Title

Association between Dementia, Change in Home-care Use, and Depressive Symptoms during the COVID-19 Pandemic: A Longitudinal Study Using Data from Three Cohort Studies

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Running title

Home care and depression in dementia

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Abstract (248/250)

Background: The emotional impact of the coronavirus disease 2019 (COVID-19) pandemic

on people with dementia has been quantified. However, little is known about the impact of change in home-care use owing to the pandemic.

Objective: To determine the longitudinal association between dementia, change in home-care use, and depressive symptoms during the pandemic.

Methods: We included data of 43,782 home-dwelling older adults from the English Longitudinal Study of Ageing (ELSA), Study of health, Ageing and Retirement in Europe (SHARE), and National Health and Aging Trends Study (NHATS). This study considered the latest main wave survey prior to the pandemic as the baseline, and the COVID-19 survey as follow-up. In a series of coordinated analyses, multilevel binomial logistic regression model was used to examine the association between baseline dementia, change in home-care use at follow-up, and presence of depressive symptoms.

Results: Dementia, using the ELSA, SHARE, and NHATS datasets, was identified in 2.9%, 2.3%, and 6.5% of older adults, and home-care use reduced in 1.7%, 2.8%, and 1.1% of individuals with dementia, respectively. Dementia was significantly associated with the increased risk of depressive symptoms in all three cohorts. However, the interaction between dementia and period (follow-up) was non-significant in SHARE and NHATS. Across all three cohorts, home-care use during the pandemic, regardless of change in amount, was significantly associated with increased depressive symptoms, compared to the non-use of home care.

Conclusion: These results highlight the need for tailoring dementia care at home to promote independence and provide sustainable emotional support.

Keywords: cohort studies; dementia; depression; home care services; SARS-CoV 2; social interaction

INTRODUCTION

The coronavirus disease pandemic, which began in 2019 (COVID-19) was caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV 2) [1]. It particularly affected older populations, especially persons with dementia. The morbidity and mortality of COVID-19 worsen with advancing age and pre-existing health conditions; therefore, many persons with dementia face a high risk [2]. Moreover, persons with dementia may be especially susceptible to the social consequences of lockdown and confinement [3], including loss of support from primary caregivers and restricted social interactions [4–6]. Furthermore, persons with dementia are more likely to rely on formal care services for social contact as well as practical support [7]. Even before the pandemic, persons with dementia and caregivers faced challenges with respect to social interactions and mental health issues [8]. Once restrictions were imposed during the COVID-19 pandemic, social contact was greatly reduced, which caused negative psychological and cognitive effects [9–11]. Several studies have quantified emotional changes such as depression and anxiety from before the pandemic to during the pandemic among people with dementia [12–15]. Furthermore, recent studies based on data from population-based cohorts in England [16] and the United States [17] have shown that persons with dementia experienced worse mental health outcomes during the pandemic compared to those without the condition. However, these studies did not measure the impact of change in home-care use due to the COVID-19 pandemic.

We aimed to investigate the relationship between dementia, change in home-care use, and change in depressive symptoms before and during the COVID-19 pandemic. We used three population-based cohorts to include older adults with probable dementia which may not necessarily be identified through clinical diagnoses. We hypothesized that compared with older adults without impairment, those with dementia would show a greater increase in depressive symptoms during the pandemic. Additionally, we hypothesized that any increases in depressive symptoms during the pandemic would be reduced in magnitude by controlling for home care, since home-care workers have the potential to provide social and practical support.

MATERIALS AND METHODS

Study Design and Setting

We used data obtained from three longitudinal studies of aging: the English Longitudinal Study of Ageing (ELSA) [18], the Study of Health, Ageing and Retirement in Europe (SHARE) [19], and the National Health and Aging Trends Study (NHATS) [20].

ELSA is a nationally representative sample of men and women aged ≥50 years who were resident in England [18]. It began in 2002 (wave 1), and the assessment is repeated every 2 years. The current study drew the pre-pandemic responses from the main ELSA wave 9 survey (collected in 2018/2019). The COVID-19 sub-study was conducted with members

of ELSA, and performed in two waves (June/July and November/December 2020). During the pandemic, COVID-related restrictions meant that ELSA's usual face-to-face interview approach could not implemented. Instead, the COVID-19 waves used a sequential mixed-mode design with an online survey and telephonic interviewing. During the first COVID-19 survey, due to a survey error, about 75% of respondents were not asked the eighth depression item [16]. Therefore, we used data from the second COVID-19 survey for the assessment of the pandemic period. The South Central – Berkshire Research Ethics Committee provided ethical approval for ELSA (21/SC/0030, March 22, 2021).

SHARE included data on the lives of Europeans aged 50+ years from 28 countries including Israel [19]. SHARE is closely modelled after and constantly harmonized with its sister studies including ELSA. Usually, data are collected biannually based on computer-assisted personal interviewing (CAPI). The interviewers conduct face-to-face interviews using a laptop on which the CAPI instrument is installed. Owing to the COVID-19 outbreak, data collection and the fieldwork were suspended in March 2020 after 70% of the regular interviews of SHARE wave 8 survey (October 2019–March 2020) were performed, which was conducted in 27 countries (excluding Portugal) [21,22]. A switch to telephone administered interviews (CATI) was decided as the alternative to the previous face-to-face interviewing, and the first SHARE Corona Survey was conducted from June to September 2020 [23,24]. The Ethics Committee of the University of Mannheim and the Ethics Council

of the Max Planck Society provided ethical approval for SHARE.

NHATS is a nationally representative sample of adults aged ≥65 who are Medicare beneficiaries in the United States [20]. Although there is another cohort for aging, namely the Health and Retirement Study (HRS), a sister study of ELSA and SHARE, the HRS data collection during the pandemic was performed as the main wave survey between March 2020 and May 2021. Considering the comparability across cohorts, we chose NHATS from the cohort studies in the United States. Data collection of NHATS began in 2011, and the replacement of the study sample occurred in 2015. Annual interviews are administered to members of NHATS. At the onset of the COVID-19 pandemic, research that relied on in-person contact was widely prohibited. Consequently, the interview was conducted by telephone in Round 10. The COVID-19 questionnaires were mailed from June 2020 ending through October 2020 ending, following the round–10 collection. Pre-pandemic responses were drawn from the 2019 NHATS round 9 survey. The Johns Hopkins Bloomberg School of Public Health IRB provided ethical approval for NHATS.

