Giorgio Di Gessa, Karen Glaser, Anthea Tinker

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The impact of caring for grandchildren on the health of grandparents in Europe: A lifecourse approach

Giorgio Di Gessa*, Karen Glaser, Anthea Tinker

Institute of Gerontology, Department of Social Science, Health & Medicine, School of Social Science and Public Policy, King's College London, London WC2R 2LS, UK

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ABSTRACT

Grandparents are becoming an increasingly important source of childcare. However, caring for grandchildren may have negative health consequences particularly for grandparents with intensive commitments such as those with primary care responsibilities. To date most studies on this issue are based on cross-sectional data and do not take earlier life circumstances into account. Thus, it is not known whether (or to what extent) the relationship between grandparental childcare and health is due to cumulative advantage or disadvantage throughout the lifecourse or to the impact of grandchild care per se.

Employing data from waves 1–3 of the Survey of Health, Ageing and Retirement in Europe we investigated the longitudinal relationship between grandparental childcare (i.e. intensive and non-intensive) and health once cumulative histories of advantage or disadvantage are taken into account. We used latent class analysis to categorise respondents according to childhood socio-economic and health conditions drawing on life history information. Experiences in adulthood (e.g. periods of ill health) were also captured. We created a latent continuous physical health variable based on self- and observer-measured indicators. OLS regression was used to explore the association between physical health at wave 2 and grandparental childcare at baseline, controlling for conditions in childhood and adulthood, and for health and socio-economic characteristics.

We found a positive longitudinal association between grandchild care and health even after earlier life health and socio-economic conditions were taken into account. However, this significant association was found only for grandmothers, and not grandfathers. Our results suggesting the health benefits of grandchild care are important given the widespread provision of grandparental childcare in Europe. However, further research on underlying mechanisms and causal pathways between grandchild care and grandparent health, as well as on gender differences in the pattern of association, is needed.

1. Introduction

It is well recognised that grandparents play a vital economic and social role in providing grandchild care to families (Hank and Buber, 2009; Laughlin, 2013). In a study of 10 European countries, 58% of grandmothers and 49% of the grandfathers looked after at least one of their grandchildren under the age of 16 in the preceding year in the absence of their parents (Hank and Buber, 2009). In the United States (US) one in four children under the age of 5 has been cared for by grandparents in the previous month (Laughlin, 2013).

Although previous studies generally support the idea that grandparents provide vital support to families looking after grandchildren, the health impacts on older people of taking on these childcare roles remain uncertain. The evidence on this issue is mixed, depending on the intensity of grandchild care provided and on the cultural context (Hughes et al., 2007; Minkler and Fuller-Thomson, 2001; Tsai et al., 2013; Grundy et al., 2012; Arpino and Bordone, 2014; Blustein et al., 2004; Ku et al., 2013; Minkler et al., 1997; Chen and Liu, 2012; Baker and Silverstein, 2008; Minkler and Fuller-Thomson, 2005; Grinstead et al., 2003). Prior research suggests that grandparents who undertake intensive grandparenting roles, in particular the custodial care of grandchildren, are often among the most disadvantaged and in the poorest health; in contrast, those who provide occasional or supplementary care tend

* Corresponding author.
E-mail address: giorgio.di_gessa@kcl.ac.uk (G. Di Gessa).

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to be better off and to report better health. However, it is not known whether or to what extent these adverse outcomes are due to the impact of grandchild care per se or to cumulative advantage or disadvantage throughout the lifecourse. Our study adds to the literature on grandparental childcare and health as we are able to take into account cumulative advantage or disadvantage across the lifecourse in examining the effect of caring roles on later life health. To address this issue, we use the longitudinal aspects of the Survey of Health, Ageing and Retirement in Europe (SHARE) including both the life history information and panel data into our analysis.

2. Background

Research to date on the relationship between grandparental childcare and health and wellbeing is inconclusive. Looking after grandchildren may be demanding, both physically and emotionally; however, provision of grandchild care may also be positively affirming and rewarding as grandparents can enjoy a closer relationship with their grandchildren (Grinstead et al., 2003). Cross-sectional studies suggest that grandparents providing occasional childcare are more likely to report better physical and psychological health, and higher quality of life compared to grandparents with primary care responsibility for a grandchild or no childcare at all (Hank and Buber, 2009; Minkler and Fuller-Thomson, 2001; Arpino and Bordone, 2014; Minkler and Fuller-Thomson, 2005; Grinstead et al., 2003; Fuller-Thomson and Minkler, 2001). However, as grandparents who look after their grandchildren occasionally are more likely to be financially better-off, and in turn to have better health, the health differences reported in studies based on cross-sectional data may reflect variations in socio-economic status rather than in caregiving per se.

Studies that have investigated these issues longitudinally (thereby allowing pre-existing health and socio-economic conditions to be taken into account) have also led to mixed results (Hughes et al., 2007; Tsai et al., 2013; Grundy et al., 2012; Blustein et al., 2004; Ku et al., 2013; Minkler et al., 1997; Chen and Liu, 2012; Baker and Silverstein, 2008). On the one hand studies, largely from the US using either the Health and Retirement Survey or the National Survey of Families and Households, have found a negative relationship between grandparent childcare and health. In particular, custodial or co-residing grandparents who provide 15 h of care per week or more are more likely to experience health declines and to report depressive symptoms in comparison to those who provide lower levels of grandchild care or no grandchild care (Hughes et al., 2007; Blustein et al., 2004; Minkler et al., 1997; Chen and Liu, 2012). On the other hand, a positive impact of grandparental childcare on health has been found particularly among grandparents providing lower intensity levels of grandparental care (Tsai et al., 2013; Grundy et al., 2012; Ku et al., 2013; Chen and Liu, 2012).

Evidence therefore suggests a complex relationship between the provision of grandparental childcare and health, and it remains unclear whether (or to what extent) the relationships found between grandparenting and health is confounded by cumulative advantage or disadvantage throughout the lifecourse. Previous findings may have been affected by inadequate controls for the lifecourse characteristics of grandparents (such as histories of poor health and socio-economic disadvantage), which are likely to be related both to current health status and the likelihood of providing grandchild care.

