.68***	133.43	49.87	499.98	3,091,817,384
Co-residents	8.81	4,712,803	2921.4***	1495.99***	77.66**	4,495.05	21,184,284,671
Age group: 16–65	Prevalence (weighted)	Estimated population (N)	Annual welfare benefits	Forgone earnings-related tax revenue	Annual health service costs	Total mean cost per carer	Aggregate annual costs (£)
Overall	14.7	7,863,587	1,102.92***	419.85**	70.66***	1,593.43	12,530,075,641
<10 hrs. caring	9.1	4,867,935	102.72	−199.85	61.68*	−35.45	−172,568,292
10+ hrs. caring	5.3	2,835,171	3,428.76***	1664.1***	100.52***	5,193.38	14,724,119,693
Extra-residents	8.7	4,653,960	122.04	−56.07	46.25*	112.22	522,267,361
Co-residents	6	3,209,627	3,164.28***	1438.05***	119.97**	4,722.3	15,156,823,471
Age group: 65+		Estimated population (N)	Annual welfare benefits	Forgone earnings-related tax revenue	Annual health service costs	Total mean cost per carer	Aggregate annual costs (£)
Overall	5.7	3,049,146	292.8**		−189.74**	103.06	314,244,990
<10 hrs. caring	3.1	1,658,307	74.76		−195.24**	−120.48	−199,792,886
10+ hrs. caring	2.5	1,337,345	486.36**		−277.75***	208.61	278,983,488
Extra-residents	2.8	1,497,826	−136.08		−155.11	−291.19	−436,151,988
Co-residents	2.9	1,551,320	672.96***		−200.58***	472.38	732,812,499

***$p \leq .01$; **$p \leq .05$; *$p \leq .10$.

Controlling for carer's sex, ethnicity, health (LLTI), marital status, highest qualification, age at time one in analysis of employment status; carer's sex, ethnicity, health (LLTI), marital status, highest qualification at time one in analysis of lost earnings-related tax revenue, and welfare benefits; controlling for carer's sex, ethnicity, marital status, highest qualification, housing tenure at time one in analysis of health service use.

Aggregate annual costs include statistically significant and non-significant welfare benefits, forgone earnings-related tax revenue, and health service costs.

The overall (sixteen plus) total aggregate annual costs are not equal to sub-group totals (sixteen to sixty-five and sixty-five plus) due the estimation of average differential costs between carers and non-carers within each group.

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differences in the associated cost across different levels of unpaid care provision. For instance, caring for ten or more hours a week is associated with higher costs to the public finances compared to providing ten or less hours of support a week. Similarly, co-resident carers receive more annual welfare benefits, pay less tax and have higher annual health service costs.

With regards to differences across age groups, overall, younger carers have an additional annual cost to the State of £1,593 compared to non-carers, while older carers had a much smaller associated cost (£103). Nevertheless, these figures are not actually comparable, as forgone earnings-related tax revenue were excluded from older carers' overall figures (as older people are mostly not working, 8.5 per cent, compared to younger individuals, 70.9 per cent, in our sample). The cost associated to receiving welfare benefits was £1,102 a year for younger carers and £293 for older carers (compared to younger and older non-carers respectively). The estimated healthcare cost of older carers was also found to be lower than for younger carers. For instance, we found a cost of £71 a year for younger carers, and savings of £190 for older carers compared to non-carers.

Matched sample

When PSM, comparing 'new' carers to matched non-carers, we found that those providing care pay significantly lower earnings-related tax. On the other hand, welfare benefits and health service costs were all significantly higher for this group. Overall, carers have higher statistically significant annual welfare benefits compared to non-carers (£685 on average per carer), they also pay less in terms of annual earnings-related tax (£767 on average per carer) and have higher annual health service costs (on average £11 more, per carer). Therefore, this represents an estimated cost of six point one billion pounds a year. As in the analysis using the unmatched sample, we also found that carers providing a larger amount of hours also receive more welfare benefits, pay less earnings-related tax, and have higher health service costs than carers that provide less than ten hours of care. We found that older carers received lower annual welfare benefits compared to younger carers, similarly their annual health service costs are also lower even when ruling out the possibility that older carers may have been selected into the role because of their better health. Older carers may also face barriers that could lead to a lower use of services, as older people may not access services in the same way that younger people do. Table 3 presents the mean annual cost differences at time two between new carers and non-carers at time one.