For each cohort study, we considered the main survey prior to the pandemic as the baseline, and COVID-19 survey as the follow-up. Procedures involving experiments on human subjects are done in accord with the Helsinki Declaration of 1975.

Participants

We selected participants from the three cohorts if they (1) were adults aged 50 years or older at baseline, (2) were living in a private home at baseline, (3) had participated in the COVID-19 survey, and (4) were home-dwelling adults during the pandemic (Figure 1).

Measurements

We conducted a coordinated, identical analyses across the different datasets to examine relationships across samples using conceptually equivalent measures of the constructs of interest [25]. Although measures differed across studies, the same covariates, measurement scores, and modeling could be used to obtain comparable results across datasets, and identify sources of discrepancy across studies.

Multiple variables were recoded to create equivalent versions across all datasets, as described below (see Supplementary Table S1). This allows a comparison of results across models to inform substantive conclusions.

Dementia

Considering the prevalent clinical misdiagnosis of dementia [26], we used the presence of dementia as the primary independent variable, irrespective of any clinical dementia diagnosis. We used the term “dementia” for probable dementia case throughout. Dementia caseness was determined by algorithms assessing the likelihood of a dementia diagnosis,

rather than relying on clinical diagnosis.

For ELSA and SHARE, we applied a common classification approach for dementia, consistent with previous studies on dementia in SHARE [27–29]. In each wave, participants were asked to complete a memory recall task (immediate and delayed recall of 10 common words) and an animal fluency task (naming as many animals as possible in 60 seconds) [30]. Participants who performed 1.5 standard deviations (SD) below the age-graded (5-year) mean of immediate or delayed recall (or both) were coded as 1 and compared to other participants, coded 0. Similarly, those who performed 1.5 SD below the age-graded mean of verbal fluency were coded as 1, compared to others coded 0. Dementia was defined as a score of 1 on both the memory and verbal fluency tasks.

In the NHATS, dementia was identified using a validated algorithm for surveys [31] based on a report of either dementia or Alzheimer's disease (diagnosed by a physician), cognitive tests of memory, orientation, and executive function. These were used to form a derived variable that was calculated using the eight-item responses to Differentiate Aging and Dementia (AD8) instrument [32]. We used the algorithm because an animal fluency task was not employed in the NHATS and we could not apply the classification approach for ELSA and SHARE as mentioned above.

Depressive Symptoms

115 We defined depressive symptoms as the mental health outcomes assessed at baseline and
116 follow-up. Since the assessment in SHARE was based on binary response options (yes or no),
117 we used the presence of clinically significant symptoms as the independent variable for the
118 main analyses across the three cohorts.
119 Depressive symptoms in ELSA were measured using the shortened version of the Center
120 for Epidemiologic Studies Depression (CESD) scale [33]. The threshold for clinically
121 significant symptoms was four or more positive symptoms.
122 In SHARE main wave surveys, depressive symptoms were assessed using a self-
123 reported European-Depression (EURO-D) scale [34]. However, SHARE Corona Survey
124 adapted only two items (depression and sleep) from EURO-D. In this study, we used a single
125 question for depression with a yes/no response option: “In the last month, have you been sad
126 or depressed?”
127 Depression in NHATS was assessed using the Patient Health Questionnaire-2 (PHQ-2)
128 [35]. The PHQ-2, a validated two-question-screening questionnaire, clarifies the frequency of
129 depressed mood and anhedonia during the preceding two weeks. The total score ranges from
130 0 to 6 while the threshold for substantial depressive symptoms was ≥3 [36].
131
132 *Changes in Home-care Use During the COVID-19 Pandemic*
133 During the COVID-19 pandemic, changes in home-care use was typically assessed using

multiple questions about (1) whether participants recently received home care, and if yes, (2) whether amount of care was less, same, or greater than it was before the pandemic. In this study, we reclassified participants into three categories: (i) older adults who did not receive home care (no home care used), (ii) those who received same or increased amount of care compared with before the pandemic (same or increased), and (iii) those who received reduced amount of care than before. In SHARE, participants were asked whether they faced more difficulties in receiving the amount of home care that they needed. If they answered "yes," they were also asked whether they had to pay more to receive the help they needed, or whether those who cared for them could not come to their home. Therefore, we assumed that participants who answered "yes" to the former question may have experienced reduced amount of care during the pandemic.

Sociodemographic characteristics

We considered the following sociodemographic characteristics: age, sex, whether the respondents had a spouse or partner, living alone, and educational attainment. The aforementioned variables were selected as potentially relevant to mental health outcomes among older adults during the pandemic across the three cohorts [17, 37–40]. Given the diversity in measurements and definitions across the three cohorts, we opted to exclude socioeconomic status, alcohol consumption, and physical comorbidities in this study,

153 although these variables could have been relevant to depressive symptoms.

154

155 *Statistical Analysis*

156 First, we calculated the descriptive statistics across the three cohorts. Thereafter, we
157 performed multilevel binomial logistic regression analyses of the presence of depressive
158 symptoms. A panel-data format was adopted wherein the same older adult appeared two
159 times. The first model used presence of depressive symptoms as the dependent variable, and
160 period (baseline or follow-up), dementia, change in home-care use, and interaction between
161 dementia and period as the independent variables. All sociodemographic variables were also
162 included as independent variables. Change in home-care use, period, and interaction term
163 were treated as within-person time-variant variables, and dementia and sociodemographic
164 variables were entered as between-person time-invariant variables. A sensitivity analysis of
165 the first model was conducted for ELSA and NHATS using a four-category classification of
166 home-care use (no home care used, reduced, same, or increased). Since the prevalence of
167 reduced home-care use was low (0.5–2.8%), the first model was reanalyzed excluding
168 participants with a reduced amount of care from the sample across the three cohorts.

169 The second model added interaction terms between dementia and change in home-care
170 use as the within-person variables to the first model. Given the potential bias in logistic
171 regression models [41, 42] and the missing evaluation for increased depressive symptoms

under the threshold, another sensitivity analysis of the second model was performed for ELSA and NHATS using linear regression analyses of total scores of depressive symptoms as the independent variable.

In the regression analysis, we used the full information maximum likelihood to handle missing data [43]. Data management was conducted using Stata 18.0 (StataCorp). We performed regression analyses using Mplus for Windows, version 8.10 (Muthén & Muthén, Los Angeles, CA, USA). Statistical significance was set at $\alpha = 0.05$.