Increasingly, research on health in later life has come to adopt a lifecourse approach, widely acknowledged as one of the most appropriate theoretical frameworks for examining later life outcomes (Bengston et al., 1997). It is well-recognised that childhood health and early-life family characteristics and socio-economic circumstances such as parental occupation and housing tenure are associated with mortality and health outcomes in mid and later life (Brandt et al., 2012). However, childhood socio-economic circumstances and health also have an important influence on future life chances and lifetime experiences. Within the lifecourse perspective, the cumulative advantage/disadvantage framework postulates that inequalities in health are initiated early in life and increase with age as initial disadvantages and advantages accumulate and interact across the lifecourse (O'Rand, 1996; Crystal and Waehrer, 1996). Those who start out with fewer advantages will have less opportunity to accumulate resources thus falling farther behind, although it is acknowledged that attaining higher status in adulthood may act to ameliorate the negative impact of disadvantage in childhood (O'Rand, 1996).

Recent studies suggest that grandparents who experienced greater disadvantage in their lifetime marital, partnership and paid work histories are more likely to provide higher levels of childcare (Prokos and Keene, 2012; Strawbridge et al., 1997; Glaser et al., 2014). For instance, in a longitudinal study of health and mortality in California, grandparents raising a grandchild were significantly more likely to have experienced negative life events, such as marital, financial and physical health problems in the 20 years prior to assuming care in comparison to those who ended up caring for parents or spouses (Strawbridge et al., 1997). Such lifetime histories, however, are themselves associated with a greater likelihood of adverse health outcomes at older ages (Brandt et al., 2012; Grundy and Tomassini, 2010).

Thus, our study contributes to a key knowledge gap in this area by controlling for cumulative advantage or disadvantage across the lifecourse when examining the longitudinal relationship between provision of grandparental childcare and health. Indeed, unlike previous longitudinal studies, in this study we were able to control not only for socio-economic characteristics and health at baseline, but also for long-term socio-economic experiences and health throughout the lifecourse. Whereas studies following individuals from birth to old ages are still scarce, SHARE collected life history data for large nationally representative samples of older people, allowing us to control for different life experiences when examining the longitudinal relationship between grandparental childcare and later life health. Moreover, unlike most of the previous studies which focused on primary carers and on grandparents who coreside with their grandchildren, we analysed the more common supplementary grandparental childcare (i.e. complementary to parental care), controlling for living arrangements and taking into account its intensity.

3. Methods

3.1. Sample

We used data from the first and second wave (2004/05 and 2006/07) and the lifecourse interview (third wave – 2008/09) in SHARE, a multidisciplinary longitudinal survey of individuals aged 50 and over living in Austria, Belgium, Switzerland, Germany, Denmark, Spain, France, Italy, Greece, the Netherlands, and Sweden. Details of sampling frames and methodology, weighting strategies and questionnaires have been reported elsewhere (http://www.share-project.org/). Our analytic sample included participants aged 50 and older who had at least one grandchild at wave 1, who participated in wave 2, and for whom information on lifecourse experiences had been collected in wave 3. After excluding respondents who were missing baseline information on the provision of childcare (n = 112, 0.7%) and respondents who had died by wave 3 (n = 795, 4.8%), the final sample consisted of 8972 grandmothers and 6567 grandfathers aged 50 and over at baseline, of whom 9137 (58.8%) participated in waves 2 and 3.

3.2. Measures

3.2.1. Outcome

As a measure of health, we combined several health indicators into a latent health index using a similar procedure to the one proposed by (Ploubidis and Grundy, 2011) to measure physical health among survey respondents for which both self-reported and observer-measured information on health is available. In particular, the following variables were combined under the assumption that such health indicators are manifestations of a latent (not directly observed) "true" physical health status: self-rated health using a 5-point ordinal scale (*excellent*, *very good*, *good*, *fair*, or *poor*); presence of severe long standing illness; the presence of one or more functional limitations with activities of daily living and/or with instrumental activities of daily living; self-reports of doctor diagnosed heart disease, stroke, lung disease and cancer; and maximum grip strength using one or both hands. Such a latent measure of physical health is less subject to measurement error, and therefore has greater repeatability and reliability in comparison to separate health indicators (Ploubidis and Grundy, 2011; Boniface and Tefft, 1997).

3.2.2. Measures of grandchild care

In wave 1 grandparents were asked whether they looked after grandchildren without parents being present during the 12 months prior to the interview. Those who did were also asked how often, on average, they looked after their grandchildren (i.e. almost daily, almost every week, almost every month, or less often), and for how many hours (i.e., on a typical day/in a typical week/in a typical month/in the last 12 months depending on the response to the earlier question on frequency). Using this information, we distinguished between grandparents who did not look after grandchildren; those who provided intensive grandparental childcare (i.e. looked after at least one grandchild almost daily or for at least 15 h a week); and those who provided non-intensive childcare (i.e. looked after a grandchild weekly but for less than 15 h per week, monthly or less often). The intensive grandchild care category captures grandparents who looked after their grandchildren for 30 h per week on average, roughly equivalent to holding a full-time job (Fuller-Thomson and Minkler, 2001; Di Gessa et al., 2016). While grandparents providing care at higher intensities may be in fact raising their grandchildren it was not possible to consider this as a separate category as SHARE does not collect this information. Moreover, less than 50 grandparents in SHARE reported that they looked after grandchildren '24 h a day', a category roughly equivalent to being the primary carer.