Discussion

This study focused on the estimation of the cost to the State associated with providing unpaid care. Following two approaches, unmatched and matched sample analysis, we found that unpaid carers are imposing a cost to public finances. Not all of these costs are necessarily negative (they may for example help meet carers' health or financial needs) but are perhaps a reflection of the fact that unpaid care is not cost-free, and that some groups of carers could be in need of extra support. For instance, we found co-resident caring and providing more intense care is associated with higher costs to the State than those living outside the household and providing fewer hours of care, respectively, perhaps calling for initiatives that aim to reduce the number of hours that carers dedicate to caring activities (to reduce the detrimental effects associated with the role of caring) or provide support or strategies to deal better with the consequences of caring. In this regard, initiatives such as care training have showed to reduce the stress for carers, helping them to cope with undesirable effects of their role (McAtee *et al.*, 2021). Additional disparities were seen when looking at the locus of care. Co-resident carers were also found to have higher costs than ex-resident carers. This may also be a consequence of co-resident carers tendency to provide a higher number of care hours and to be more likely to provide personal care than extra-resident carers (Colombo *et al.*, 2011; Brimblecombe *et al.*, 2018; Rand *et al.*, 2019). This emphasises the

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Table 3. Aggregated annual costs (£): matched sample

ALL carers 16+	Prevalence (weighted)	Estimated population (N)	Annual welfare benefits	Forgone earnings-related tax revenue	Annual health service costs	Total mean cost per carer	Aggregate annual costs (£): Total cost per carer * estimated Population
Overall	7.7	4,140,419	685.17***	767.16***	10.82	1,463.15	6,058,054,060
<10 hrs. caring	5.4	2,861,918	−13.61	420.52*	−2.76	404.15	1,156,644,160
10+ hrs. caring	2.2	1,150,116	2,659.62***	1,396.92***	20.23	4,076.77	4,688,758,405
Extra-residents	4.6	2,455,365	−160.01	261.14	−23.33	77.8	191,027,397
Co-residents	3.1	1,679,705	2,368.24***	1,488.20***	70.99	3,927.43	6,596,923,808
Age group: 16–65	**Prevalence (weighted)**	**Estimated population (N)**	**Annual welfare benefits**	**Forgone tax earnings-related revenue**	**Annual health service costs**	**Total mean cost per carer**	**Aggregate annual costs (£)**
Overall	5.8	3,102,640	675.49***	867.18***	7.63	1,550.30	4,810,022,792.00
<10 hrs. caring	4.2	2,246,739	−70.23	576.86**	1.85	508.48	1,142,421,846.72
10+ hrs. caring	1.4	748,913	3,691.37***	1,619.57***	28.17	5,339.11	3,998,528,887.43
Extra-residents	3.8	2,032,764	0.70	535.06*	7.02	542.78	1,103,343,643.92
Co-residents	2.0	1,069,876	2,598.18***	1,467.23***	6.77	4,072.18	4,356,727,649.68
Age group: 65+	**Prevalence (weighted)**	**Estimated population (N)**	**Annual welfare benefits**	**Forgone earnings-related tax revenue**	**Annual health service costs**	**Total mean cost per carer**	**Aggregate annual costs (£)**
Overall	2.0	1,069,876	176.62		−47.96	128.66	137,650,246.16
<10 hrs. caring	1.2	641,925	320.94		−28.28	292.66	187,865,770.50
10+ hrs. caring	0.7	374,457	−432.89		−129.51	−562.40	−210,594,616.80
Extra-residents	0.8	427,950	−52.738		−147.88	−200.62	−85,854,473.10
Co-residents	1.1	588,432	211.78		46.59	258.37	152,033,175.84

***$p \leq .01$; **$p \leq .05$; *$p \leq .10$.

Controlling for carer's sex, ethnicity, health (LLTI), marital status, highest qualification, age at time 1 in analysis of employment status; carer's sex, ethnicity, health (LLTI), marital status, highest qualification at time 1 in analysis of lost earnings-related tax revenue, and welfare benefits; controlling for carer's sex, ethnicity, marital status, highest qualification, housing tenure at time 1 in analysis of health service use.

need for extra support and targeted approaches as not all carers face the same challenges and circumstances.

Our results also show that older carers tend to cost less in terms of health costs compared to younger carers. There may be many reasons for this disparity, perhaps, the difference between younger carers and younger non-carers in terms of mental health outcomes is higher than the difference between older carers and older non-carer outcomes (Brimblecombe & Cartagena-Farias, 2022). Some groups of carers may also have better physical health outcomes than non-carers: older carers may take on caring responsibilities because they are in better health (the healthy carer effect previously mention in this article), while younger carers may not or may not experience poorer physical health to the same extent at that age (Pinquart & Sörensen, 2003; Buyck, *et al*., 2011; Stacey *et al*., 2018; Palmer, 2019). However, we rule out this latter possibility by using a matching approach. Therefore, lower health costs among older carers could be, perhaps, flagging issues related to access to services as lacking time or energy to attend or search for help, and the possibility that older carers may need more support in terms of asking for help or receiving preventative services, an implication for policy and practice. Older people may worry about safety as well as the availability and costs of public transport to access health services (Stark *et al*., 1997; Foster *et al*., 2001; Ford *et al*., 2015) and that could have an impact on the services that they actually receive.