RESULTS

A total of 43,782 older adults aged ≥50 years were included in this study. Table 1 displays baseline characteristics of participants per cohort. NHATS included more older adults aged ≥85 years (23.4%) than ELSA (2.9%) or SHARE (7.4%). Overall, 1,146 individuals were identified with probable dementia at baseline (2.7%) including 2.9% in ELSA (N = 6,114), 2.3% in SHARE (N = 33,263), and 6.5% in NHATS (N = 3,001) (Table 1).

Table 2 shows the numbers and percentages of changes in amount of home care per cohort. During the pandemic, more than 90% of participants in ELSA and SHARE did not receive home care. Approximately 16–17% of individuals with dementia received home care in the two cohorts. Contrarily, 1,398 (48.9%) participants in NHATS received home care

191 during the pandemic, including 79% of individuals with dementia received home care. Few
192 participants (0.5–2.8%) reported reduction in amount of care since the COVID-19 outbreak,
193 regardless of dementia status (Table 2).

194 Figure 2 indicates the presence of depressive symptoms at baseline and follow-up by
195 dementia status per cohort. Across all three cohorts, individuals with dementia appeared to
196 have higher percentages of depressive symptoms than those without impairment. In ELSA
197 and NHATS, depressive symptoms increased during the pandemic than before. However, the
198 decline in depressive symptoms was more observed in SHARE participants, as is described in
199 a previous study [44] (Figure 2, Supplementary Table S2).

200 Table 3 and Supplementary Table S3 summarize results of the first multilevel binomial
201 logistic regression analyses models. Across all three cohorts, dementia was significantly
202 associated with increased risk of depressive symptoms. In ELSA, participants with dementia
203 were less likely to report presence of depressive symptoms during the pandemic. However,
204 the interaction between dementia and period was non-significant in SHARE and NHATS.
205 Regardless of whether there was a reduction, or same or increase in care amount, participants
206 who received home care were more likely to report presence of depressive symptoms than
207 those with no home-care use (Table 3, Supplementary Table S3). A sensitivity analysis using
208 the four-category variable of home-care use revealed that a reduced or the same amount of
209 home-care use was significantly associated with an increased risk of depressive symptoms.

While increased home-care use was significantly associated with an increased risk of depressive symptoms in NHATS, this association was not observed in ELSA (Supplementary Table S4). Another sensitivity analysis excluding participants with reduced home-care use did not alter the association between increased or the same amount of home-care use and depressive symptoms in all the three cohorts (Supplementary Table S5).

Table 4 and Supplementary Table S6 present the results of the second model wherein interaction terms were added to the first model. In ELSA, participants with dementia and home-care use regardless of change in amount were more likely to report presence of depressive symptoms. However, in SHARE and NHATS, interactions between dementia and change in home-care use were non-significant (Table 4, Supplementary Table S6). A sensitivity analysis using total scores of depressive symptoms did not significantly change the results (Supplementary Table S7).

Discussion

To our knowledge, this is the first study on a general population that examined association between dementia, change in home-care use, and depressive symptoms during the pandemic. Numerous studies have demonstrated worsening mental health in persons with dementia [9–15]. A few studies further revealed that those with dementia were at higher risk of depressive symptoms than the general older adults during the pandemic [16,17]. However,

229 the association between dementia and change in depressive symptoms was inconsistent
230 across the three cohorts. The interaction effects between dementia and period and that
231 between dementia and home-care reduction were observed in ELSA, but not in either
232 SHARE or NHATS. Contrary to our hypothesis, receiving home care was consistently
233 associated with worse depressive symptoms across the three cohorts. This is the first study to
234 demonstrate a consistent association between home-care use during the pandemic and worse
235 depressive symptoms across England, other 27 European countries, and the United States.
236 Older adults who did not use home care were less likely to report depressive symptoms
237 during the pandemic than those who used home care, regardless of dementia status or change
238 in care amount.

239 Participants with dementia were more likely to receive care at home during the
240 pandemic. Receiving care at home was related to worse depressive symptoms, which is
241 consistent with a previous report that activity of daily living (ADL) and mobility impairment
242 were associated with worse mental health changes [38]. These findings suggest that the loss
243 of independence among older adults may have exacerbated the impact of pandemic-related
244 restrictions and reduced social interactions on mental health. As persons with dementia are at
245 increased risk for COVID-19 infection [2], they were particularly targeted for compliance
246 with physical distancing measures, which likely result in reduced social interactions [45–47].
247 Considering that friendships, sense of belonging, and feeling valued within social

connections are important for mental health in older adults [46], individuals with less resilience for substituting their loss of social contacts may have magnified adverse effects [47]. Our findings indicate that in any similar future pandemic, emotional support for social connectedness should be integrated and sustained for home-care users with dementia wherever possible, and that potentially significant detriments to mental health need to be weighed against risks of infection and physical illness [48–51]. In the early pandemic months, numerous individuals transitioned from in-person to video contact in order to maintain social ties [52]. This type of transition may have been challenging among older adults with dementia. Despite campaigns by the Alzheimer's Society United Kingdom and other charities [53], home-care agencies that were not specialized in dementia care, as well as family and friends who were non-caregivers, compared with caregivers, may have been less aware of these campaigns. Therefore, additional strategies should be explored to achieve this goal.

In our study, changes in amount of care due to the pandemic substantially varied across England, other 27 European countries, and the United States. In the United States, most older adults with dementia received same or increased amount of home care. In England and other 27 European countries, more than 80% of participants with dementia did not receive home care during the pandemic. As participants in ELSA and SHARE were younger than those in NHATS, the cross-cohort difference in home-care use could have reflected that these younger

participants had fewer care needs, resulting in refraining from home-care use during the pandemic. However, we did not consider baseline home-care use before the pandemic, as the questions and definitions of home care were typically different from those in the COVID-19 study in each cohort. Some participants classified into “no home-care use” could have belonged to the “reduced” cases who had been home-care users before the pandemic. Furthermore, it should be noted that data about home-care use in SHARE and NHATS could not be used to calculate the proportion of informal and formal care. It is possible that the family and friends of older adults with dementia might have compensated for the decreased formal care, which has been suggested by studies during the early pandemic months [54,55]. This shift in care could have resulted in reduced social networks and contacts [56], which could have increased the adverse effects of the pandemic on mental health outcomes in individuals with dementia.