3.2.3. Early and adult life socio-economic circumstances and health – SHARE life history data

Several indicators of participants' recall of early life socio-economic circumstances (at age 10) and early life health (in childhood, defined as from when respondents were born up to age 15) were combined using latent class analysis (LCA) to classify them into homogenous subgroups. At age 10 the indicators included the main parental breadwinner's occupation, whether a biological parent was absent from the household, the features of the accommodation (i.e. an inside toilet, central heating, fixed bath and a running hot water supply), the number of books in the household, and whether one of the parents or guardians was a heavy drinker or had mental health problems. Such measures of childhood socio-economic circumstances are thought to capture the economic and social status of the individual, which in turn influence adult health outcomes (Galobardes et al., 2004). Measures of health status in childhood (i.e. up to age 15) included whether respondents had been confined to bed or stayed in the hospital for more than one month, their self-reported health, and whether they had experienced any illnesses (such as polio, epilepsy or cancer).

In addition, a series of categorical indicators capturing both participants' lifecourse experiences as well as those in adulthood were also created. Participants were asked whether they ever had to go through a period during which they suffered from hunger, and whether they had ever experienced an adverse event (such as being in prison and/or being homeless for more than one month). Respondents' health in adulthood was captured using number of periods of ill health or disability lasting more than a year (recoded into two or more periods of ill health versus 1 or none). Partnership histories were summarised by two dichotomous variables representing whether the respondent had ever experienced a marital breakdown through divorce or widowhood. Preliminary analyses considered total number of marriages, which lead to similar results. Finally, we summarised paid work histories distinguishing between respondents who never worked and those who engaged in paid work for either more or less than 75% of their potential working life, defined as 21–65 for men and 21–60 for women (capping the working lifespan at the age reported at wave 3 if respondents were younger than 65 and 60) (Price et al., 2015). Different thresholds (60%, and 80%) were considered in our preliminary analyses – particularly among grandmothers; however, the various thresholds used made no difference to our results.

3.2.4. Confounders

Age, gender, employment status, educational level, wealth, social engagement, grandchild characteristics (i.e. age of the youngest grandchild and total number of grandchildren), living arrangements, as well as other health measures and behaviours at baseline (physical health, cognitive ability, depressive symptoms, obesity, and smoking) were included in our analyses as previous work has shown them to be important confounders of the association between grandparental childcare provision and health in later life. Moreover, given widely documented differences in health among older people and in grandparental childcare across Europe, region fixed-effects were also included in the analysis (Hank and Buber, 2009; Di Gessa et al., 2016; Crimmins et al., 2011). In particular, using the classification proposed by Hank (Hank et al., 2007), we grouped together the three southern European countries (Greece, Italy and Spain) and the three northern European countries (Denmark, the Netherlands, and Sweden), with the remaining countries as the reference category. Educational level was recoded into three categories using the International Standard Classification of Education (for more details see http://www.uis.unesco.org/), where low education refers to below secondary education, and high education is defined as university education or above. Wealth was measured using quintiles based on the harmonised sum of the net value of properties, non-housing financial wealth and business assets created by the RAND Corporation (for further details see http://www.rand.org/labor/aging/dataprod/hrs-data.html). Baseline respondents' employment status was measured as being in paid work, retired or 'other' (i.e. unemployed, sick or disabled, homemaker or other). Social engagement was defined as involvement in at least one activity including voluntary work, attendance at training courses, participation in political or religious organisations, or in sport or social clubs almost every week or more often. Living arrangements were measured using a 4-category indicator, distinguishing between grandparents who lived alone, with at least one adult child, with grandchildren, or in other types of living arrangements (i.e. mostly with partners only). Among grandparents coresiding with at least one grandchild (i.e. N = 391, less than 3%), it was not possible to consider grandparents in skipped generations as a separate category given the small number of cases. Finally, in addition to the latent physical health variable at baseline, we also

controlled for depression, cognitive function, obesity and smoking. Depressive symptoms were measured using the EURO-D 12 item scale: Respondents who reported four or more symptoms (such as being unhappy or having trouble sleeping) were classified as reporting depressive symptomatology. This cut-off has previously been validated against a variety of relevant clinical assessments in Europe (Prince and Reischieset al, 1999). Cognitive ability was assessed by several questions relating to orientation in time, verbal fluency, numeracy skills, and word recall; respondents were categorised as having poor cognitive function if they scored in the lowest country-specific quintile for all tests (Singh-Manoux and Akbaralyet al, 2010). Finally, we created a binary indicator for obesity (BMI $\geq$ 30) and smoking (whether or not current smoker).

3.3. Statistical analyses

The latent summaries of the self-reported measures of physical health at baseline and follow-up were derived with latent variable models appropriate for a combination of binary, ordinal, and continuous measurements. We considered a unidimensional model, where a single latent factor accounts for the variation in self-reported and observer-measured health indicators (see Fig. 1). Model fit was evaluated with several global fit indices, including Root Mean Square Error of Approximation (RMSEA, where values less than 0.06 indicate good fit), Comparative Fit Index and Tucker Lewis Index (for both adequate model fit is defined by values above 0.95).

We combined all indicators of early life socio-economic circumstances and health using latent class analysis (LCA), as this allows us to classify the observed response patterns of individuals across a set of categorical variables into the smallest number of homogenous subgroups (classes) which fit the data well and account for associations among the observed variables. We considered up to 5 classes which we then compared using both absolute and relative model fit measurements (Pearson Chi-square statistic, bootstrap likelihood ratio test, and the Bayesian information criterion). The final number of latent classes chosen was based on these statistics as well as on substantive criteria and interpretability of the resulting classes. The entropy index was used to assess classification quality, with values approaching 1.0 indicating a favourable classification (Celeux and Soromenho, 1996). For each latent class model, we specified 2000 random sets of starting values, 50 optimizations and 50 iterations for the final stage, in order to ensure the replication of the best log likelihood and that solutions are not derived from local maxima.