Older carers, on average, have lower welfare costs to the State compared to younger carers. While it is difficult to know the exact reasons for these lower costs, there is some evidence that older people may be unaware of the type of welfare support available to them or may believe that they are not entitled to receive any support. They may not claim because of health reasons, or because the application process is too complicated and time-consuming (Radford *et al*., 2012). Pride and stigma also limit the extent to which older people ask for help (Age UK, 2021). In this regard, recent official statistics have shown that almost a million pensioner households are entitled to Pension Credit benefits, but not claiming them (DWP, 2020). This calls for initiatives that could make the system more accessible, for instance, reducing the complexity of the application process and/or providing automatic entitlements. Access to information is also fundamental. For this, local advice services play a very important role, but have been lately under incredible pressure following the challenges imposed by Covid-19 (Age UK, 2021) and cuts to voluntary sector funding (Jones *et al.,* 2015). There is a strong argument, therefore, to reverse the funding cuts and find alternative means of delivering the information to older people (e.g. GPs). The UK Government itself has launched a campaign trying to encourage those eligible to claim Pension Credit, trying to cover social media, newspapers, and providing information leaflets to local communities (Department for Work and Pensions, 2022).

The unmatched and matched analyses provide different estimates of the costs to the state of providing unpaid care (twenty one billion pounds and six point one billion pounds annually, respectively). This as an upper and lower band is not insignificant to the public finances, and corresponds to around to almost 70 per cent and 16 per cent, respectively, of the annual UK spending on social care in 2015–2016 (Institute for Fiscal Studies, 2017). While there is a large difference with regards to the cost of unpaid care between the two approaches, aggregate costs were high in both cases and the direction and interpretation of the results similar. They are not, however, comparable due to methodological issues and also the sample utilised (e.g., the matched approach uses a limited sample of new carers which are only four point one million compared to the six point seven million reported by Office for National Statistics (ONS) Census 2011 figures). The matched sample helps to deal with selection bias concerns using a sample of new carers, which may be providing fewer hours of care – but the inequalities across different groups of carers persist. The cost to the State varies depending on the age of the carer, their locus of care, and the intensity of their caring activities. These results highlight the need to understand the complexity of the hidden consequences of providing unpaid care. The costs to the State could perhaps be better spent on preventing the negative consequences associated with early retirement, being

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unemployed, and/or worse health outcomes. For instance, improving working conditions could reduce and prevent early retirement due to health deterioration (Hermansen & Midtsundstad, 2018), allowing people to stay at work, reducing health costs and forgone earnings-related tax revenues.

It is important to note, that although we estimated a number of costs to the public finances, there may be other economic impacts of providing care to the State, including a reduction in consumption and expenditure due to lower earnings level of carers, which may indirectly affect tax collection and economic growth (Brimblecombe *et al.*, 2018; Spann *et al.*, 2020). We did, however, gain a better understanding of the overall impact of the impacts of having caring responsibilities on the public finances. The main strength of this study is to have estimated the cost to the State for all adults, using a large representative sample, being able to reduce the risk of selection bias, and also being able to explore sub-group inequalities. There are many policy implications of this research. For instance, providing care may be associated with potentially avoidable costs to government. There is a need, therefore, to gain a better understanding of the differential support that sub-groups of carers may require and also of reducing barriers for carers to gain the support that they need. It is also paramount to understand that welfare benefit costs and health service costs are not necessarily unwelcomed, as carers are getting some financial or health support. In fact, lower costs may either indicate lower impacts – a good thing – or an inability to access support that is needed – a bad thing. Finally, we would like to highlight the potential role played by prevention initiatives that could set against the cost per carer to the government, prevention initiatives have been widely promoted in England in the development of care needs, but this approach has not been extended to carers who usually approach services at the breaking point.

Conclusions

Our study contributes to gaining a better understanding of the consequences of unpaid care provision by estimating its cost on the public finances. We estimate that the economic costs to the State because of individuals providing unpaid care could range from six point one to twenty one billion pounds a year. As far as we know, this study is the first to estimate these costs by all adults, dealing with selection bias concerns, and also the first to explore these associations looking at cost by carer provision characteristics. Further research could be aimed at investigating other types of inequalities that may be present among carers (such as gender or ethnic origin differentials) or the role played by COVID-19 in exacerbating already existent inequalities, including the increase of costs due to a higher reliance on unpaid care during the pandemic (Bergmann & Wagner, 2021).

Data availability statement. This study used third party data made available under licence that the author does not have permission to share (SN 6614 The UK Household Longitudinal Study, UKHLS, Understanding Society: Waves 1-12, 2009–2021 and Harmonised British Household Panel Survey (BHPS): Waves 1-18, 1991–2009). Requests to access the data should be directed to the UK Data Service (UKDS) at https://ukdataservice.ac.uk/.

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