Strengths and Limitations

The main strength of this study is the use of representative cohorts from England, other 27 European countries, and the United States. The longitudinal design allowed for comparisons of outcome measures before and during the pandemic. Further, our study included a sufficient number of individuals with dementia for statistical comparison with those without impairment. The use of full information maximum likelihood estimation

286 enabled us to include participants with missing data in the multilevel binomial logistic
287 regression analyses. The findings obtained across the three cohorts provided insights into the
288 consistent experiences and needs of individuals with dementia after long-term restrictions,
289 regardless of country-specific healthcare systems and COVID-19 related counter-measures.
290 However, each cohort used different depression metrics such that the direct comparisons
291 of depressive symptoms across cohorts were limited. The degree of comparability would also
292 be compromised by the cross-cohort differences in the prevalence of dementia and change in
293 home-care use. Participants in ELSA and SHARE were younger than those in NHATS; the
294 difference in age distribution may have led to relatively small number of participants with
295 dementia in those cohorts. Similarly, participants in NHATS experienced care reduction
296 during the pandemic less frequently. Cognitive function during the pandemic might have
297 been subject to the risk of decline, which could have led to a reverse causation between
298 dementia and depressive symptoms. In addition, measures regarding resilience that may have
299 helped people with dementia adapt to challenges [57,58] were not included in this study.
300 Notably, we did not consider social contact with family or friends, which may prevent mental
301 health deterioration. Although COVID-19 sub-studies usually assessed social contact with
302 family and friends, it often involved different measures from those in main wave surveys.
303 Additionally, social contact with family or friends may overlap with informal care at home
304 during the pandemic. Individuals with severe dementia may have difficulties answering

surveys, though the measures (e.g., trained interviewers) were taken to mitigate it. We did not have data on prescriptions or dysphasia, which may affect performance in cognitive tests. Furthermore, some risk factors for depressive symptoms, such as socioeconomic status, alcohol consumption, or physical comorbidities were not included in this study due to the diversity in measurement across the three cohorts. Finally, the participants in this study only had two times of assessment. Future follow-up research to evaluate mental health changes would be helpful to project the trajectory.

Conclusions

Our findings demonstrate that older adults who received home care, regardless of change in care amount and dementia status, during the outbreak were more likely to report worse depressive symptoms compared with those who received no care at home. The loss of independence among older adults may have exacerbated the impact of pandemic-related related restrictions and reduced social interactions on mental health. As people with dementia are more likely to receive care at home, there is a need for promoting independence and emotional support for people living with dementia.

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CONFLICT OF INTEREST

The authors have no conflict of interest to report. MN is an Editorial Board Member of

this journal, but was not involved in the peer-review process nor had access to any information regarding its peer-review.

AUTHOR CONTRIBUTIONS

M.N. performed conceptualization, data curation, formal analysis, funding acquisition, investigation, methodology, visualization, and writing – original draft. S.Y., T.N., and Y.M. contributed to formal analysis, funding acquisition, methodology, validation, and writing – review & editing. C.C., M.R., and D.S. contributed to conceptualization, data curation, and investigation, and provided resources, supervision, and writing – review & editing. S.M., Y.H., and A.N. conducted project administration, and provided software, supervision, and writing – review & editing.

DATA AVAILABILITY STATEMENT

The data used in this study were available from the following sources: English Longitudinal Study of Ageing (ELSA): the UK Data Service with access codes SN 8688, and 5050; Study of Health, Ageing and Retirement in Europe (SHARE): http://www.share-project.org; and National Health and Aging Trends Study (NHATS): https://www.nhats.org/researcher.

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List of Supplementary Materials

Table S1. Variables across three cohort studies

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616 **Table 1.** Characteristics of older adults in the three cohort studies prior to the COVID-19 pandemic

	ELSA		SHARE		NHATS	
	N of responses	Mean (SD) or N (%)	N of responses	Mean (SD) or N (%)	N of responses	Mean (SD) or N (%)
Age, mean (SD)	--	--	34,475	70.4 (9.1)	3,001	79.6 (6.5)
Age, N (%)	6,306		34,475		3,001	
74 or less		2,587 (41.0)		13,394 (38.9)		738 (24.6)
75–84		1,162 (18.4)		8,530 (24.7)		1,561 (52.0)
85 or more		182 (2.9)		2,557 (7.4)		702 (23.4)
Sex, man, N (%)	6,306	2,772 (44.0)	34,475	14,510 (42.1)	3,001	1,290 (43.0)
Married or with a partner, N (%)	6,305	4,348 (69.0)	34,475	23,735 (68.8)	3,001	1,542 (51.4)

Living alone, N (%)	6,306	1,264(20.0)	34,475	10,515 (30.5)	3,001	934 (31.1)
Educational attainment, N (%)	5,747		34,475		2,965	
1 (low)		840 (14.6)		5,910 (17.1)		473 (15.8)
2		1,603 (27.9)		5,741 (16.7)		764 (25.8)
3		733 (12.8)		13,104 (38.0)		823 (27.8)
4 (high)		2,571 (44.7)		9,720 (28.2)		941 (31.4)
Dementia, N (%)	6,114	179 (2.9)	33,623	773 (2.3)	3,001	194 (6.5)

617 *Note:* COVID-19, coronavirus disease 2019; ELSA, English Longitudinal Study of Ageing (N = 6,306); SHARE, Study of Health, Ageing and

618 Retirement in Europe (N = 34,475); NHATS, National Health and Aging Trends Study (N = 3,001); SD, standard deviation; N, number.

Table 2. Change in home-care use during the COVID-19 pandemic by dementia at baseline

	ELSA		SHARE		NHATS	
	Dementia	No dementia	Dementia	No dementia	Dementia	No dementia
Home-care use, N (%)	N = 178	N = 5,934	N = 772	N = 32,824	N = 182	N = 2,677
Reduced	3 (1.7)	30 (0.5)	22 (2.8)	408 (1.2)	2 (1.1)	24 (0.9)
Same or increased	27 (15.2)	360 (6.1)	98 (12.7)	1,396 (4.3)	142 (78.0)	1,230 (45.9)
Same	16 (9.0)	263 (4.4)	N/A	N/A	128 (70.3)	1,109 (41.4)
Increased	11 (6.2)	97 (1.6)	N/A	N/A	14 (7.7)	121 (4.5)
No home care used	148 (83.1)	5,544 (93.4)	652 (84.5)	31,020 (94.5)	38 (20.9)	1,423 (53.1)

Note: COVID-19, coronavirus disease 2019; ELSA, English Longitudinal Study of Ageing (N = 6,112; 194 excluded due to missing data); SHARE, Study of Health, Ageing and Retirement in Europe (N = 33,596; 879 excluded due to missing data); NHATS, National Health and Aging Trends Study (N = 2,859; 142 excluded due to missing data). In SHARE, positive response (yes) to the question whether facing more

623 difficulties in getting the amount of home care needed was coded as “Reduced.” Negative response (no) to the question was coded as “Same or

624 increased.”