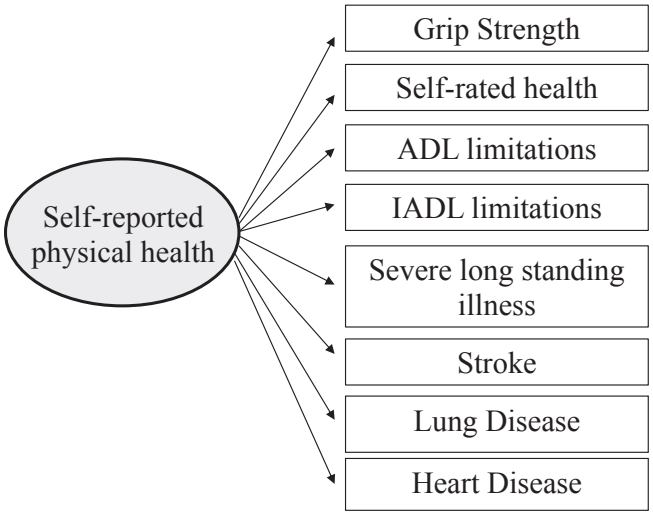

Fig. 1. Health latent variable unidimensional measurement model.

Our analyses of the association between grandparental childcare at baseline and physical health at follow-up consisted of two steps. First, we controlled only for health, demographic and socio-economic factors at baseline; and second, we also took lifecourse characteristics into account. Second, we carried analyses separately for grandfathers and grandmothers. This is for two key reasons. First, because marital and work lifecourse characteristics differ by gender (Price et al., 2015), and second, because grandparenting is a gendered experience carrying varying expectations of behaviours and responsibilities for men and women with differing effects on health (Stelle et al., 2010). Given the continuous nature of the outcome variable, we used linear regression models.

In order to deal with sample attrition, the models were estimated using full information maximum likelihood (FIML) estimation. In this context, it is assumed that the selection mechanism is Missing at Random (MAR) (Little and Rubin, 1989) which implies that all systematic selection effects depend on variables which are included in the model (such as baseline demographic, socio-economic characteristics, and health status). In our model, we also used self-rated health at wave 3 as an auxiliary variable in order to improve estimates in the FIML procedure. To take into account the complex sample designs, all of the analyses use design weights provided by the SHARE teams. Latent summaries and LCA were estimated using Mplus 7.3; all models were estimated using STATA 13.

4. Results

4.1. Descriptive statistics

4.1.1. Measurement model for health in adulthood

Table 1 presents the standardised factor loadings of the health indicators used in the unidimensional latent factor; these can be interpreted as correlations between observed health measurements and the latent variables. All health indicators significantly loaded on the latent factor, with self-rated health, ADL and IADL limitations, as well as severe long standing illness, being the indicators which loaded more strongly on the latent physical health variable (with values around 0.80). The loadings for the remaining health indicators were satisfactory, with values exceeding 0.40 and of similar magnitude (i.e. between 0.40 and 0.49). Similar loadings were observed both at baseline, and at follow-up. High scores on the latent continuous physical health measure indicate good physical health. Table 1 presents the established goodness of fitness criteria (as discussed above), which shows that the physical health latent model fits the data well. The latent health variable obtained by combining several health indicators into a unidimensional model offers a continuous measure of physical health. Fig. 2 shows the baseline estimated distribution of the physical health scores; this variable is broadly normally distributed, although slightly skewed left (skewness = −0.34 and kurtosis = 2.87).

4.1.2. Classification of childhood health and socio-economic circumstances

We classified respondents' childhood health and socio-economic circumstances into three homogenous subgroups, as these provided the best model fit (as defined above). For ease of interpretation, Fig. 3 shows the conditional response probabilities of each of the childhood variables for each of the three latent classes. For instance, respondents assigned to Class 1 showed higher probabilities of having experienced poor socio-economic circumstances in childhood; however, these respondents had low probabilities of reporting health problems. We have labelled this

Table 1
Standardised factor loadings of the health indicators on the physical health measurement model and descriptive criteria of model fit, at both baseline and follow-up.

Health indicators	Physical health at baseline	Physical health at follow-up
Grip strength	0.42***	0.39***
Self-Rated Health	0.77***	0.76***
IADL limitations	0.78***	0.79***
ADL limitation	0.80***	0.80***
Severe long standing illness	0.81***	0.83***
Heart condition	0.41***	0.46***
Lung condition	0.40***	0.42***
Stroke	0.49***	0.47***
N of Respondents	15,539	9137
Criteria of Model Fit		
Comparative Fit Index	0.969	0.968
Tucker Lewis Index	0.957	0.955
Root Mean Square Error of Approximation	0.057	0.059

Notes: values of the Comparative Fit Index and of the Tucker Lewis Index greater than 0.95 indicate good fit; values of the Root Mean Square Error of Approximation less than 0.06 indicate good fit. ***: significant at $p < 0.001$.

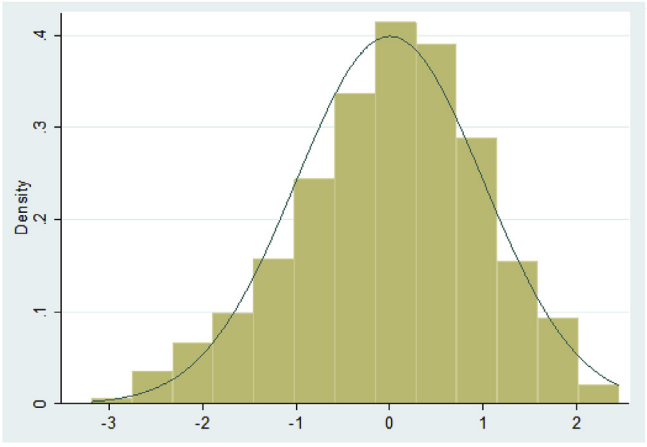

Fig. 2. Frequency distribution of the health latent variable at baseline. Source: SHARE 2004/05; own calculations.

class 'Lower socio-economic circumstances and good health' —approximately 68% of respondents belonged to this group. Respondents in Class 2 ('Lower socio-economic circumstances and poor health') showed a different pattern of conditional probabilities on the health variables than did respondents in Class 1, suggesting that members of Class 2 (roughly 7%) also experienced poor health in childhood in addition to poor socio-economic conditions. Finally, Class 3 (25%) is characterised by a pattern of relatively low probabilities on all of the items, suggesting that such respondents had a relatively higher socio-economic circumstances and better health in early life ('Higher socio-economic circumstances and good health').

4.1.3. Descriptive characteristics by childcare

Table 2 shows both baseline and life history socio-economic, health and demographic characteristics of grandparents by type of grandchild care. Overall, almost half of grandparents (45%) looked after grandchildren, with about 15% providing intensive

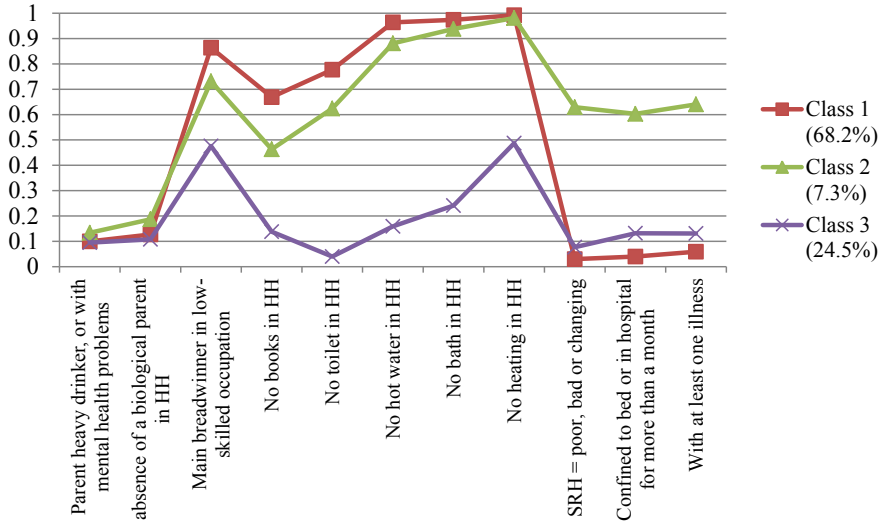

Fig. 3. Conditional response probabilities for each childhood variable in each of the three latent classes. Source: SHARELIFE. We labelled classes as 'Lower socio-economic circumstances and good health' (class 1), 'Lower socio-economic circumstances and poor health' (class 2), and 'Higher socio-economic circumstances and good health' (class 3). Note: the entropy statistic obtained for such classification, i.e. a summary measure for the quality of classification, was equal 0.84 indicating high classification accuracy. Also the classification matrix indicated a high reliability of the classification. In our case, we obtained high class assignment probabilities for Classes 1 and 2 (0.94 and 0.96, respectively), whereas the mean assignment probability for members of Class 3 was 0.85, i.e. lower but still indicating good classification.

Table 2
Percent distribution of baseline and life-history health, demographic, and socio-economic characteristics, by grandparental childcare.

		No childcare	Non-intensive	Intensive	Total	p value
BASELINE CHARACTERISTICS	Physical Health (mean)	−0.20	0.24	0.07	−0.01	***
	With depressive symptoms	32.8	25.7	29.5	32.8	***
	In lowest cognitive function	27.9	9.4	12.5	27.9	***
	Obesity (BMI ≥ 30)	19.1	17.3	22.2	19.1	***
	Smoker	3.3	16.0	15.6	3.3	***
	Grandmothers	58.4	59.4	64.9	58.4	***
	50–59	15.3	30.6	27.1	15.3	***
	60–69	26.3	44.0	46.5	26.3	
	70–79	36.1	22.3	23.2	36.1	
	80+	22.5	3.1	3.3	22.5	
	Low Education	62.6	46.2	66.2	62.6	***
	Mid Education	26.4	35.2	22.6	26.4	
	High Education	11.0	18.7	11.2	11.0	
	Retired	64.9	52.2	54.1	64.9	***
	In paid work	11.7	23.0	15.7	11.7	
	Other	23.5	24.8	30.2	23.5	
	Engaged in social activities	17.4	29.7	19.1	17.4	***
	In lowest wealth quintile	27.6	16.6	19.1	27.6	***
	Living with spouse/partner	49.9	64.0	59.2	49.9	***
	Living with adult child (ren)	14.6	17.0	19.8	14.6	
	Living alone	32.9	17.4	13.7	32.9	
	Living with grandchild (ren)	2.7	1.6	7.3	2.7	
	Baseline Respondents (N)	7701	5679	2159	15,539	
	Percentages (%)	55.0	30.4	14.6	100	
CHILDHOOD and ADULTHOOD CHARACTERISTICS	Lower socio-economic circumstances, good health	73.8	58.7	75.7	68.2	***
	Lower socio-economic circumstances, poor health	7.0	7.8	6.9	7.3	
	Higher socio-economic circumstances, good health	19.2	33.5	17.4	24.5	
	Worked >75%	55.0	63.4	49.5	57.4	***
	Worked <75	27.9	27.4	30.9	28.4	
	Never worked	17.2	9.2	19.6	14.4	
	Ever Divorced	13.3	14.0	6.8	12.6	***
	Ever Widowed	32.7	17.0	18.6	24.5	***
	With 2 + periods of ill health	7.8	5.4	6.7	6.7	***
	Has suffered hunger	13.1	8.6	9.7	10.8	***
	Has experienced an adverse event in accommodation	11.4	10.6	9.6	10.8	
	SHARELIFE respondents (N)	4204	3551	1382	9137	

Source: SHARE 2004/05 and SHARELIFE. Countries: Denmark, Sweden, Austria, France, Germany, Switzerland, Belgium, the Netherlands, Greece, Spain and Italy. Own calculations; baseline characteristics are weighted, whereas childhood and adulthood characteristics are unweighted. Note: P values refer to the relevant statistical tests for three-group comparison (i.e. ANOVA or chi-square tests); **, ***: significant at the 0.05 and 0.0l levels, respectively.

grandchild care (i.e. almost daily or at least 15 h a week). Grandparents who did not provide any grandchild care at baseline were more likely to report worse health, whereas those who engaged in non-intensive levels of grandchild care generally reported better health. Provision of non-intensive grandchild care is also associated with more advantaged characteristics such as higher educational levels, being in paid work and socially engaged and not being in the lowest wealth quintile. The distribution of the life history characteristics of grandparents by childcare provided at baseline indicates that non-intensive grandparental childcare is also positively associated with health and socio-economic advantage in both childhood and adulthood.