625 **Table 3.** Odds ratios, 95% confidence intervals, and P-values for the presence of depressive symptoms by baseline dementia and change in

626 home-care use during the COVID-19 pandemic

	ELSA		SHARE		NHATS	
	Odds ratio (95%CI)	P-value	Odds ratio (95%CI)	P-value	Odds ratio (95%CI)	P-value
Within-person level						
Home care during the pandemic, reference = no home care used						
Reduced	11.236 (3.230, 39.084)	<.001	2.444 (1.897, 3.149)	<.001	5.401 (1.282, 22.751)	.022
Same or increased	2.974 (2.127, 4.158)	<.001	1.681 (1.456, 1.940)	<.001	2.305 (1.681, 3.162)	<.001
Period, during the pandemic	3.695 (3.264, 4.185)	<.001	0.375 (0.360, 0.391)	<.001	1.157 (0.885, 1.512)	.285
Dementia x during pandemic	0.499 (0.304, 0.819)	.006	0.809 (0.635, 1.030)	.086	0.890 (0.483, 1.640)	.709
Between-person level	Coefficient (95%CI)		Coefficient (95%CI)		Coefficient (95%CI)	

Dementia at baseline	1.531 (1.107, 1.954)	<.001	0.882 (0.701, 1.063)	<.001	1.474 (1.007, 1.865)	<.001

Note: Multilevel binomial logistic regression analysis was employed. All analyses were adjusted for age, sex, married or with a partner, living alone, and educational attainment. Full-information maximum likelihood methods were used to handle missing data. CI, confidence interval. ELSA, English Longitudinal Study of Ageing (N = 6,306); Depressive symptoms were measured using a shortened version of the Center for Epidemiologic Studies Depression Scale (total score ≥4). SHARE, Study of Health, Ageing and Retirement in Europe (N = 34,475); Presence of depressive symptoms was assessed by single question for depression from European-Depression scale: "In the last month, have you been sad or depressed?" NHATS, National Health and Aging Trends Study (N = 3,001); Presence of depressive symptoms were measured using the Patient Health Questionnaire-2 (total score ≥3).

634 **Table 4.** Odds ratios, 95% confidence intervals, and P-values for the presence of depressive symptoms by interaction between baseline dementia

635 and change in home-care use during the COVID-19 pandemic

	ELSA		SHARE		NHATS	
	Odds ratio (95%CI)	P-value	Odds ratio (95%CI)	P-value	Odds ratio (95%CI)	P-value
Within-person level						
Home care during the pandemic, reference = no home care used						
Reduced	12.798 (3.627, 45.155)	<.001	2.505 (1.938, 3.237)	<.001	4.111 (1.047, 16.136)	.043
Same or increased	3.100 (2.188, 4.393)	<.001	1.712 (1.477, 1.984)	<.001	2.322 (1.704, 3.164)	<.001
Period, during the pandemic	3.601 (3.185, 4.071)	<.001	0.378 (0.362, 0.394)	<.001	1.116 (0.859, 1.449)	.410

Dementia x during pandemic	0.690 (0.413, 1.151)	.155	0.842 (0.651, 1.090)	.192	1.114 (0.458, 2.708)	.812
Dementia x reduced	0.202 (0.004, 9.817)	.419	0.720 (0.114, 4.532)	.726	999.000 (999.000, 999.000)	.187
Dementia x same or increased	0.690 (0.209, 2.278)	.543	0.722 (0.395, 1.322)	.291	0.718 (0.261, 1.973)	.521
Between-person level	Coefficient (95%CI)		Coefficient (95%CI)		Coefficient (95%CI)	
Dementia at baseline	1.265 (0.872, 1.658)	<.001	0.893 (0.701, 1.084)	<.001	1.389 (0.976, 1.803)	<.001

Note: Multilevel binomial logistic regression analysis was employed. All analyses were adjusted for age, sex, married or with a partner, living alone, and educational attainment. Full-information maximum likelihood methods were used to handle missing data. CI, confidence interval. ELSA, English Longitudinal Study of Ageing (N = 6,306); Depressive symptoms were measured using a shortened version of the Center for Epidemiologic Studies Depression Scale (total score ≥4). SHARE, Study of Health, Ageing and Retirement in Europe (N = 34,475); Presence of

640 depressive symptoms was assessed by single question for depression from European-Depression scale: “In the last month, have you been sad or

641 depressed?” NHATS, National Health and Aging Trends Study (N = 3,001); Presence of depressive symptoms were measured using the Patient

642 Health Questionnaire-2 (total score ≥3).

Figure Legends

Figure 1. Flow chart of this study

Numbers of participants in COVID-19 surveys in this figure may not be equal to those in the original data sets, as some participants were excluded based on the exclusion criteria for this study. ELSA, English Longitudinal Study of Ageing; SHARE, Study of Health, Ageing and Retirement in Europe; EU, European Union; NHATS, National Health and Aging Trends Study.

Figure 2. Presence of depressive symptoms before and during the COVID-19 pandemic across England, other European countries, and the United States

Baseline, main wave survey before the COVID-19 pandemic. Follow-up, sub-study during the pandemic. A: ELSA, English Longitudinal Study of Ageing. Depressive symptoms were measured using a shortened version of the Center for Epidemiologic Studies Depression Scale (total score ≥4). B: SHARE, Study of Health, Ageing and Retirement in Europe. Presence of depressive symptoms was assessed by single question for depression from European-Depression scale: “In the last month, have you been sad or depressed?” C: NHATS, National Health and Aging Trends Study. Presence of depressive symptoms were measured using the Patient Health Questionnaire-2 (total score ≥3).