4.2. Associations between caregiving and health indicators at follow-ups

Table 3 presents results from linear regression models which investigated, separately for grandmothers and grandfathers, associations between grandparental childcare at baseline and physical health at the two year follow-up, controlling for socio-economic and demographic characteristics and health at baseline (Model I) and for life history health and socio-economic characteristics (Model II). All reported model parameters are standardised.

When only baseline characteristics are controlled for (i.e. Model I), Table 3 shows that provision of both non-intensive ($\beta = 0.039$, $p < 0.001$) and intensive grandchild care ($\beta = 0.034$, $p < 0.001$) is significantly associated with better physical health only among grandmothers. Similar but slightly weaker associations between provision of intensive grandchild care and physical health were also found when lifetime socio-economic experiences and health were controlled for (Models II). Even after taking lifetime experiences into account, grandmothers who reported both intensive and non-intensive grandparental childcare at baseline had significantly higher latent physical health scores than grandmothers who did not provide any grandchild care at baseline. In contrast, only grandfathers who reported non-intensive grandchild care scored higher than those who did not look after grandchildren at all, indicating better physical health, even once life history characteristics were controlled for; however, such an association was not significant ($p = 0.180$).

Associations with other baseline covariates were broadly as expected from previous studies. Older grandparents, those not in paid work and those in the lower wealth and education groups all had lower scores on the latent index of physical health. Neither number of grandchildren, age of the youngest grandchild, nor patterns of living arrangements were significantly associated with the latent physical health measures. In all the models, as expected, baseline health and health behaviours were strongly associated with poorer physical health at follow-up. Grandparents who reported four or more depressive symptoms and who were obese at baseline, as well as grandmothers in the lowest cognitive quintile and who smoked at baseline had significantly lower scores on the latent health index.

The associations between the life history characteristics added

Table 3
Association between grandparental childcare at baseline and health at follow-up, controlling for baseline health, socio-economic and demographic characteristics (Model I), and also for life history health and socio-economic characteristics (Model II). Standardised Beta coefficients and 95% confidence intervals obtained from fully adjusted linear regression.

	Grandmothers				Grandfathers			
	Model I		Model II		Model I		Model II	
	B	95% CIs	B	95% CIs	B	95% CIs	B	95% CIs
Non-Intensive childcare[a]	0.039***	(0.014; 0.064)	0.025**	(0.002; 0.048)	0.016	(−0.007; 0.039)	0.016	(−0.007; 0.039)
Intensive childcare[a]	0.034***	(0.013; 0.055)	0.031***	(0.010; 0.052)	0.001	(−0.021; 0.023)	−0.001	(−0.023; 0.020)
With adult children[b]	−0.001	(−0.020; 0.018)	−0.004	(−0.030; 0.071)	0.003	(−0.019; 0.024)	0.001	(−0.022; 0.024)
Alone[b]	0.007	(−0.012; 0.027)	0.000	(−0.022; 0.114)	0.009	(−0.011; 0.030)	0.009	(−0.017; 0.034)
Living with grandchild[b]	0.022	(−0.002; 0.045)	0.022	(−0.002; 0.045)	0.002	(−0.020; 0.024)	0.002	(−0.019; 0.023)
60–69[c]	−0.017	(−0.041; 0.008)	−0.022*	(−0.048; 0.003)	−0.048***	(−0.083;−0.012)	−0.043**	(−0.077;−0.009)
70–79[c]	−0.089***	(−0.120;−0.057)	−0.095***	(−0.128;−0.062)	−0.087***	(−0.129;−0.045)	−0.080***	(−0.120;−0.039)
80+[c]	−0.119***	(−0.151;−0.088)	−0.125***	(−0.158;−0.092)	−0.117***	(−0.153;−0.081)	−0.103***	(−0.137;−0.068)
Mid Education[d]	−0.021	(−0.043; 0.002)	−0.018	(−0.042; 0.005)	−0.029	(−0.059; 0.001)	−0.033**	(−0.062;−0.003)
Low Education[d]	−0.032***	(−0.056;−0.009)	−0.035***	(−0.061;−0.008)	−0.031**	(−0.062;−0.001)	−0.040***	(−0.076;−0.004)
Retired[e]	−0.060***	(−0.096;−0.024)	−0.050***	(−0.085;−0.015)	−0.004	(−0.037; 0.029)	0.001	(−0.034; 0.036)
Other work[e]	−0.048***	(−0.084;−0.011)	−0.033	(−0.071; 0.004)	−0.026**	(−0.052;−0.001)	−0.020**	(−0.047;−0.006)
Not engaged in social activities[f]	−0.006	(−0.028; 0.016)	−0.005	(−0.027; 0.016)	−0.017	(−0.039; 0.003)	−0.016	(−0.037; 0.005)
IV wealth quintile[g]	−0.006	(−0.030; 0.020)	−0.006	(−0.031; 0.019)	−0.029**	(−0.055;−0.002)	−0.030**	(−0.056;−0.003)
III wealth quintile[g]	−0.022	(−0.056; 0.011)	−0.020	(−0.054; 0.013)	−0.040***	(−0.068;−0.012)	0.040***	(−0.068;−0.011)
II wealth quintile[g]	−0.023	(−0.050; 0.003)	−0.021	(−0.048; 0.006)	−0.059***	(−0.089;−0.029)	−0.059***	(−0.089;−0.028)
Lowest quintile[g]	−0.042***	(−0.073;−0.011)	−0.039**	(−0.069;−0.008)	−0.066***	(−0.094;−0.037)	−0.059***	(−0.087;−0.030)
2-3 grandchildren[h]	−0.009	(−0.036; 0.018)	−0.010	(−0.037; 0.018)	−0.006	(−0.037; 0.026)	−0.005	(−0.036; 0.026)
4+ grandchildren[h]	0.004	(−0.030; 0.039)	0.005	(−0.030; 0.040)	−0.024	(−0.055; 0.009)	−0.021	(−0.051; 0.009)
Age youngest grandchild	−0.003	(−0.024; 0.019)	−0.004	(−0.026; 0.017)	−0.016	(−0.045; 0.012)	−0.014	(−0.043; 0.016)
Physical health at baseline	0.574***	(0.548; 0.599)	0.554***	(0.527; 0.581)	0.577***	(0.551; 0.603)	0.556***	(0.530; 0.582)
Lowest Cognitive function[i]	−0.035***	(−0.059;−0.011)	−0.037***	(−0.061;−0.013)	−0.032	(−0.067; 0.003)	−0.029	(−0.063; 0.004)
With depressive symptoms[l]	−0.061***	(−0.082;−0.041)	−0.057***	(−0.077;−0.037)	−0.064***	(−0.092;−0.035)	−0.061***	(−0.090;−0.033)
Obese[m]	−0.044***	(−0.065;−0.022)	−0.045***	(−0.066;−0.023)	−0.047***	(−0.068;−0.026)	−0.046***	(−0.067;−0.025)
Smoker[n]	−0.024**	(−0.046;−0.003)	−0.028**	(−0.049;−0.006)	0.009	(−0.016; 0.033)	0.007	(−0.018; 0.032)
North[o]	0.003	(−0.024; 0.029)	0.001	(−0.025; 0.027)	0.015	(−0.015; 0.045)	0.013	(−0.016; 0.043)
South[o a]	−0.008	(−0.031; 0.014)	−0.003	(−0.026; 0.019)	−0.012	(−0.041; 0.017)	−0.014	(−0.040; 0.013)
Ever Divorced[p]			0.003	(−0.023; 0.029)			0.014	(−0.017; 0.046)
Ever Widowed[p]			−0.011	(−0.040; 0.018)			−0.012	(−0.048; 0.024)
Work<75%[r]			−0.013	(−0.041; 0.015)			−0.017	(−0.048; 0.014)
Never worked[r]			−0.015	(−0.046; 0.016)			−0.065***	(−0.099;−0.032)
Suffered hunger[s]			−0.008	(−0.030; 0.015)			−0.028**	(−0.056;−0.001)
With 2 + periods of ill health[t]			−0.079***	(−0.103;−0.055)			−0.074***	(−0.102;−0.045)
1 + adverse event[u]			−0.015	(−0.037; 0.006)			−0.033**	(−0.060;−0.006)
Lower socio-economic circumstances and good health[v]			0.012	(−0.020; 0.044)			0.015	(−0.017; 0.048)
Lower socio-economic circumstances and poor health[v]			−0.021	(−0.050; 0.007)			0.002	(−0.027; 0.031)
Number of Observations	8972		8972		6567		6567	

Sources: SHARE waves 1, 2, 3. Reference categories: a) No grandchild care provided; b) Living with spouse/partner or others; c) 50–59; d) Highest educational group; e) In paid work; f) Engaged in social activities; g) Highest wealth quintile; h) 1 grandchild; i) Not in the lowest cognitive quintile; l) Less than four depressive symptoms reported on EURO-D scale; m) Not obese; n) Currently non-smoker; o) Central European country; p) Never divorced; q) Never widowed; r) In paid work for more than 75% of potential working life; s) Never suffered from hunger; t) One or fewer periods of ill health in adulthood; c) No adverse events in adulthood; v) Higher socio-economic circumstances and good health at childhood (Class 3). Note: **, ***: significant at the 0.05 and 0.0l levels, respectively. Own calculation

in Model II and physical health at wave 2 were also broadly as expected. For example, there was a negative association between having experienced hunger ($\beta = -0.028$, $p < 0.001$) or an adverse event ($\beta = -0.033$, $p < 0.001$) and the latent index of physical health among grandfathers. For both grandmothers ($\beta = -0.079$, $p < 0.001$) and grandfathers ($\beta = -0.074$, $p < 0.001$) those who reported two or more periods of ill health or disability lasting for more than a year in adulthood had significantly higher scores for the latent physical health measures in comparison to those who experienced either no or only 1 period of ill health.

5. Discussion

Understanding the consequences of looking after grandchildren for health of grandparents is a critical issue, given the current involvement of grandparents in grandchild care in Europe. Previous research suggests that some of the complex relationships found between provision of grandparental childcare and health may be confounded by the healthy caregiver effect as well as by cumulative advantage or disadvantage throughout the lifecourse. In our study, we therefore investigated longitudinal associations between grandparental childcare and health, controlling for childhood and adulthood characteristics which may affect both the likelihood of providing childcare and current health. We also adjusted for the intensity of caregiving (distinguishing between intensive and non-intensive childcare); for engagement in other productive, social and leisure activities which may capture capacity to be actively engaged; and for several measures of baseline health.

Taking into account not only baseline characteristics but also socio-economic experiences and health both in early and adult life, our longitudinal results showed a positive association between grandchild care provision and better physical health among grandmothers. Those who looked after grandchildren intensively and non-intensively had significantly higher physical health scores than grandmothers who did not provide any childcare. However, the longitudinal relationship between the provision of grandparental childcare and health was not significant for grandfathers. Overall, our results suggest that looking after grandchildren

appears to be beneficial for grandparents' physical health, particularly for grandmothers. However, the causal relationship between provision of grandchild care and "good health" is difficult to identify, even in longitudinal studies. Although in this study we account for the lifecourse characteristics of grandparents, which are associated with both current health and the likelihood of providing grandchild care, and we also take baseline health and socioeconomic and demographic characteristics into account, it is plausible that better health provides an impetus for looking after grandchildren and that this advantage is maintained over time.