Table S1. Variables across the three cohort studies

		Cohort		
		ELSA	SHARE	NHATS
Time	Variable	England	27 European countries	The United States
Baseline	Depressive symptoms	CESD score, range 0–8 • 1 = present (4 or more) • 0 = no (0–3)	One item from EURO-D: “In the last month, have you been sad or depressed?” • 1 = yes • 0 = no	PHQ-2 score, range 0–6 • 1 = present (3 or more) • 0 = no (0–2)
	Dementia status	Classification approach using immediate recall, delayed recall, and verbal fluency • 1 = dementia • 0 = no dementia	Classification approach using immediate recall, delayed recall, and verbal fluency • 1 = dementia • 0 = no dementia	Dementia classification by validated algorithm for survey • 1 = dementia • 0 = no dementia
	Age	Original cohort sampled from adults aged 50-89 or “90 or more” (classified into one category) Reclassified into five age bands • 1 = 74 or younger • 2 = 75-84 • 3 = 85 or older	Original cohort sampled from adults aged 50 or more Reclassified into five age bands • 1 = 74 or younger • 2 = 75-84 • 3 = 85 or older	Original cohort sampled from adults aged 65 or more Reclassified into five age bands • 1 = 74 or younger • 2 = 75-84 • 3 = 85 or older
	Sex	Male or female	Male or female	Male or female
	Educational	• 1 = NVQ4/NVQ5/degree or	ISCED-97	• 1 = no schooling completed

Time	Variable	Cohort ELSA England	SHARE 27 European countries	NHATS The United States
	attainment	equivalent • 2 = higher education below degree • 3 = NVQ3/GCE advanced level equivalent • 4 = NVQ2/GCE ordinary level equivalent • 5 = NVQ1/CSE other grade equivalent • 6 = foreign/other • 7 = no qualification	• 0 = pre-primary education • 1 = primary or first stage of basic education • 2 = lower secondary or second stage of basic education • 3 = (upper) secondary education • 4 = post-secondary non-tertiary education • 5 = first stage of tertiary education • 6 = second stage of tertiary education	• 2 = 1st–8th grade • 3 = 9th–12th grade • 4 = high school graduate (high school diploma or equivalent) • 5 = vocational, technical, business, or trade school certificate or diploma (beyond high school) • 6 = some college but no degree • 7 = associate's degree • 8 = bachelor's degree • 9 = master's, professional, or doctoral degree
		Reclassification using quartiles • 1 = no qualification • 2 = NVQ2/GCE ordinary level OR NVQ1/CSE • 3 = NVQ3/GCE advanced level OR higher education below degree	Reclassification using quartiles • 1 = ISCED 97 level 0 OR 1 • 2 = ISCED 97 level 2 • 3 = ISCED level 3 • 4 = ISCED level 4 OR 5 OR 6	Reclassification using quartiles • 1 = no school completed OR 1st–8th grade OR 9th–12th grade • 2 = high school graduate • 3 = diploma beyond high school OR some college OR associate's degree

Time	Variable	Cohort ELSA England	SHARE 27 European countries	NHATS The United States
		• 4 = NVQ4/NVQ5 • missing = foreign/other		• 4 = bachelor's OR master's, professional, or doctoral degree
	Married or with a partner	• 1 = yes: married OR remarried • 0 = no: single, never married OR separated OR divorced OR widowed	• 1 = yes: married and living together OR registered partnership OR married, living separated • 0 = never married OR divorced OR widowed	• 1 = yes: married OR living with a partner • 0 = no: separated OR divorced OR widowed OR never married
	Living alone	• 1 = yes: number of people in household is equal to 1 • 0 = no: number of people in household >1	• 1 = yes: household type is single person • 0 = no: household type is other than single person	• 1 = yes: number of people in household is equal to 1 • 0 = no: no: number of people in household >1
Follow-up	Depressive symptoms	CESD score, range 0–8 • 1 = present (4 or more) • 0 = no (0–3)	One item from EURO-D: "In the last month, have you been sad or depressed?" • 1 = yes • 0 = no	PHQ-2 score, range 0–6 • 1 = present (3 or more) • 0 = no (0–2)
	Home-care use	Over the past month have you received care at home? • Yes, formal (paid, provided from an agency)	Did you regularly receive home care before the outbreak of Corona? • Yes • No	• DURING the COVID-19 outbreak, in a typical week, how many people have done household activities with you or

Time	Variable	Cohort ELSA England	SHARE 27 European countries	NHATS The United States
		• Yes, informal (friend or relative) • No		for you or helped you with personal care activities? • DURING the COVID-19 outbreak, in a typical week, about how many hours have people spent doing your household activities with you or for you or helping you with personal care activities?
	Change in home-care use	Since the coronavirus outbreak started is the amount of care you receive… • Less than it was • About the same • More than it was • No longer receive help	Since the outbreak of Corona, did you face more difficulties in getting the amount of home care that you need? • Yes • No	Is that more, less or about the same compared to a typical week before the COVID-19 outbreak? • Less than before • More than before • About the same
	Reclassification of change in home-care use	• "No home care use": Did not receive care at home over the past month OR no longer receive help • "Same or increased": the amount	• "No home care use": Did not regularly receive home care • "Same or increased": Did not face more difficulties in getting the amount of home care	• "No home care use": No people helped in a typical week • "Same or increased": Hours people spent were about the same OR more than before

Time	Variable	Cohort ELSA England	SHARE 27 European countries	NHATS The United States
		of care was same OR more than it was • "Reduced": the amount of care was less than it was	needed • "Reduced": Faced more difficulties	• "Reduced": Hours people spent were less than before

Note: ELSA, English Longitudinal Study of Ageing (N = 6,306); SHARE, Study of Health, Ageing and Retirement in Europe (N = 34,475); NHATS, National Health and Aging Trends Study (N = 3,001); CESD, a shortened version of the Center for Epidemiologic Studies Depression Scale; EURO-D, European-Depression scale; PHQ-2, Patient Health Questionnaire-2; NVQ, National Vocational Qualification; GCE, General Certificate of Education; CSE, Certificate of Secondary Education; ISCED, International Standard Classification of Education.

Table S2. Presence of depressive symptoms according to presence of dementia at baseline across England, other 27 European countries, and the United States

N (%)	ELSA		SHARE		NHATS	
	Dementia	No dementia	Dementia	No dementia	Dementia	No dementia
Baseline						
Depressive symptoms						
Yes	54 (31.8)	641 (10.9)	425 (57.1)	12,770 (38.9)	42 (22.5)	203 (7.3)
No	116 (68.2)	5,259 (89.1)	319 (42.9)	20,040 (61.1)	145 (77.5)	2596 (92.7)
Follow-up						
Depressive symptoms						
Yes	71 (40.1)	1,429 (24.4)	287 (37.5)	8,158 (24.9)	59 (31.4)	300 (10.8)
No	106 (59.9)	4,428 (75.6)	478 (62.5)	24,620 (75.1)	129 (68.6)	2488 (89.2)

Table S3. Coefficients, 95% confidence intervals, and P-values of depressive symptoms of all covariates in the first model across England, other 27 European countries, and the United States