Several mechanisms may explain the positive relationship between grandparental childcare and health. In the US, where most previous research on this issue has been conducted, data is routinely collected on whether grandparents assume responsibilities for raising a grandchild and whether they act as primary carers. Evidence from such studies suggests that custodial grandparents are more likely to experience health disadvantages. In Europe, however, no national surveys collect such data; moreover, most grandparents have no legal responsibilities for their grandchildren, and the care provided is largely complementary to parental care (Herlofson et al., 2012). Given that our study did not specifically consider custodial grandparents (we did examine coresidence with grandparents but in most cases parents are also present), our findings are consistent with the idea that for most grandparents the demands of grandchild care are likely to be counterbalanced by the benefits of caregiving. It is likely that grandparents' 'complementary' caretaking role provides them with emotional gratification, a sense of belonging, attachment and usefulness which in turn may enhance health and life satisfaction (Grinstead et al., 2003). Moreover, consistent with previous studies on family support and relationships and their effect on health, it is plausible that grandparents providing childcare have stronger social ties with both grandchildren and their parents, and are therefore likely to benefit from greater levels of family support. This in turn may act to promote the health of grandparent caregivers by enhancing self-care practices, and through the provision of tangible aid, emotional support and affirmation (Hayslip et al., 2015; House et al., 1988). Looking after grandchildren may also lead to grandparents maintaining or increasing their levels of physical activity and health behaviours which in turn are associated with better physical health and wellbeing (Holmes and Joseph, 2011).

However, we found that grandparental childcare appears to affect the physical health of grandmothers and grandfathers differently: the longitudinal association between grandchild care and health is positive and significant only for grandmothers. Other studies have also found gender differences in the effect of provision of grandchild care particularly on mental health, and have attributed these to the differential roles, expectations, and desires which men and women have with respect to care and family involvement (Grundy et al., 2012; Blustein et al., 2004). Grandmothers may perceive grandchild care as an addition to their family responsibilities, and may therefore experience and perform care differently from grandfathers, which in turn may have a different effect on health (Stelle et al., 2010; Waldrop et al., 1999). It is however also possible that gender differences reflect the lack of power in the grandfather sample, as fewer grandfathers report looking after their grandchildren, or doing so intensively.

5.1. Strengths and limitations

This study is, to our knowledge, the first longitudinal investigation of grandparental childcare and health which uses a lifecourse approach, adjusting for key lifecourse characteristics which may act to confound the association between caregiving and physical health of grandparents. In particular, we investigated longitudinal associations between grandparent involvement in family life and its consequences for physical health, controlling for cumulative advantage or disadvantage across the lifecourse. We used SHARE, a survey which collected life history information for large nationally representative samples of older people in 11 European countries. Given that almost half of grandparents (45%) in SHARE looked after their grandchildren and about 15% did so intensively, our finding that provision of grandchild care is not associated with poor physical health is remarkable. Moreover, unlike most previous studies which have focused on primary carers and on grandparents who co-reside with their grandchildren, our definition of grandchild care considered more common supplementary grandparental childcare taking into account its intensity, and controlling for living arrangements.

Our analyses, however, have several limitations. All measurements except for maximum grip strength are self-reported and may be sensitive to cultural norms and differences in definitions. In addition, although coresiding grandparents are both asked whether they looked after grandchildren, we cannot exclude the possibility that grandfathers reported their spouse's or partner's childcare engagement as their own —this may account for the lack of a significant longitudinal association between grandparental childcare and physical health for men. Moreover, we have no information on the experiences and activities of grandparent caregivers: no data is available on whether grandparents gained satisfaction from their role; their reasons for providing care (e.g. out of a sense of obligation); the tasks and activities performed; the quality of the relationship with children and grandchildren; and the presence and perception of social support. Future studies of grandparent caregiving would benefit from surveys which collected such information, given that this is particularly important for identifying and examining the causal pathways underlying the association between grandparental childcare and health as well as the reported differences between grandfathers and grandmothers.

Additionally, SHARE is affected by attrition which may act to confound some of the reported associations (Fitzgerald et al., 1998; Di Gessa et al., 2015). The use of FIML estimation in this study enables the MAR assumption to be made, rather than the more restrictive missing completely at random assumption required for correct estimation with listwise deletion. However, we recognise that data missing not at random may have biased the estimates. For instance, in a recently published paper where various missing not at random (MNAR) scenarios were tested, the positive association between grandparent childcare and health strengthened under the assumption that those lost to follow-up were more likely to report poor health (Di Gessa et al., 2015).

Also, our aim was not to investigate differences across European regions in the relationship between provision of grandchild care and grandparents' health. Previous work has shown that the availability of formal childcare, female labour market participation and cultural norms are associated with the level of grandchild care provision across countries (Hank and Buber, 2009; Di Gessa et al., 2016), and are likely to influence the activities grandparents do when they provide care, as well as the role and expectations of grandparents: such variations in the context in which grandchild care occurs are thus likely to lead to different effects on health.

Finally, although in our study we found a longitudinal association between grandparental childcare and better health among grandmothers, further work, including qualitative studies, is needed to identify the *causal* mechanisms which may explain such a positive association, and to assess the extent to which the observed gender differences depend on grandmothers' and grandfathers' differential roles, expectations, desires, and activities. However, if looking after grandchildren is not detrimental for grandparents' health, more attention should be paid to those

factors associated with childcare provision, as younger, healthier and financially better-off grandparents are more likely to take care of their grandchildren particularly in the absence of conflicting commitments such as paid work (Di Gessa et al., 2016).

Author contributors

G Di Gessa conducted analyses, drafted article, contributed to the study design and co-led the interpretation of data with K Glaser and A Tinker; K Glaser led the conception and design of the study, supervised analyses, co-led the interpretation of data with G Di Gessa and contributed to manuscript revisions. A Tinker critically reviewed the manuscript and contributed to the interpretation of data. All authors have read and approved the final version.

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