Variable	ELSA			SHARE			NHATS		
	Coefficient	95%CI	P-value	Coefficient	95%CI	P-value	Coefficient	95%CI	P-value
Within-person level									
Home care during the pandemic, reference = no home care used									
Reduced	2.419	1.172, 3.666	<.001	0.894	0.640, 1.147	<.001	1.687	0.249, 3.125	.022
Same or increased	1.090	0.755, 1.425	<.001	0.519	0.376, 0.663	<.001	0.835	0.519, 1.151	<.001
Period, during the pandemic	1.307	1.183, 1.431	<.001	-0.980	-1.022, -0.938	<.001	0.146	-0.122, 0.414	.285
Dementia x during pandemic	-0.695	-1.189, -0.200	.006	-0.212	-0.454, 0.030	.086	-0.116	-0.727, 0.495	.709
Between-person level									
Dementia at baseline	1.531	1.107, 1.954	<.001	0.882	0.701, 1.063	<.001	1.474	1.007, 1.940	<.001
Age, reference = 74 or less									
75-84	-0.402	-0.608, -0.197	<.001	0.259	0.197, 0.320	<.001	0.039	-0.349, 0.427	.843
85 or more	-0.539	-1.034, -0.044	.033	0.314	0.212, 0.416	<.001	-0.058	-0.496, 0.380	.795
Sex, male	-0.770	-0.928, -0.612	<.001	-0.853	-0.907, -0.799	<.001	-0.028	-0.318, 0.261	.849
Married or with a partner	-0.517	-0.762, -0.272	<.001	-0.011	-0.123, 0.102	.851	-0.466	-0.797, -0.135	.006
Living alone	0.463	0.195, 0.731	<.001	0.464	0.352, 0.576	<.001	0.053	-0.282, 0.387	.757
Educational attainment,									

reference = 1 (low)									
2	-0.387	-0.646, -0.129	.003	-0.143	-0.233, -0.053	.002	-0.432	-0.823, -0.041	.030
3	-0.371	-0.697, -0.045	.026	-0.257	-0.335, -0.179	<.001	-0.999	-1.424, -0.573	<.001
4 (high)	-0.509	-0.755, -0.264	<.001	-0.362	-0.444, -0.280	<.001	-1.521	-1.960, -1.082	<.001

Note: Multilevel binomial logistic regression analysis was employed. Full-information maximum likelihood methods were used to handle missing data. CI, confidence interval. ELSA, English Longitudinal Study of Ageing (N = 6,306); SHARE, Study of Health, Ageing and Retirement in Europe (N = 34,475); NHATS, National Health and Aging Trends Study (N = 3,001).

Table S4. Sensitivity analysis of the first model replacing with four categories of home-care use: coefficients, 95% confidence intervals, and P-values of depressive symptoms of all covariates across England and the United States

Variable	ELSA			NHATS		
	Coefficient	95%CI	P-value	Coefficient	95%CI	P-value
Within-person level						
Home care during the pandemic, reference = no home care used						
Reduced	2991.107	2950.957, 3031.257	<.001	1.701	0.398, 3.004	.011
Same	3567.569	3528.318, 3606.819	<.001	0.717	0.398, 1.037	<.001
Increased	-538.428	-538.428, -538.428	.999	1.529	0.908, 2.150	<.001
Period, during the pandemic	-13710.145	-13867.497, -13552.792	<.001	0.141	-0.120, 0.403	.290
Dementia x during pandemic	62.470	-109.125, 234.065	.476	-0.048	-0.652, 0.556	.876
Between-person level						
Dementia at baseline	1.479	1.069, 1.888	<.001	1.374	0.914, 1.834	<.001
Age, reference = 74 or less						
75-84	-0.354	-0.640, -0.068	<.001	-0.114	-0.436, 0.208	.489
85 or more	-0.267	-0.927, 0.393	.015	-0.221	-0.625, 0.183	.283
Sex, male	-0.686	-0.925, -0.447	.428	0.004	-0.282, 0.291	.976
Married or with a partner	-0.844	-1.168, -0.521	<.001	-0.519	-0.863, -0.176	.003
Living alone	0.392	0.064, 0.720	.019	-0.022	-0.334, 0.291	.891
Educational attainment, reference = 1 (low)						
2	-0.670	-1.030, -0.309	<.001	-0.504	-0.880, -0.129	.009
3	-0.970	-1.414, -0.526	<.001	-1.108	-1.521, -0.695	<.001

4 (high)	-0.763	-1.062, -0.464	<.001	-1.631	-2.021, -1.240	<.001

Note: Multilevel binomial logistic regression analysis was employed. Full-information maximum likelihood methods were used to handle missing data. CI, confidence interval. ELSA, English Longitudinal Study of Ageing (N = 6,306); NHATS, National Health and Aging Trends Study (N = 3,001).

Table S5. Sensitivity analysis of the first model excluding participants reduced home-care use: coefficients, 95% confidence intervals, and P-values of depressive symptoms of all covariates across England, other 27 European countries, and the United States

Variable	ELSA			SHARE			NHATS		
	Coefficient	95%CI	P-value	Coefficient	95%CI	P-value	Coefficient	95%CI	P-value
Within-person level									
Home care during the pandemic, reference = no home care used									
Same or increased	--	--	--	0.524	0.380, 0.667	<.001	--	--	--
Same	549.818	533.869, 565.767	<.001	--	--	--	0.746	0.419, 1.073	<.001
Increased	-294.322	-294.322, -294.322	.999	--	--	--	1.543	0.902, 2.184	<.001
Period, during the pandemic	-1873.888	-1873.888, -1873.888	.999	-0.967	-1.009, -0.925	<.001	0.156	-0.114, 0.426	.257
Dementia x during pandemic	116.885	-2403.642, 2687.411	.928	-0.228	-0.481, 0.026	.078	-0.072	-0.685, 0.540	.817
Between-person level									
Dementia at baseline	0.854	0.607, 1.100	<.001	0.898	0.699, 1.096	<.001	1.389	0.915, 1.863	<.001
Age, reference = 74 or less									
75-84	-0.291	-0.525, -0.057	.015	0.257	0.195, 0.319	<.001	0.007	-0.347, 0.360	.971
85 or more	-0.116	-0.529, 0.298	.584	0.303	0.199, 0.408	<.001	-0.055	-0.485, 0.374	.801
Sex, male	-0.587	-0.799, -0.376	<.001	-0.857	-0.911, -0.803	<.001	-0.017	-0.301, 0.268	.909
Married or with a partner	-0.801	-1.036, -0.565	<.001	-0.001	-0.107, 0.106	.990	-0.451	-0.804, -0.098	.012

Living alone	0.147	-0.034, 0.328	.112	0.472	0.364, 0.579	<.001	0.068	-0.268, 0.405	.690
Educational attainment, reference = 1 (low)									
2	-0.446	-0.655, -0.237	<.001	-0.149	-0.237, -0.061	.001	-0.481	-0.850, -0.113	.010
3	-0.703	-1.038, -0.368	<.001	-0.253	-0.331, -0.176	<.001	-1.094	-1.482, -0.706	<.001
4 (high)	-0.606	-0.830, -0.381	<.001	-0.360	-0.440, -0.279	<.001	-1.608	-2.008, -1.209	<.001

Note: Multilevel binomial logistic regression analysis was employed. Full-information maximum likelihood methods were used to handle missing data. CI, confidence interval. ELSA, English Longitudinal Study of Ageing (N = 6,273); SHARE, Study of Health, Ageing and Retirement in Europe (N = 34,018); NHATS, National Health and Aging Trends Study (N = 2,975).

Table S6. Coefficients, 95% confidence intervals, and P-values of depressive symptoms of all covariates in the second model across England, other 27 European countries, and the United States

Variable	ELSA			SHARE			NHATS		
	Coefficient	95%CI	P-value	Coefficient	95%CI	P-value	Coefficient	95%CI	P-value
Within-person level									
Home care during the pandemic, reference = no home care used									
Reduced	2.549	1.288, 3.810	<.001	0.918	0.661, 1.175	<.001	1.414	0.046, 2.781	.043
Same or increased	1.132	0.783, 1.480	<.001	0.538	0.390, 0.685	<.001	0.842	0.533, 1.152	<.001
Period, during the pandemic	1.281	1.158, 1.404	<.001	-0.974	-1.015, -0.933	<.001	0.110	-0.151, 0.371	.410
Dementia x during pandemic	-0.371	-1.565, 0.823	.155	-0.172	-0.430, 0.086	.192	0.108	-0.781, 0.996	.812
Dementia x reduced	-1.601	-5.487, 2.284	.419	-0.329	-2.169, 1.511	.726	47.305	-22.933, 117.548	.187
Dementia x same or increased	-0.371	-1.565, 0.823	.543	-0.325	-0.930, 0.279	.291	-0.331	-1.343, 0.680	.521
Between-person level									
Dementia at	1.265	0.872 1.658	<.001	0.893	0.701, 1.084	<.001	1.389	0.976, 1.803	<.001

baseline									
Age, reference = 74 or less									
75-84	-0.412	-0.622, -0.201	.001	0.261	0.200, 0.321	<.001	0.045	-0.264, 0.353	.777
85 or more	-0.589	-1.014, -0.164	.007	0.325	0.224, 0.423	<.001	-0.030	-0.363, 0.304	.861
Sex, male	-0.778	-0.938, -0.618	<.001	-0.839	-0.893, -0.786	<.001	0.040	-0.235, 0.314	.777
Married or with a partner	-0.670	-0.882, -0.459	<.001	0.026	-0.076, 0.128	.616	-0.364	-0.692, -0.036	.029
Living alone	0.275	0.040, 0.510	.022	0.487	0.385, 0.590	<.001	0.142	-0.211, 0.496	.430
Educational attainment, reference = 1 (low)									
2	-0.466	-0.704, -0.227	<.001	-0.138	-0.223, -0.052	.002	-0.370	-0.726, -0.013	.042
3	-0.419	-0.726, -0.112	.007	-0.240	-0.316, -0.164	<.001	-0.917	-1.308, -0.527	<.001
4 (high)	-0.585	-0.813, -0.357	<.001	-0.337	-0.416, -0.258	<.001	-1.428	-1.794, -1.063	<.001

Note: Multilevel binomial logistic regression analysis was employed. Full-information maximum likelihood methods were used to handle missing data. CI, confidence interval. ELSA, English Longitudinal Study of Ageing (N = 6,306); SHARE, Study of Health, Ageing and Retirement in Europe (N = 34,475); NHATS, National Health and Aging Trends Study (N = 3,001).

Table S7. Sensitivity analysis of the second model replacing with total scores of depressive symptoms: coefficients, 95% confidence intervals, and P-values of depressive symptoms of all covariates across England and the United States

Variable	ELSA			NHATS		
	Coefficient	95%CI	P-value	Coefficient	95%CI	P-v
Within-person level						
Home care during the pandemic, reference = no home care used						
Reduced	1.891	1.085, 2.698	<.001	0.664	0.051, 1.277	.03
Same or increased	1.172	0.919, 1.426	<.001	0.233	0.149, 0.317	<.0
Period, during the pandemic	0.106	0.051, 0.162	<.001	0.074	0.019, 0.130	.00
Dementia x during pandemic	0.062	-0.344, 0.469	.765	0.164	-0.233, 0.561	.41
Dementia x reduced	-1.091	-3.753, 1.572	.422	0.131	-1.927, 2.189	.90
Dementia x same or increased	0.082	-0.936, 1.099	.875	-0.153	-0.626, 0.321	.52
Between-person level						
Dementia at baseline	0.691	0.413, 0.969	<.001	0.627	0.389, 0.866	<.0
Age, reference = 74 or less						
75-84	-0.221	-0.319, -0.123	<.001	0.003	-0.087, 0.094	.94
85 or more	-0.347	-0.541, -0.154	<.001	-0.012	-0.125, 0.101	.83
Sex, male	-0.474	-0.551, -0.397	<.001	-0.130	-0.209, -0.050	.00
Married or with a partner	-0.262	-0.390, -0.135	<.001	-0.097	-0.199, 0.005	.06
Living alone	0.309	0.151, 0.466	<.001	0.065	-0.039, 0.170	.22
Educational attainment, reference = 1 (low)						
2	-0.172	-0.312, -0.032	.016	-0.242	-0.382, -0.101	.00
3	-0.228	-0.389, -0.067	.006	-0.446	-0.582, -0.310	<.0
4 (high)	-0.270	-0.400, -0.140	<.001	-0.567	-0.699, -0.435	<.0

Note: Multilevel linear regression analysis was employed. Full-information maximum likelihood methods were used to handle missing data. CI, confidence interval. ELSA, English Longitudinal Study of Ageing (N = 6,306); NHATS, National Health and Aging Trends Study (N = 3,001).